BALANCING ACT: ECONOMIC INCENTIVES, ADMINISTRATIVE RESTRICTIONS, AND URBAN LAND EXPANSION IN CHINA

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Abstract We examine how the system of "federalism, Chinese style" functions in the context of land allocation. China's land laws give provision of land a central role in local officials' growth promotion strategies. Requisitions of farmland by local authorities have engendered significant rural unrest. In response, the central government has attempted to re-establish control over the pace of urban land expansion by enacting regulations limiting conversion of rural land to urban uses. We derive theoretically the conditions under which non-compliance with such regulations is optimal. An econometric investigation shows that legal restrictions on farmland conversion had no effect on rates of farmland loss but did limit urban spatial growth rates in some regions. Our econometric evidence suggests very limited enforcement of those legal limits on farmland conversion.

Key words: China, urbanization, land development, farmland conversion, land use, decentralization, fiscal federalism

JEL Codes: R52, R14, Q15, H77

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1. Introduction

China's rapid urban growth has engendered tensions on a number of fronts. Among the most notable are those arising out of the spatial expansion of Chinese cities into the surrounding countryside. Requisitions of farmland and sales of farmland by corrupt officials to allow for urban development have engendered significant rural unrest, making the central government apprehensive about threats to social stability as well as to self-sufficiency in food production (Cao 2004, Deng et al. 2006, Lichtenberg and Ding 2008). Another source of tension comes from conflicts between the central government, which sets land use policy, and local officials, who manage land use "on the ground". These conflicts have their roots in a series of reforms that decentralized economic decision making, gave greater scope to market activity, and hardened budget constraints. The net result has been what has been called "federalism, Chinese style". Reforms in governance devolved responsibility for economic decision making to local officials, giving them incentives to adopt policies that promote economic growth. Fiscal reforms shifted the base of government finance from remittance of profits from state-owned enterprises to taxes on value added and income, accommodating a transition to private sector activity. These fiscal reforms, combined with reform of the banking system, have hardened budget constraints (Jin, Qian, and Weingast 2005, Podpiera 2006).

The goal of these decentralizing reforms has been to accelerate economic growth. Promotion prospects for local officials, for example, are explicitly tied to their performance in promoting economic growth (Li and Zhou 2005, Edin 2003, Whiting 2004). Urban spatial expansion has been shown to be closely associated with urban economic growth (Seto and

Kaufmann 2003, Deng et al. 2008, Ke et al. 2009, Deng et al. 2009). The provision of land has been shown to be an explicit contributor to urban economic growth (Ding and Lichtenberg 2011). China's land laws give provision of land a central role in local officials' growth promotion strategies and conversion of rural land to urban uses has been shown to be influenced by both growth promotion and fiscal incentives facing local officials (Lichtenberg and Ding 2009, Ke et al. 2009).

But reforms like China's decentralize political as well as economic power and thus tend to weaken the authority of the central government and central Communist Party apparatus.[1] To counterbalance the centrifugal and destabilizing tendencies created by these reforms, the Chinese government employs a combination of incentives and direct controls. Central government control over local officials' promotion prospects helps align interests at each level of government, as does sharing tax revenues between local, provincial, and central governments according to predetermined formulas. Competition among cities for domestic and foreign investment and rotation of officials can help temper tendencies for monopolization, protectionism, and favoritism at the local level (Head and Ries 1996; Bo 2004). The central government has also attempted to re-establish control over the pace of urban land expansion by enacting regulations limiting conversion of rural land to urban uses, supplemented by periodic campaigns against corruption, fraud, illegal land development, and other violations of planning restrictions and other regulations (Ding and Lichtenberg 2011).[2]

This paper examines the tension between regulations designed to preserve central government control and economic incentives created by decentralization in China in the context

[1] They may also threaten macroeconomic stability, as competition between jurisdictions has at times led to excessive investment in capital and land (Ding and Lichtenberg 2011).
[2] To take just one example, a number of provincial officials were executed or sentenced to life in prison for illegal land market activity during the period 1998-2004 (China Land and Resource Net 2004).

of land transactions. We show theoretically how and when these regulations can conflict with the promotion of economic growth and local government fiscal health and derive conditions under which the incentives faced by local officials make non-compliance more likely. We then examine empirically the extent to which these farmland protection regulations have inhibited urban land expansion and losses of agricultural land.

We proceed as follows. Section 2 discusses the institutional structure of land use in China. Section 3 describes trends in land use in China in recent years. Section 4 presents a theoretical model of conversion of agricultural land to urban uses when farmland protection regulations are imperfectly enforced. Section 5 discusses the data and econometric specification used in the empirical analysis. Section 6 discusses the results of the econometric analysis and their implications. Section 7 concludes.

2. Institutions Governing Land Allocation in China

All land in China is formally owned by the public. Urban land owned by the state; its use is controlled largely by local officials acting as agents of the state, subject to oversight by higher level officials at the higher levels of government (Ding 2007).[3] Rural land is controlled by village collectives, again subject to oversight by higher level government bodies, and can be used for limited kinds of housing, public works, and village enterprises in addition to agriculture. The use of rural land for most forms of industrial or commercial development is expressly prohibited.

China reconciled expansion of private enterprise and market transactions with the socialist principle of public ownership of land by adopting the Hong Kong system of renting out use rights to land under long term leases. This system was legalized for the country as a whole by the Land Administration Law of 1986. Use rights are sold for an up-front land conveyance

[3] Exceptions to control by local officials include land allocated directly to schools, infrastructure, and other public uses and to state-owned enterprises under grants made primarily during the pre-reform period.

fee paid to the local government; the lessee also owes the local government an annual rent for the duration of the lease term. Tenure under these leases is secure: Lessees have full control over land during the lease term, with the ability to rent, sell, mortgage, donate, or leased out land held under lease (Ho and Lin 2003, Ding 2003, Cai, Henderson and Zhang 2009).

Farmland is the principal source of land for urban expansion, accounting for 60 to 80 percent of increases in urban land during the period 1996-2001 (Figure 1). The principal kind of farmland converted to urban use has been what China calls “cultivated land”, which consists of land allocated to major grains, oilseeds, tubers, and vegetables; it accounts for 50 to 75 percent of increases in urban land, i.e., 80 to 95 percent of farmland conversion. At various times, land in orchards (“horticultural land”) and pasture have also been significant additional sources of urban land expansion.

China’s relative scarcity of arable land might seem to make redevelopment of existing urban land more attractive than urban expansion into farmland. But redevelopment of existing urban land is limited by several factors. Urban planning guidelines limit density and thus substitution of capital for land (Bertaud 2007). Some urban land is controlled by former state-owned enterprises under previous grants and can thus not be redeveloped by municipal officials. And redevelopment of land controlled by municipal officials can be quite expensive because existing tenants must be resettled and compensated at local government expense (Fu et al. 1999, Lin 2007). Additionally, as discussed below, legal requirements keep the cost of converting farmland low. All of these factors make conversion of farmland the most attractive means of providing land to accommodate economic growth.

Rural land becomes available for development into commercial, industrial, or urban residential use only after being converted from rural to urban status. The process begins when a municipal government requisitions rural land from a village collective. The village collective receives a compensation package set by an administrative formula based largely on agricultural productivity that includes payments for land, crops currently under cultivation, attachments to land, and land improvements along with subsidies for resettlement. That administrative formula allows local governments to profit by converting land from rural to urban status. Because it is based on agricultural productivity, compensation for rural land tends to be much lower than the conveyance fees local governments receive as up-front payments for use-right leases, at least in rapidly growing urban areas. Anecdotal evidence suggests that conveyance fees are frequently 10-20 times farmland compensation (Investigating Group of Land Acquisition Reform of Ministry of Land and Resources 2003, Ding 2007).

Profits from land transactions go directly to local governments; they are not subject to sharing with higher levels of government—in contrast to most taxes, notably the value added and income taxes that form the basis of Chinese government finance since fiscal and tax reforms introduced in the early 1990s (Lin 2007, Ding 2007). In China as a whole, land-related revenue grew from less than 10% of tax revenue in 1999 to 55% of tax revenue in 2003-2004 (Ding and Lichtenberg 2011). Land transactions provided an especially large share of local government revenue in coastal China, in the cities of Beijing, Tianjin, and Chongqing, and in Sichuan Province, where land-related revenues have been greater than or equal to tax revenues in recent years (Ding 2007). Land has also been used as collateral for loans to local governments.

The rapid pace of urban expansion into the countryside has created numerous problems. Social unrest in villages whose land has been requisitioned—exemplified by the recent case of Wukan in Guangdong Province, where residents blockaded entry into their village to protest the sale of their land—has arguably received the most attention in the US. Protests against illegal and involuntary land sales have become increasingly widespread. The central government has also expressed concern about China's ability to maintain food security in the face of farmland loss (Lichtenberg and Ding 2008). Speculative farmland conversion is another source of concern, as local officials in some cities have requisitioned farmland to create economic development zones in the hope that the availability of land would attract investment—not always successfully, as demonstrated by development zones that remained vacant (Cai 2003, Ho and Lin 2004, Su 2005). Central government investigations led to forced reconversion of many such vacant development zones back to agricultural use (Cao 2004, Lin 2007). Problems associated with excess capacity are also intimately connected to farmland conversion, since converted farmland is the principal source of sites for new industrial, commercial, and residential investment.

Responding to these problems, the central government amended the Land Administration law in 1998 to include a set of farmland protection provisions whose goal is no net loss of "cultivated land". This "dynamic balance" policy was introduced in principle in 1994 and pilot tested subsequently before being written into law in 1998. It requires county and township governments to designate basic farmland protection zones consisting of cultivated land that is either (a) high-quality/high productivity cultivated land or (b) good-quality/moderate productivity. Under the dynamic balance policy, it is illegal to convert land designated as high-quality cultivated land to nonagricultural use. Converting good quality cultivated land to nonagricultural use requires approval from higher-level authorities. Moreover, any conversion must be offset by conversion or reclamation of other land to agricultural use so that amount of land in agriculture, adjusted for quality, remains constant (Ding 2003; Lichtenberg and Ding 2008). The 1998 Land Administration Law requires each province to designate at least 80 percent of its cultivated land as basic farmland. Thus, conversion of cultivated land to nonagricultural use in some jurisdictions in a given province can, in principle then, be offset by conversion of other land to cultivated land in others in the same province. In practice, the dynamic balance policy has been largely interpreted as holding for each jurisdiction.

The dynamic balance policy is implemented via a hierarchical, top-down planning process in which the State Council approves land use master plan for cities with populations greater than a million populations and provincial governments approve land use master plans for cities with populations under a million. These land use master plans specify the maximum amount of agricultural land to be used for construction, the maximum amount of "cultivated" land to be developed, maximum per capita land use in cities and towns, the minimum amounts of protected farmland and "cultivated" land, all of which are subject to a top-down approval process. In addition, certain types of conversion of farmland to nonagricultural uses—land designated as basic farmland, cultivated land not designated as basic farmland but exceeding 35 hectares, and any other farmland exceeding 70 hectares—must be approved by the central government. These procedural requirements are intended to establish a system of vertical oversight and enforcement (Lichtenberg and Ding 2008).

3. Trends in Urban and Agricultural Land Use, 1996-2004

Despite the adoption of the dynamic balance policy, farmland continues to decline in China (Figure 2). During the period 1996-2004, cultivated land area shrank at an average annual rate of 925,000 hectares, or 0.7 percent. The bulk of that decline occurred in Central/Western China, where cultivated land area fell by an average of 737,500 hectares, or 0.8 percent. Eastern China[4], which accounts for a tenth of China's total farmland but a quarter of its land in

[4] Eastern China comprises the coastal provinces Liaoning, Hebei, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong, and Hainan along with the provincial-level cities Beijing, Tianjin, and Shanghai.

major crops (“cultivated land”) and almost two-fifths of its population lost cultivated land at an average annual rate of 175,000 hectares, or 0.6 percent.

Much of the reduction of cultivated land area in Central/Western China occurred during 1999-2003 (Figure 3) and is attributable to the “Grain for Green” program (Yang and Li 2000). Launched in 1999, “Grain for Green” addressed problems of erosion and desertification of poor quality land that had been converted to grain production during China’s drive for self-sufficiency in grain production during the 1950s, 1960s, and 1970s. The program pays farmers to convert that land back to its traditional land cover of forest and grassland. This land was poorly suited for agriculture and thus contributed little to crop production (Uchida, Xu, and Rozelle 2005; The Central People’s Government of China 2007).

Rates of loss of cultivated land in Eastern China were minimal in the years immediately preceding and those immediately following adoption of the dynamic balance policy (Figure 3). The effect of the policy appears to have worn off rather quickly, as the rate of cultivated land loss rose above 1 percent a year by 2001.

Urban land area continued to rise throughout the period 1996-2004 (Figure 4). The dynamic balance policy appears to have had similarly temporary effects on increases in urban land area. In China as a whole, urban land area increased at an average annual rate of 93,750 hectares, or 10.1 percent. Urban expansion was especially rapid in Eastern China, where urban area increased at an average annual rate of 46,250 hectares, or 26.4 percent. Urban area in Central/Western China grew at an average annual rate of 47,500 hectares, or 6.4 percent. The growth rate of urban land fell in China as a whole and in Eastern China between 1998 and 2000 before rising again (Figure 5). The reduction in the growth of urban area in Central/Western China lasted longer, until 2002.

4. Impacts of the Dynamic Balance Policy: Theory

We use a single-period version of Lichtenberg and Ding's (2009) dynamic model of farmland conversion to construct a conceptual framework describing how the dynamic balance policy influences the decisions of municipal officials. Following Li and Zhou (2005), Edin (2003), Whiting (2004) and others, we assume that the advancement prospects of those officials depend positively on their performance in promoting economic growth and managing the fiscal balance of their cities. Let L_u, L_a, and L_o denote the areas of urban, agricultural, and all other land, respectively, within a jurisdiction. Let $X_a \geq 0$ denote the area of agricultural land converted to urban use, and $X_o \geq 0$ denote the area of all other land converted to agricultural use. Let $0 \leq \varphi \leq 1$ denote the productivity of other land relative to existing agricultural land, so that the quality-adjusted area of other land converted to agricultural land is φX_o.

The local economy consists of two sectors: agriculture and urban. Local officials face the problem of maximizing GDP from agriculture, $R(L_a - X_a + \varphi X_o)$ plus GDP from the urban sector, $\pi(L_u + X_a)$. Assume that both GDP functions are increasing and concave in land. Local budgetary revenue come from two sources: a value added tax on urban GDP imposed at a rate τ, so that tax receipts are $\tau\pi(L_u + X_a)$, and profit from land transactions, $(p - c)X_a$, where p denotes the per hectare conveyance fee paid for use rights and c denotes compensation per hectare for farmland conversion. Local budgetary expenditures on infrastructure and public services are assumed to be increasing and convex in urban area, $e(L_u + X_a)$. GDP, tax receipts, and expenditures are capitalized in perpetuity at a rate $\delta > 0$ to obtain long run values. Profits from land transactions are short run only. Let β denote the value that higher level officials place on promotion of urban economic growth relative to agricultural production and γ denote the value placed on budgetary fiscal management relative to agriculture. Finally, let $g(X_o)$ denote the cost of converting other land to agricultural use and ω be the weight that higher level officials place on that cost.

The local official's decision problem is to choose how much land to convert from agricultural to urban use and how much land to convert from other uses to agriculture in order to maximize

$$\max_{X_a, X_o} \left\{ \frac{R(L_a - X_a + \varphi X_o)}{\delta} + \frac{(\beta + \gamma\tau)\pi(L_u + X_a)}{\delta} - \frac{\gamma e(L_u + X_a)}{\delta} + (p - c)X_a - \omega g(X_o) \right\}.$$

Optimal farmland conversion X_a* balances short run profits from land transactions plus long run increases in urban GDP and associated tax revenue against long run reductions in agricultural GDP and increases in budgetary expenditures:

$$(p - c) + \frac{(\beta + \gamma\tau)\pi'(L_u + X_a^*)}{\delta} = \frac{R'(L_a - X_a^* + \varphi X_o^*)}{\delta} + \frac{\gamma e'(L_u + X_a^*)}{\delta}. \quad (1)$$

Optimal conversion of other land to agriculture X_o* balances the short run marginal cost of converting other land to agriculture against long run increases in agricultural productivity,

$$\omega g'(X_o^*) = \frac{R'(L_a - X_a^* + \varphi X_o^*)}{\delta\varphi}. \quad (2)$$

To simplify the exposition (and without loss of generality), assume that in the absence of the dynamic balance policy local officials never find it optimal to convert other land to agricultural uses, i.e., X_o* = 0 (i.e., the left hand side of equation (2) is strictly greater than the right hand side). It is straightforward to show that in the absence of the dynamic balance policy optimal farmland conversion is greater in areas where conveyance fees are higher (e.g., because there is greater demand for urban land development) and in situations where compensation for requisitioned agricultural land is lower (e.g., because agricultural land is less productive or because higher level governments pay all or part of the compensation package). Similarly, optimal farmland conversion is increasing in the weight higher level officials place on promotion of urban economic growth (β) and in the weight higher level officials place on long term performance (reflected in a lower discount rate δ). It is also increasing in the weight higher level officials place on budgetary fiscal performance as long as marginal tax revenues exceed marginal expenditure obligations.

Now consider optimal land conversion under the dynamic balance policy. When binding, the dynamic balance constraint requires $X_a = \varphi X_o$. Substituting this constraint makes the local official's decision problem

$$\max_{X_a}\left\{\frac{R(L_a)}{\delta} + \frac{(\beta+\gamma\tau)\pi(L_u+X_a)}{\delta} - \frac{\gamma e(L_u+X_a)}{\delta} + (p-c)X_a - \omega g\left(\frac{X_a}{\varphi}\right)\right\}.$$

In this case, optimal farmland conversion X_a^c balances short run profits from land transactions plus long run increases in urban GDP and associated tax revenue against reductions in agricultural GDP and increases in budgetary expenditures:

$$(3) \qquad (p-c) + \frac{(\beta+\gamma\tau)\pi'(L_u+X_a^c)}{\delta} = \frac{\omega g'(\frac{X_a^c}{\varphi})}{\varphi} + \frac{\gamma e'(L_u+X_a^c)}{\delta}.$$

$X_o^* = 0$ implies $\omega g'/\varphi > R'/\delta$, hence $X_a^c < X_a^*$: The dynamic balance constraint, when binding, reduces conversion of agricultural land to urban uses and thus local officials' objective functions.

Let V^c denote the local official's maximized objective function when the dynamic balance policy is binding and V^* denote the maximized objective function when it is not. Assume that administrative restrictions like the dynamic balance policy are enforced by periodic or selective crackdowns, so that penalties for violations F are incurred stochastically with probability q. Local officials will ignore the dynamic balance policy when

$$(4) \qquad \sigma \equiv V^*(p,c,\beta,\gamma,\delta) - V^c(p,c,\beta,\gamma,\delta) - qF \geq 0$$

and comply when the inequality is reversed. Application of the envelope theorem to the switching function σ indicates that compliance with the dynamic balance policy should be less prevalent (the inequality in condition (4) is more likely to hold) in areas where profits from land conversion are higher (i.e., conveyance fees are higher relative to compensation for agricultural land), as is the case in Eastern China. Compliance is also less prevalent in times and places where higher level officials place greater weight on promoting urban economic growth and urban fiscal management relative to agriculture.

In sum, the theoretical analysis of this section implies the following:

1. Conversion of agricultural land to urban use is greater in areas where the value of urban land is higher.
2. Conversion of agricultural land to urban use is lower in areas where the value of agricultural land is higher.
3. Conversion of agricultural land to urban use is higher in areas where tax revenues are greater.
4. The dynamic balance policy is less likely to be effective in areas where profits from farmland conversion are higher.

5. Data and Econometric Specification

5.1. Data

We test these propositions econometrically using a panel of prefecture-level data for the period 1996-2004 compiled from three sources. Land use data come from official statistics kept by China's Ministry of Land and Resources. Economic data come from annual provincial statistical yearbooks. Data on the years in which the dynamic balance policy took effect in each province come from an internet search.

Detailed data on the areas of cultivated land, urban land, and unused land were obtained from official statistics kept by the Ministry of Land and Resources, which report the area of land in each of a wide variety of uses down to 0.1 *mu* (approximately 0.007 hectares). We restrict our sample to the period beginning in 1996, the first year in which Chinese land use data are known to be reliable (Lichtenberg and Ding 2008).

GDP from the primary, secondary, and tertiary sectors, local government budgetary revenue (almost all of which comes from urban sources) and local government budgetary expenditures were taken from published provincial statistical yearbooks for the years 1997-2005. All monetary variables were adjusted for inflation to real year 2004 terms and then converted to US dollars using the 2004 average annual exchange rate, both as reported by the World Bank (2011). GDP deflators for agricultural, industry, and services sectors were used to deflate the local GDP from their respective sectors while the overall GDP deflator was used to deflate budgetary revenues and expenditures.

The 1998 Land Administration Law—and dynamic balance policy—took effect at the national level as of January 1, 1999. However, each provincial level government enacted its own legislation implementing the Law and revising their provincial land use regulations in accordance with it.[5] As a result, the dynamic balance policy was actually phased in gradually over the entire country. As can be seen from Table 1, which lists the effective dates in which the dynamic balance policy became effective in each provincial-level administrative division, 27 out of the 31 provincial-level divisions started implementing the new Land Administration Law by the end of 2000, while another three implemented it in 2001 and 2002. The last province to implement it, Qinghai, adopted it only in 2006. We found no record of Beijing having done so. Since it is the national capital, however, we assumed that the national law became effective there as of January 1, 1999. Our econometric model exploits the gradual phase-in of the policy to

[5] The provincial-level administrative divisions in mainland China include twenty-one provinces, five autonomous regions, and four municipalities governed directly by the State Council.

estimate its effects. In that model, we assume that provincial enabling legislation or regulations adopted in the first six months of the year were effective for that entire calendar year and that legislation or regulations adopted in the second half of the year became effective the following calendar year.

We conduct our econometric analysis using prefecture-level data because county-level economic data were incomplete in some provinces. After adjusting for boundary changes occurring during the sample period, the data set contained 326 prefectures and four provincial-level municipalities, a total of 330. We estimate separate models for Eastern and Central/Western China in addition to China as a whole. The fastest-growing areas of China are located in the Eastern China The theoretical analysis of the preceding section suggests that compliance with the dynamic balance policy is likely to be lower in Eastern China than in Central/Western China because profits from farmland conversion and economic growth potential are both higher in the former than the latter.

Table 2 summarizes the land variables and economic variables used in the econometric analysis.

5.2 Specification and Estimation of the Econometric Model

We examine the relative importance of economic incentives and administrative restrictions on land use by estimating models of changes in land use *j* in prefecture/city *k* during year *t* as functions of initial (period *t*) urban land value, agricultural land value, government budgetary revenue, government budgetary expenditures, and an indicator variable taking on a value of one in years in which the dynamic balance policy was in effect in the province in which each prefecture is located.

(5)
$$X_{jkt} \equiv L_{jk,t+1} - L_{jkt} = b_{1j} UrbanValue_{jkt} + b_{2j} AgValue_{jkt} + b_{3j} Govt\,\mathrm{Re}\,v_{jkt}$$
$$+ b_{4j} GovtExp_{jkt} + b_{5j} 1[DynBal_{jkt} = 1] + a_{jk} + a_{jt} + e_{jkt}.$$

Here a_{jk} denotes unobserved factors influencing land use *j* in prefecture *k* over the entire sample period, a_{jt} denotes unobserved factors influencing land use *j* in all prefectures in year *t*, and e_{jkt} is a white noise error.

We examine changes in three classes of land use *j*: urban land, "cultivated land", and unused land—the latter being the most likely source of additional land for conversion to agriculture, hence the best estimate of X_o, changes in other land. Results (1)-(4) imply that the change in urban area should be increasing in the value of urban land ($b_{1j} > 0$), decreasing in the value of agricultural land ($b_{2j} < 0$), and increasing in government revenue ($b_{3j} > 0$). If the dynamic balance policy is effective in curbing conversion of farmland to urban use, the coefficient of the dynamic balance policy indicator should be negative ($b_{5j} < 0$). Results (1)-(4) similarly imply that the coefficients in the change in "cultivated land" equation should have the opposite signs.

The effects of government budgetary expenditures on changes in land use are less clear. The theoretical model of Section 4 implicitly assumes that all government spending is allocated to current services. In reality, a significant share of government spending is allocated to investments in infrastructure and other projects intended to promote economic growth and enhance local prestige. Many such projects require land and are thus positively correlated with conversion of agricultural land to urban uses. In sum, we have no *a priori* expectation about the signs of b_{4j} other than surmising that it is more likely to be positive in the urban land equation and negative in the "cultivated land" equation.

We modify the estimating equation (5) to allow for possible nonlinearities by regressing the difference of the logs of each class of land use in adjacent years on the logs of urban land value, agricultural land value, government budgetary revenue, and government budgetary expenditure along with the dynamic balance indicator, all in the initial year:

$$\begin{aligned}(6)\qquad &\log(L_{jk,t+1}) - \log(L_{jkt}) = b_{1j}\log(UrbanValue_{jkt}) + b_{2j}\log(AgValue_{jkt}) \\ &+ b_{3j}\log(GovtRev_{jkt}) + b_{4j}\log(GovtExp_{jkt}) + b_{5j}1[DynBal_{jkt} = 1] + a_{jk} + a_{jt} + e_{jkt}.\end{aligned}$$

Our theoretical analysis leads us to expect the coefficients to have the same signs as noted above.

Wald tests (Baum 2001) indicated heteroskedasticity across cities for changes in all three kinds of land use in both level and percentage change terms (Panel A of Table 3). The procedure suggested by Wooldridge (2002, p. 275) indicated the presence of serial correlation in the equations for level and percentage changes in urban land (in all instances except level changes in Western/Central China) and in changes in "cultivated land" in Eastern China (Panel B of Table 3). We therefore estimated standard errors corrected for heteroskedasticity and contemporaneous correlation across cities using the *xtpcse* command in Stata. For urban land and cultivated land we estimated both coefficients and standard errors corrected for serial correlation as well as heteroskedasticity and contemporaneous correlation using the *xtpcse* Stata command. The estimated coefficients of models for "cultivated" land, urban land, and unused land are shown in Tables 4, 5, and 6, respectively.

6. Results

The estimated models for changes in "cultivated" land and urban land fit the data reasonably well, as indicated by R^2 on the order of 0.25-0.45 in both cases. The estimated coefficients have, for the most part, the expected signs. The fit of the models of changes in unused land is poorer, on the order of 0.10-0.15 in most cases, suggesting that factors other than agricultural and urban land values, tax revenues, and budgetary expenditures are the stronger determinants of changes in this category of land.

6.1 The Dynamic Balance Policy, Urban Spatial Expansion, and "Cultivated" Land Loss

The coefficient of the dynamic balance policy indicator is statistically insignificant in most models and economically negligible in models where it is significantly different from zero in a statistical sense. Implementing the dynamic balance policy had no effect on "cultivated" land loss in either level or percentage terms. It did, apparently, lead to reductions in the rate of urban spatial growth in Western/Central China and in China as a whole: The coefficient of the dynamic balance policy is negative, as expected, in all models of changes in urban land use and significantly different from zero in the models of percentage changes in models of changes in urban land use in all China and in Western/Central China. The effect of the dynamic balance policy appears to have been extremely small, however: Implementing the dynamic balance policy in a province was associated a 0.01 percentage point reduction in the urban spatial growth rate in Western/Central China and China overall and a 0.004 percentage point reduction in the urban spatial growth rate in Eastern China.

Overall, then, the dynamic balance policy appears to have served as a binding constraint on urban spatial expansion only to a very limited extent. It had no effect on the rate of urban spatial growth and on the rate of "cultivated" land loss in Eastern China, where the gains from farmland conversion to urban use have been high, and a small but statistically significant negative effect on the rate of urban spatial expansion in Western/Central China, where the gains from farmland conversion to urban use have been low—a pattern consistent with prediction 4 of the theoretical analysis.

The dynamic balance policy is the law of the land and thus binding on local officials responsible for land allocation. Yet compliance with that policy appears to be limited and selective. As noted in the theoretical analysis, limited, selective compliance is consistent with local officials' optimal land allocation decisions when faced with demands for promoting economic growth that conflict with legal limits on farmland conversion to urban uses. When the enforcement capacity of a central authority is limited by a lack of auditing resources, local officials will ignore legal requirements that limit gains from promoting economic growth—unless audit probabilities and/or penalties for non-compliance are sufficiently large relative to the gains from non-compliance. From this perspective, it is telling that the dynamic balance policy appears to have been effective in Western/Central China, which accounted for a large share of the cases of speculative farmland conversion in which local officials requisitioned farmland for economic development zones that remained vacant and were reconverted back to agricultural use after their detection by central government investigations (Cao 2004, Lin 2007).

6.2 Economic and Fiscal Incentives, Urban Spatial Expansion, and "Cultivated" Land Loss

In contrast to legal limits on farmland conversion, economic incentives appear to have had substantial, statistically significant effects on rates of urban spatial expansion and "cultivated" land loss. As predicted by the theoretical analysis, higher "cultivated" land values were associated with lower rates of "cultivated" land loss and lower rates of urban spatial growth while higher urban land values were associated with higher rates of urban spatial expansion and, in most cases, higher rates of "cultivated" land loss. Like Lichtenberg and Ding (2009), who used the same data but different econometric specifications, we find that a one percent increase in the value of urban land was associated with a 0.11-0.13 percentage point increase in urban spatial growth. Higher "cultivated" land values were associated with much smaller reductions in urban spatial growth, on the order of 0.03-0.05 percentage points for each one percent increase in "cultivated" land value. Moreover, the coefficients of "cultivated" land value were not statistically significantly different from zero, a result possibly attributable to the fact that payment of compensation for requisitioned farmland has little impact on local government budgets. A one percent increase in the average value of "cultivated" land was associated with a reduction in "cultivated" land loss of 0.10-0.11 percentage points in Eastern China and 0.02-0.03 percentage points in Western/Central China and China as a whole. A one percent increase in urban land value had a much smaller effect on "cultivated" land loss, increasing it on the order of 0.01 percentage points for each one percent increase in urban land value. Those coefficients were not statistically significantly different from zero, moreover.

Fiscal considerations also appear to have influenced land allocation. Higher budgetary revenues were associated with increased rates of urban spatial growth in Eastern China and accelerated rates of "cultivated" land loss in Western/Central China. Higher budgetary expenditures were associated with higher rates of urban spatial expansion everywhere in China and "cultivated" land loss in Eastern China, results consistent with higher budgetary expenditures reflecting higher rates of investment in infrastructure projects.

6.3 Unused Land

Changes in the area of unused land were included in this analysis on the supposition that this land use classification contained the land most likely to be converted to agricultural use in order to comply with the dynamic balance policy. As noted above, the dynamic balance policy appears to have very little effect on rates of urban spatial expansion and “cultivated” land loss, so it is not surprising that it had no apparent effect on changes in unused land. Unused land did appear to suffer some shrinkage in areas where agriculture was more productive (as indicated by higher “cultivated” land values). Unused land area also decreased in areas where budgetary expenditures were higher, a result is consistent with higher budgetary expenditures being associated with greater investment in infrastructure projects.

7. Concluding Remarks

China’s current system of governance combines a formal structure of highly centralized authority with a great deal of *de facto* local autonomy. Decentralizing reforms enacted from the late 1980s through the mid-1990s devolved responsibility for promotion of economic growth to local officials. The scope for private enterprise was widened; state enterprises were privatized or closed; and taxes on value added and income were made the base of government finance at all levels. Stringent tax revenue sharing arrangements and reform of the banking system hardened budget constraints at the local level as well. To counterbalance the centrifugal tendencies created by these reforms, the central government offers a system of rewards and promotions; rotates officials outside their home areas to prevent entrenchment; sets limits on the use of capital, labor and land; and conducts periodic campaigns against corruption, fraud, and other violations of planning restrictions, law and norms of cadre behavior.

This paper examines how this system of “federalism, Chinese style” functions in the context of land allocation. All land in China is public property. Private sector development of land for industrial, commercial, and residential uses is limited to urban land. Acquisition of new urban land to accommodate private sector investment requires conversion of rural land to urban status. In rapidly growing parts of China, farmland requisitions have engendered significant unrest. In response to the tensions created by land requisitions, the central government has enacted regulations limiting conversion of rural land to urban uses.

We show theoretically that non-compliance with such regulations can be optimal for local officials. Further, we show that compliance is less likely when returns to land conversion are high—notably when urban land values are high and/or agricultural land values are low—and when expected penalties for non-compliance are low (e.g., because audit probabilities are low or because fines are low). We then examine empirically the extent to which these farmland protection regulations have inhibited urban land expansion and losses of agricultural land. We find that legal restrictions on farmland conversion—a "no net loss" policy—enacted in 1998 (and implemented in various subsequent years by different provinces) had no effect on rates of farmland loss but did limit urban spatial growth rates in Western/Central China—the locus of most crackdowns on illegal and excessive farmland conversion. Even in that region, however, the effect of those legal restrictions was quite small, suggesting very limited enforcement of those legal limits on farmland conversion. Further, we find that those legal restrictions had no effect on changes in unused land, the most likely source of land for conversion to agricultural use to comply with the "no net loss" policy, further indicating limited enforcement of this policy.

Our theoretical model emphasizes the "demand" side of compliance, that is, the incentives of local officials. The "supply" of compliance enforcement by the central government is also likely important. In times and places where the gains from farmland conversion are high, the central government may find that the benefits of relaxing the dynamic balance policy outweigh the costs and may thus be inclined to grant either explicit or implicit exemptions.[6] But in times and places where the gains from farmland conversion are low—for example, when there are "speculative" conversions that fail to bear fruit and thus remain idle or when local land market bubbles appear—the central government will tend to crack down on violations. The result of such a dynamic would be a pattern of selective enforcement of the dynamic balance policy consistent with our econometric findings.

Our results shed some light on how China's central government addresses the tension between the need for decentralization to promote economic growth and the need for central control to maintain to preserve national cohesion and ensure macroeconomic stability. Paradoxically, strict hierarchical lines of authority can limit the capacity of the central government to enforce its mandates: Consistent, ongoing monitoring of those lower down in the hierarchy is an implicit admission that those lower level officials systematically fail to obey directives from their superiors, contrary to the spirit and intent of hierarchical authority. Non-compliance with those directives is thus treated as an aberration and is dealt with by periodic campaigns against violators. In the case of the dynamic balance policy, moreover, limits on farmland conversion contradict the imperative to promote economic growth, making it sensible to crack down on violators selectively for short run as well as long run considerations.

[6] For example, Beijing has consistently exceeded its State Council-approved quota of land development. The cap on urban land for 2010, set in the master plan for Beijing adopted in 1993, was met by 2003; the cap on urban land for 2020, set in the master plan adopted in 2004, was met by 2011. In neither case was urban land expansion stopped—or even slowed—once the cap was reached.

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Table 1 Effective Dates of the Implementing Acts* of the 1998 Land Administration Law by Province

Provincial-Level Division	**Date**
Chongqing Municipality[3]	01/01/1999
Shandong Province[2]	08/22/1999
Gansu Province[3]	09/02/1999
Xinjiang Autonomous Region[2]	09/15/1999
Hebei Province[2]	09/24/1999
Hainan Province[1]	09/24/1999
Yunnan Province[1]	09/24/1999
Shanxi Province[1]	09/26/1999
Hubei Province[1]	09/27/1999
Xizang (Tibet) Autonomous Region[2]	11/25/1999
Shaanxi Province[2]	11/30/1999
Henan Province[3]	12/01/1999
Sichuan Province[1]	12/10/1999
Fujian Province [1]	01/01/2000
Heilongjiang Province [3]	01/01/2000
Guangdong Province [2]	01/08/2000
Hunan Province [2]	03/31/2000
Jiangxi Province [1]	04/28/2000
Zhejiang Province [1]	06/29/2000
Neimenggu (Inner Mongolia) Autonomous Region[2]	10/15/2000
Jiangsu Province [1]	10/17/2000
Tianjin Municipality[1]	11/01/2000
Anhui Province [2]	12/01/2000
Shanghai Municipality[2]	01/01/2001
Guizhou Province [3]	01/01/2001
Ningxia Autonomous Region[3]	01/01/2001
Guangxi Autonomous Region[2]	09/01/2001
Liaoning Province [2]	04/01/2002
Jilin Province [1]	09/01/2002
Qinghai Province [1]	10/01/2006
Beijing Municipality[2]	Last Update: 01/01/1993

[1] Source: Real Estate Law Service Net, http://www.law110.com
[2] Source: Law Library, http://www.law-lib.com
[3] Source: China Agricultural Information Net, http://www.agri.gov.cn

Table 2. Descriptive Statistics of the Data Used in the Econometric Analysis

Variable	No. of Observations	Mean	Standard Deviation	Minimum	Maximum
Panel A. All China					
Cultivated Land Area in Year *t* (Ha)	2,640	385,579	333,361	1,392	2,545,017
Urban Land Area in Year *t* (Ha)	2,640	8,893	8,354	77	85,876
Unused Land Area in Year *t* (Ha)	2,640	745,094	2,994,557	601	36,700,000
Absolute Change in Cultivated Land Area from Year *t* to Year *t*+1 (Ha)	2,640	-2,754	9,242	-155,187	95,450
Absolute Change in Urban Land Area from Year *t* to Year *t*+1 (Ha)	2,640	285	952	-15,489	11,174
Absolute Change in Unused Land Area from Year *t* to Year *t*+1 (Ha)	2,640	-177	26,211	-79,217	1,289,941
Log(Cultivated Land in Year *t*+1) - Log(Cultivated Land in Year *t*)	2,640	-0.00856	0.03307	-0.70990	0.37496
Log(Urban Land in Year *t*+1) - Log(Urban Land in Year *t*)	2,640	0.03239	0.08309	-0.31085	1.48984
Log(Unused Land in Year *t*+1) - Log(Unused Land in Year *t*)	2,640	-0.00202	0.07235	-0.85232	1.85253
Local GDP from Primary Industry per Unit of Cultivated Land in Year *t* (2004US$/Ha)	2,562	2,738	3,243	110	43,075
Local GDP from Secondary and Teriary Industries per Unit of Urban Land in Year *t* (2004US$/Ha)	2,562	340,734	236,140	8,549	2,302,404
Local Budgetary Revenue per Unit of Urban Land in Year *t* (2004US$/Ha)	2,538	21,938	17,494	1,268	186,162
Local Budgetary Expenditure per Unit of Urban Land in Year *t* (2004US$/Ha)	2,538	42,294	32,845	2,811	390,032
Panel B. Eastern China					
Cultivated Land Area in	808	311,088	227,036	5,566	1,132,309

Year *t* (Ha)					
Urban Land Area in Year *t* (Ha)	808	12,915	9,960	1,379	85,876
Unused Land Area in Year *t* (Ha)	808	99,999	161,842	601	1,115,495
Absolute Change in Cultivated Land Area from Year *t* to Year *t*+1 (Ha)	808	-1,772	6,304	-97,537	15,423
Absolute Change in Urban Land Area from Year *t* to Year *t*+1 (Ha)	808	453	1,334	-15,489	10,129
Absolute Change in Unused Land Area from Year *t* to Year *t*+1 (Ha)	808	-519	4,095	-73,634	59,920
Log(Cultivated Land in Year *t*+1) - Log(Cultivated Land in Year *t*)	808	-0.00926	0.04116	-0.70990	0.12109
Log(Urban Land in Year *t*+1) - Log(Urban Land in Year *t*)	808	0.03534	0.07055	-0.26987	0.81878
Log(Unused Land in Year *t*+1) - Log(Unused Land in Year *t*)	808	-0.00394	0.09920	-0.85232	1.13107
Local GDP from Primary Industry per Unit of Cultivated Land in Year *t* (2004US$/Ha)	808	4,722	4,614	358	43,075
Local GDP from Secondary and Teriary Industries per Unit of Urban Land in Year *t* (2004US$/Ha)	808	475,754	279,016	56,454	1,670,239
Local Budgetary Revenue per Unit of Urban Land in Year *t* (2004US$/Ha)	808	27,981	24,225	4,150	186,162
Local Budgetary Expenditure per Unit of Urban Land in Year *t* (2004US$/Ha)	808	40,477	30,183	8,763	390,032
Panel C. Western/Central China					
Cultivated Land Area in Year *t* (Ha)	1832	418432.7	365955	1391.96	2545017
Urban Land Area in Year *t* (Ha)	1832	7118.874	6823.955	77.02666	50570.2
Unused Land Area in Year *t* (Ha)	1832	1029612	3556458	1708.673	3.67E+07

Absolute Change in Cultivated Land Area from Year *t* to Year *t*+1 (Ha)	1832	-3186.947	10245.47	-155186.8	95450.13
Absolute Change in Urban Land Area from Year *t* to Year *t*+1 (Ha)	1832	210.596	710.3261	-1546.107	11173.9
Absolute Change in Unused Land Area from Year *t* to Year *t*+1 (Ha)	1832	-26.23227	31348.79	-79217	1289941
Log(Cultivated Land in Year *t*+1) - Log(Cultivated Land in Year *t*)	1832	-8.25E-03	2.88E-02	-0.3759828	3.75E-01
Log(Urban Land in Year *t*+1) - Log(Urban Land in Year *t*)	1832	0.0310861	0.0880464	-0.3108482	1.48984
Log(Unused Land in Year *t*+1) - Log(Unused Land in Year *t*)	1832	-0.0011796	0.0566123	-0.3270702	1.852527
Local GDP from Primary Industry per Unit of Cultivated Land in Year *t* (2004US$/Ha)	1754	1823.61	1706.581	110.3845	23703.7
Local GDP from Secondary and Teriary Industries per Unit of Urban Land in Year *t* (2004US$/Ha)	1754	278536.1	182625	8549.005	2302404
Local Budgetary Revenue per Unit of Urban Land in Year *t* (2004US$/Ha)	1730	19114.94	12252.27	1267.817	127117.1
Local Budgetary Expenditure per Unit of Urban Land in Year *t* (2004US$/Ha)	1730	43143.2	33992.44	2810.583	372127

Table 3. Specification Tests for Heteroskedasticity and Autocorrelation

Variable	**All China**	**Eastern China**	**Western/Central China**
Panel A. Wald Test for Panel Heteroskedasticity			
Absolute Change in Cultivated Land Area from Year *t* to *t*+1 (Ha)	1.5e+06** (0.0000)	1.4e+05** (0.0000)	5.3e+05** (0.0000)
Absolute Change in Urban Land Area from Year *t* to *t*+1 (Ha)	8.0e+07** (0.0000)	4.7e+05** (0.0000)	2.8e+06** (0.0000)
Absolute Change in Unused Land Area from Year *t* to *t*+1 (Ha)	8.0e+07** (0.0000)	2.5e+06** (0.0000)	4.5e+07** (0.0000)
Percentage Change in Cultivated Land Area from Year *t* to *t*+1 (Ha)	1.3e+06** (0.0000)	2.2e+05** (0.0000)	1.2e+06** (0.0000)
Percentage Change in Urban Land Area from Year *t* to *t*+1 (Ha)	4.0e+05** (0.0000)	31048.17** (0.0000)	4.7e+05** (0.0000)
Percentage Change in Unused Land Area from Year t to t+1 (Ha)	2.3e+08** (0.0000)	3.6e+06** (0.0000)	1.9e+07** (0.0000)
Degrees of Freedom	330	101	229
Panel B. Wooldridge Tests for Panel-Level Autocorrelation			
Absolute Change in Cultivated Land Area from Year *t* to *t*+1 (Ha)	0.012 (0.9115)	5.207* (0.0246)	0.459 (0.4988)
Absolute Change in Urban Land Area from Year *t* to *t*+1 (Ha)	27.645** (0.0000)	54.966** (0.0000)	0.708 (0.4010)
Absolute Change in Unused Land Area from Year *t* to *t*+1 (Ha)	1.540 (0.2155)	0.116 (0.7337)	1.497 (0.2224)
Percentage Change in Cultivated Land Area from Year *t* to *t*+1 (Ha)	0.244 (0.6216)	4.154* (0.0442)	1.776 (0.1839)
Percentage Change in Urban Land Area from Year *t* to *t*+1 (Ha)	18.251** (0.0000)	27.621** (0.0000)	9.577** (0.0022)
Percentage Change in Unused Land Area from Year t to t+1 (Ha)	1.690 (0.1946)	1.784 (0.1846)	0.696 (0.4052)

p-values reported in parentheses.

** significantly different from zero at a 1% significance level

* significantly different from zero at a 5% significance level

Table 4. Estimated Coefficients of Panel Models of Changes in "Cultivated" Land Area

Variable	**All China**	**Eastern China**		**Western/Central China**
			AR(1) Correction	
Panel A. Level Changes (Hectares per Year)				
Real "Cultivated" Land Value (US$/Ha)	1.403** (0.170)	1.270** (0.277)	1.342** (0.296)	1.168** (0.354)
Real Urban Land Value (US$/Ha)	0.00309* (0.00125)	0.00477 (0.00348)	0.00405 (0.00373)	0.00407** (0.00104)
Real Budgetary Revenue per Unit of Urban Land (US$/Ha)	-0.0415 (0.0282)	-0.0733 (0.0476)	-0.0752 (0.0511)	-0.167** (0.0343)
Real Budgetary Expenditure per Unit of Urban Land (US$/Ha)	-0.0406** (0.00759)	-0.00562 (0.00969)	-0.00271 (0.00899)	-0.0424** (0.0121)
Dynamic Balance Policy in Effect	460.5 (455.1)	-73.99 (1102.1)	-154.4 (1139.2)	290.8 (680.0)
N	2475	808	808	1667
R^2	0.407	0.386	0.357	0.421
Panel B. Percentage Changes				
Log of Real "Cultivated" Land Value (US$/Ha)	0.0361 (0.0275)	0.0952** (0.0362)	0.114** (0.0380)	0.0191 (0.0119)
Log of Real Urban Land Value (US$/Ha)	-0.0116 (0.0150)	-0.00508 (0.0231)	-0.0125 (0.0248)	-0.00872 (0.00480)
Log of Real Budgetary Revenue per Unit of Urban Land (US$/Ha)	-0.000391 (0.00364)	-0.00165 (0.0144)	-0.00519 (0.0164)	-0.00749 (0.00785)
Log of Real Budgetary Expenditure per Unit of Urban Land (US$/Ha)	-0.0101 (0.00862)	-0.0330** (0.0120)	-0.0298* (0.0128)	0.00325 (0.00717)

Dynamic Balance Policy in Effect	0.00506 (0.00511)	-0.00251 (0.00652)	-0.00345 (0.00668)	0.00638 (0.00771)
N	2475	808	808	1667
R^2	0.245	0.269	0.250	0.276
All models contain year- and prefecture-specific fixed effects and are corrected for prefecture-level heteroskedasticity and contemporaneous correlation across prefectures. Standard errors reported in parentheses. ** significantly different from zero at a 1% significance level * significantly different from zero at a 5% significance level				

Table 5. Estimated Coefficients of Panel Models of Changes in Urban Land Area

Variable	All China		Eastern China		Western/Central China	
		AR(1) Correction		**AR(1) Correction**		**AR(1) Correction**
Panel A. Level Changes (Hectares per Year)						
Real “Cultivated” Land Value (US$/Ha)	-0.0678 (0.147)	-0.0842 (0.154)	-0.0568 (0.0937)	-0.0594 (0.0941)	-0.0416* (0.0171)	-0.0418* (0.0175)
Real Urban Land Value (US$/Ha)	0.00117* (0.000498)	0.00122* (0.000475)	0.00328* (0.00134)	0.00333* (0.00134)	0.000672** (0.000227)	0.000680** (0.000224)
Real Budgetary Revenue per Unit of Urban Land (US$/Ha)	0.0258** (0.00597)	0.0271** (0.00538)	0.0193 (0.0165)	0.0193 (0.0166)	0.0252** (0.00699)	0.0260** (0.00692)
Real Budgetary Expenditure per Unit of Urban Land (US$/Ha)	0.00137 (0.000837)	0.00147 (0.000761)	0.000113 (0.00187)	0.000122 (0.00187)	0.00215** (0.000780)	0.00231** (0.000742)
Dynamic Balance Policy in Effect	-56.51 (54.27)	-68.20 (55.38)	-19.05 (204.5)	-22.99 (205.8)	-38.23 (34.97)	-35.83 (37.45)
N	2475	2475	808	808	1667	1667
R^2	0.344	0.323	0.295	0.293	0.421	0.376
Panel B. Percentage Changes						
Log of Real “Cultivated” Land Value (US$/Ha)	-0.0318 (0.0295)	-0.0366 (0.0299)	-0.0496 (0.0357)	-0.0527 (0.0360)	-0.0297 (0.0191)	-0.0323* (0.0196)
Log of Real Urban Land Value (US$/Ha)	0.121** (0.0297)	0.129** (0.0308)	0.108** (0.0417)	0.112** (0.0421)	0.121** (0.0200)	0.130** (0.0222)
Log of Real Budgetary Revenue per Unit of Urban Land (US$/Ha)	0.0349 (0.0197)	0.0320 (0.0202)	0.0870** (0.0229)	0.0873** (0.0235)	0.0160 (0.00992)	0.0115 (0.0111)
Log of Real Budgetary Expenditure per Unit of Urban Land (US$/Ha)	0.107** (0.0248)	0.110** (0.0272)	0.0626** (0.0232)	0.0626** (0.0233)	0.125** (0.0320)	0.129** (0.0367)
Dynamic Balance Policy in Effect	-0.0110* (0.00667)	-0.0106 (0.00649)	-0.00381 (0.00904)	-0.00378 (0.00914)	-0.0151* (0.00704)	-0.0142* (0.00612)

N	2475	2475	808	808	1667	1667
R^2	0.329	0.308	0.349	0.345	0.328	0.296
All models contain year- and prefecture-specific fixed effects and are corrected for prefecture-level heteroskedasticity and contemporaneous correlation across prefectures. Standard errors reported in parentheses. ** significantly different from zero at a 1% significance level * significantly different from zero at a 5% significance level						

Table 6. Estimated Coefficients of Panel Models of Changes in Unused Land Area

Variable	All China	Eastern China	Western/Central China
Panel A. Level Changes (Hectares per Year)			
Real "Cultivated" Land Value (US$/Ha)	0.174 (0.158)	-0.166 (0.0960)	0.129 (0.271)
Real Urban Land Value (US$/Ha)	0.00102 (0.00150)	0.000676 (0.00310)	-0.0000931 (0.00131)
Real Budgetary Revenue per Unit of Urban Land (US$/Ha)	0.00633 (0.0259)	-0.0265 (0.0280)	-0.0769* (0.0405)
Real Budgetary Expenditure per Unit of Urban Land (US$/Ha)	0.00358 (0.00587)	-0.00735* (0.00375)	0.0561** (0.0123)
Dynamic Balance Policy in Effect	1356.4* (637.1)	780.6 (560.5)	1435.5 (943.0)
N	2475	808	1667
R^2	0.112	0.290	0.113
Panel B. Percentage Changes			
Log of Real "Cultivated" Land Value	-0.0156 (0.00806)	-0.0366 (0.0259)	-0.0107* (0.00522)
Log of Real Urban Land Value	-0.00555 (0.00577)	-0.0135 (0.0318)	-0.00749 (0.00590)
Log of Real Budgetary Revenue per Unit of Urban Land (US$/Ha)	0.0125 (0.00955)	-0.0188 (0.0132)	0.0145 (0.00815)
Log of Real Budgetary Expenditure per Unit of Urban Land (US$/Ha)	-0.0229** (0.00601)	-0.0183 (0.0209)	-0.0154* (0.00707)
Dynamic Balance Policy in Effect	0.00263 (0.0121)	0.00253 (0.0197)	0.00486 (0.00367)

N	2475	808	1667
R^2	0.144	0.149	0.147
All models contain year- and prefecture-specific fixed effects and are corrected for prefecture-level heteroskedasticity and contemporaneous correlation across prefectures. Standard errors reported in parentheses. ** significantly different from zero at a 1% significance level * significantly different from zero at a 5% significance level			

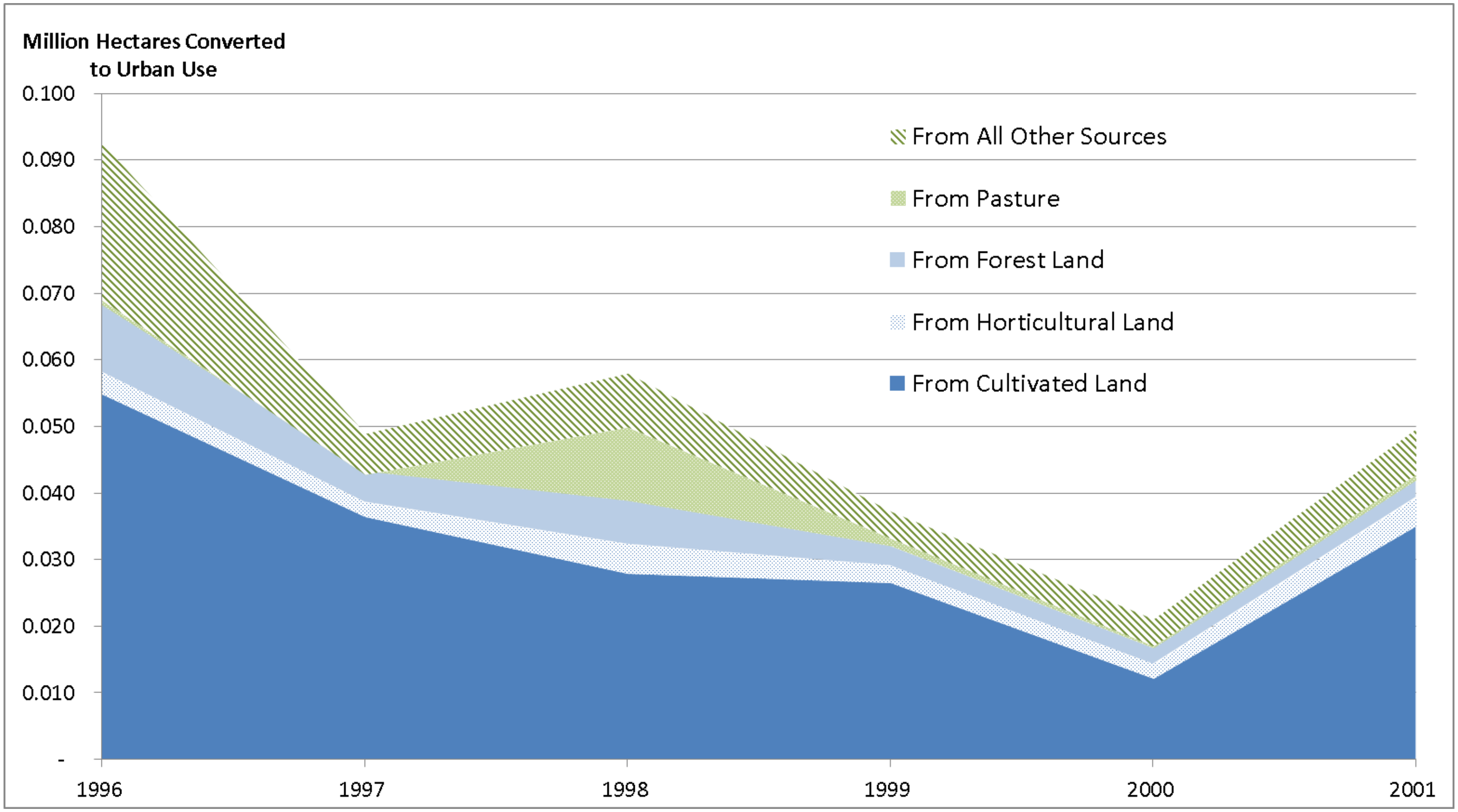

Figure 1. Net Change in Urban Land in China by Origination, 1996-2001 (Source: Ministry of Land and Resources)

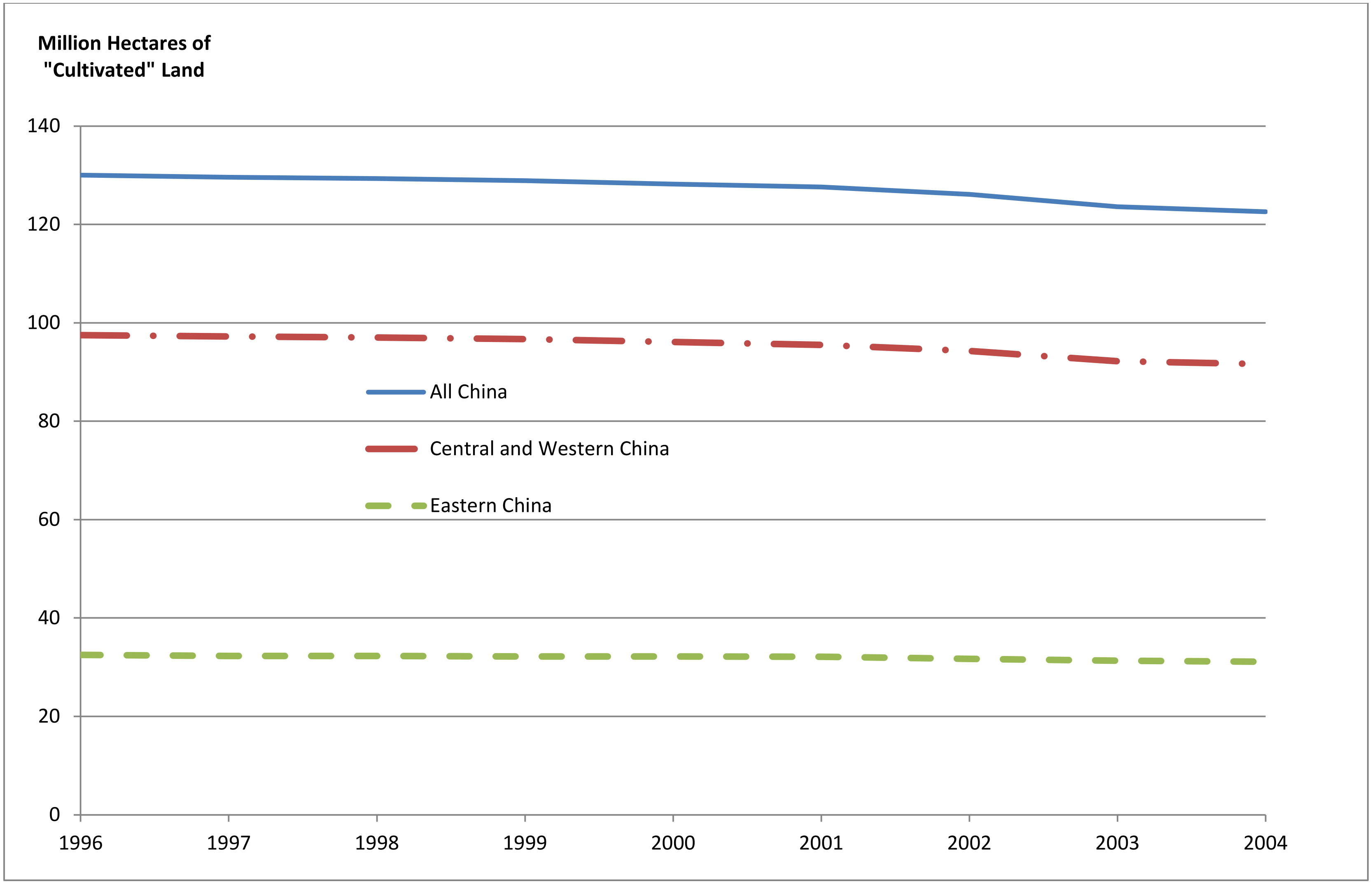

Figure 2. Area of “Cultivated” Land in China as a Whole and by Region, 1996-2004.

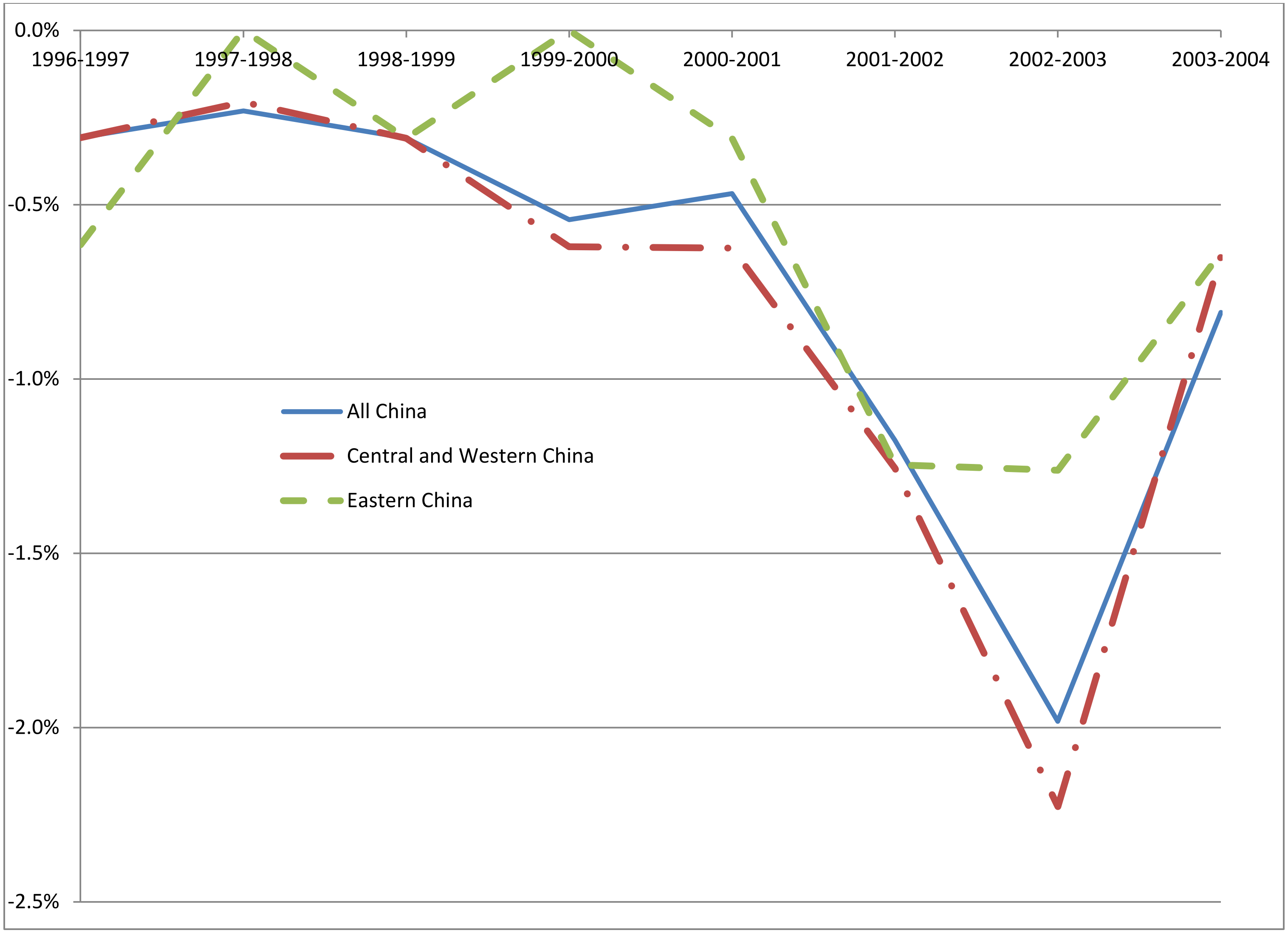

Figure 3. Rates of Change in "Cultivated" Land in China as a Whole and by Region, 1996-2004

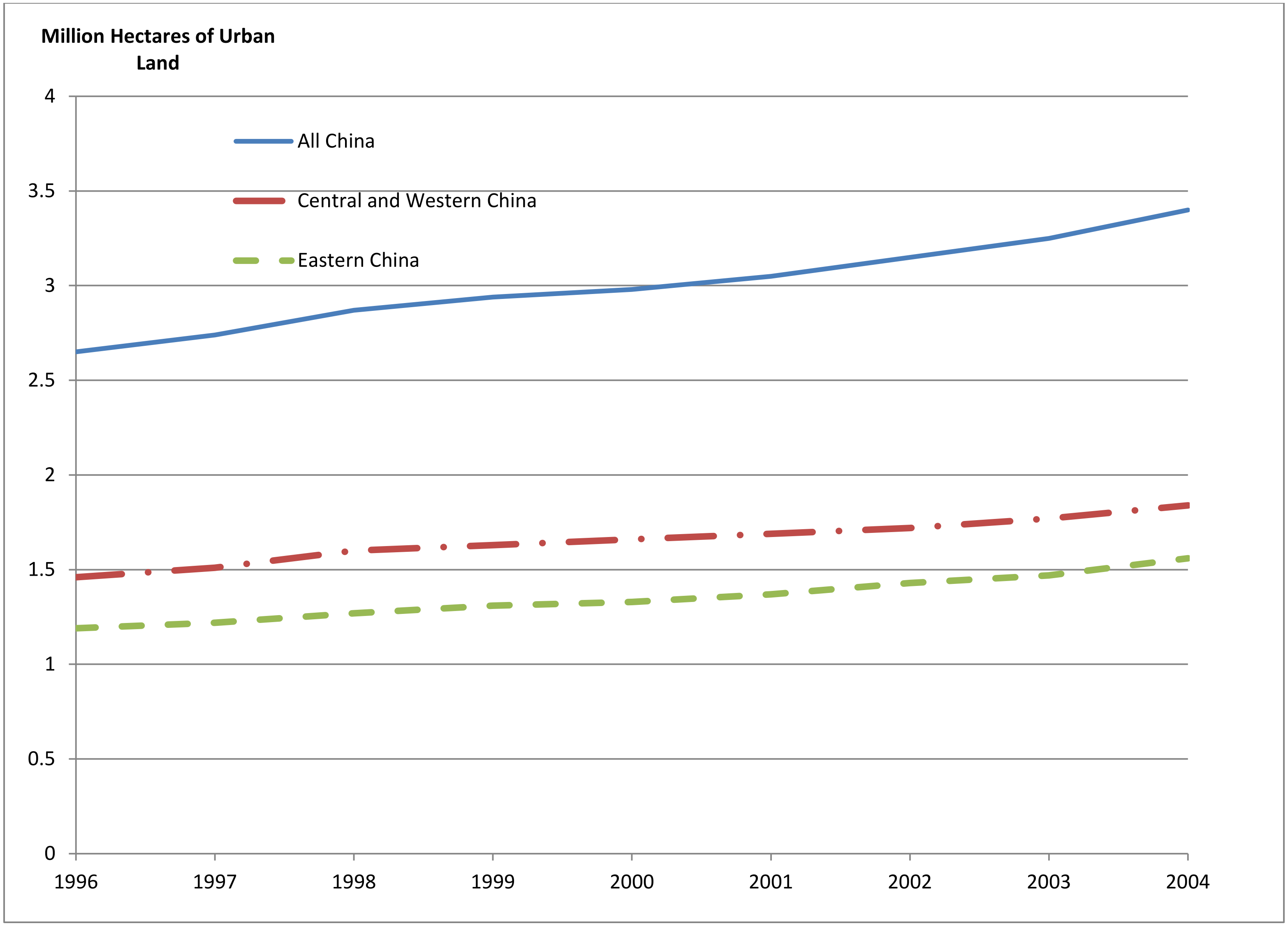

Figure 4. Area of Urban Land in China as a Whole and by Region, 1996-2004.

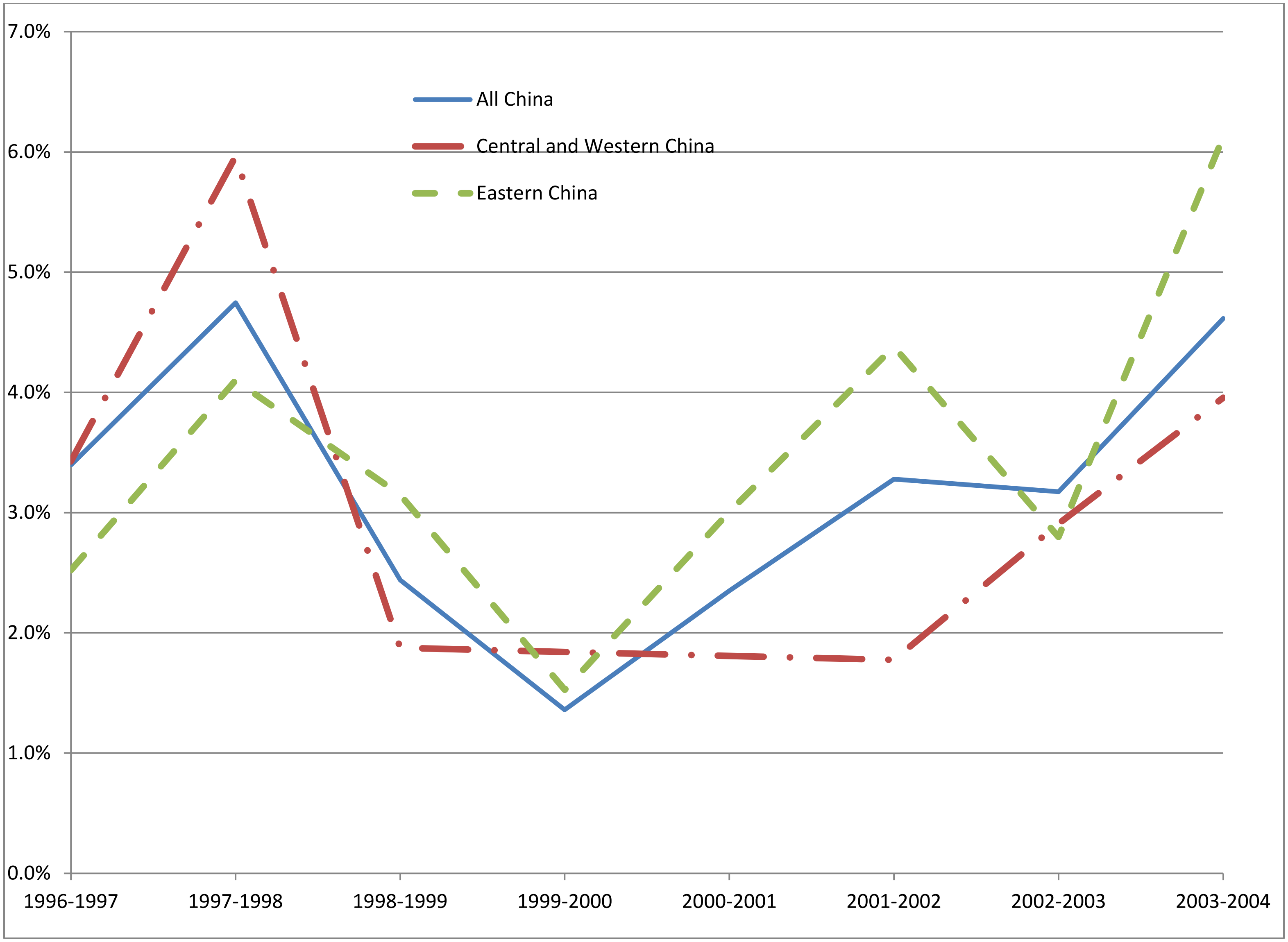

Figure 5. Rates of Change in Urban Land in China as a Whole and by Region, 1996-2004