Designing Property Rights over Land in Rural China

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DESIGNING PROPERTY RIGHTS OVER LAND IN RURAL CHINA*

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After nearly four decades, China's rural land tenure arrangement remains by and large how it looked like at the beginning of the economic reform. Rural land remains collectively owned. Peasants contract land from collectives, with their tenure insecure, and their transfer rights restricted. If such an arrangement was deemed a historical legacy at the beginning of the reform, it now looks more and more like a constrained efficient design by historical accident. This article suggests the constraints against which this design may be constrained efficient, and provides a stylised model that matches a wide array of empirical patterns.

After nearly 40 years of economic reform, with almost every other part of China's original planned economy changed beyond recognition, China's rural land tenure arrangement remains by and large how it looked like at the beginning of the reform. Rural land remains collectively instead of privately owned. Peasants contract land from the collectives, with their tenure insecure, and their transfer rights restricted. If such a land tenure arrangement was deemed a historical legacy at the beginning of the reform, it now looks more and more like a constrained efficient design by historical accident. In this article, we suggest the constraints against which this design may be constrained efficient, and show how our stylised model generates predictions that match a wide array of empirical patterns. We also use this stylised model to ponder the prospect of privatisation of rural land in China.

Among the most important empirical patterns we observe is the variation in China's rural land tenure arrangements across both time and regions: tenure is more insecure, and restrictions on transfer rights more severe, at earlier stages of the reform and in inland regions (*vis-à-vis* coastal regions). Previous theories might also explain the diversity in China's rural land tenure arrangements, but the predicted pattern would have been an opposite one. For example, Andolfatto (2002, p. 384) argues that, when the capital market works 'too well', social security recipients may be able to sell off their social security payments through the capital market, in effect undoing the social insurance intended by the government. In that case, restricting recipients' rights to transfer those payments would be optimal, and in-kind payments can help if it is easier to restrict the transfer of in-kind payments than monetary payments.[1] If one thinks of

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[1] See also Blackorby and Donaldson (1988), Bruce and Waldman (1991), and Coate (1995) for similar theories.

land as a possible form of in-kind payment from the government to peasants for social security purpose, then this theory would predict that social security payments rely more on (non-transferable) land than on cash at a time and in a region where the capital market works better. In other words, since the capital market works better at later stages of the reform and in coastal regions, this theory would predict that land more likely plays the role of in-kind social security payments and hence its transfer is subject to more severe restrictions at later stages of the reform and in coastal regions. Such a prediction is opposite to what we observe empirically.

Our theory differs from these previous theories, and proceeds as follows. Peasant migrant workers are good for urban economies as long as the economy is good. However, during economic hard times, peasant migrant workers who stay in the cities may go underground, creating problems for the government. Peasants do not internalise this negative externality when they make their migration decisions. Normally, conditional monetary payments, appropriately designed, suffice to make peasants internalise this externality. However, disbursement of monetary payments relies on local officials, and corruption makes these payments infeasible. On the other hand, land is immobile, and this makes land less vulnerable to corruption: while it is easy for corrupt officials to run away with cash, it is difficult for them to run away with land.[2] Therefore, land naturally takes the place of cash in an otherwise standard incentive mechanism, with peasants' claims on their land contingent on their migration decisions. In other words, as part of an efficient mechanism under the corruption constraint, land tenure has to be insecure, albeit insecure in a certain specific way.[3]

Tenure insecurity is socially costly (see below). It is hence optimal to minimise the size of the land whose tenure is insecure, subject to the incentive compatibility (IC) constraint that the peasant migrant worker is willing to return to the village during economic hard times. Since a peasant can always rent his land to the best alternative user, the productivity of the best alternative user approximates the value of the land to the peasant, and hence also the amount he will lose if he stays in the city and forfeits his tenure. The higher is the productivity of the best alternative user, the smaller is hence the necessary size of land whose tenure needs to be insecure in order to satisfy the peasant migrant worker's IC constraint. Since the productivity of the best alternative user is higher in later stages of the reform and in coastal regions, our theory hence predicts that tenure is more secure at such time and in those regions.

The main reason why tenure insecurity is socially costly is that it induces short-term behaviour. When a peasant migrant worker tries his luck at finding a good job in the city, he naturally would like to rent his land to an alternative user instead of leaving the land idle. But a rental contract that preserves the quality of the land is impossible to write, because the alternative user will damage the land in exchange for higher short-term payoff if she thinks there is a good chance that she would not be able to use the

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[2] A corrupt official may try to sell a peasant's land illegally and run away with the cash receipts. But the land necessarily stays behind and can be recovered from the illegal buyer.

[3] In other words, we differ from previous theories such as Andolfatto (2002) in postulating that land is used as a substitute of monetary payments not because the capital market works 'too well', but because of corruption.

land for long (possibly because the peasant migrant worker may forfeit his own tenure by staying in the city). Such kind of short-term behaviour not only is inefficient, but also reduces the peasant migrant worker's incentives to return to the village during economic hard times, beating the original purpose of insecure tenure.

In order to get around this problem, the optimal tenure arrangement involves further dividing the part of land with insecure tenure into two different kinds, which we shall call contract land and ration land respectively.[4] While both kinds of land are subject to insecure tenure, the transfer of ration land faces more severe restrictions, while that of contract land faces fewer. The purpose of such division is to preserve the quality of at least some of the land (i.e. the ration land), making sure that the peasant migrant worker has incentives to return to the village during economic hard times.

Indeed, if short-term behaviour is very inefficient, contract land (which faces fewer restrictions on its transfer) would have been dominated by ration land, and we should not have observed contract land in use in equilibrium. However, contract land is heavily used in China's rural land tenure arrangement. It means our theory has to 'predict' that short-term behaviour is only modestly inefficient. This 'prediction' also matches the recent empirical findings of Jacoby *et al.* (2002).

When short-term behaviour is only modestly inefficient, neither contract land nor ration land dominates the other, and the optimal tenure arrangement involves a mix of the two. Since a major cost of ration land is that it will be left idle instead of being rented to an alternative user when the peasant migrant worker is trying his luck at finding a good job in the city, the optimal mix is tilted more towards contract land when the productivity of the best alternative user is higher. Once again, since the productivity of the best alternative user is higher in later stages of the reform and in coastal regions, our theory predicts that restrictions on peasants' transfer rights to transfer are less severe at such time and in those regions.

Indeed, when the productivity of the best alternative user is too low, our theory predicts that a peasant migrant worker would voluntarily leave his land idle instead of renting it out, even if he is not restricted to do so. This is because, when the best alternative user is too unproductive, the rent a peasant migrant worker can collect is too low to be worth the damage from short-term behaviour. This prediction also matches what happened temporarily at the beginning of the reform.

Our article contributes to the literature on China's rural reform. Rural China is one of those areas in the developing world where property rights over land are far from secure and unrestricted. Many economists have voiced their support for further reform, and in particular for land privatisation. Officials and non-economists, on the other hand, are more concerned about the social security consequences. Land privatisation, they argue, not only deprives the government of its most important instrument of redistribution among different households within a village, but may also render peasants more vulnerable by allowing them to sell their land in the free market (Chen, 1993; Wen, 2000, 2006; Chen *et al.*, 2008).[5]

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[4] In reality, the nomenclature of land shows no consistency across time and regions (see the institutional background in Section 1). Our usage of contract land and ration land is hence only meant to be suggestive.

[5] For an excellent account of the privatisation debate, see Zhang and Donaldson (2013), which also contains detailed references.

Formalising the social security arguments against land privatisation proves difficult due to two noticeable missing pieces. First, the social-security arguments never explain why land, instead of cash, is the preferred instrument of redistribution among different households within a village. Consider, for example, the co-op system, which has been experimented in many isolated instances (see Section 1). Under an idealised version of the co-op system, instead of reallocation of land, redistribution takes the form of reallocation of the shares of a co-op. The co-op, in turn, owns all land in the village. With land privatisation, the co-op can sell the land and invest the proceeds in other assets. Even without land privatisation, the co-op can still sign long-term leases with the best users. Either way, allocative inefficiency and investment inefficiency (in the form of short-term behaviour) are not necessary evils that must accompany redistribution among different households within a village. To formalise the social security arguments, one must first explain why the co-op system did not thrive in rural China.

Second, implicit in the social-security arguments is that peasants are not fully rational, and may not always use their privately owned land in the way that is to their best interest. While a formal theory built on irrational agents is possible, such a theory may not be very conducive to the discussion of possible reforms – it is difficult to agree on how supposedly irrational agents may behave under different proposed reforms.

One possible way to formalise the social security arguments without running into the above two difficulties is to follow the approach of Andolfatto (2002). However, as we explained at the beginning of this section, the resulting formal theory will be at odds with the kind of temporal and regional variations observed in the data. Our theory takes a different route. Although it is not a loyal formalisation of the social security arguments (in particular it does not postulate irrational peasants), it explains why land is a more preferred form of social security payments than cash is, and it matches the kind of temporal and regional variations observed in the data.

Besides the social security argument, another informal theory that rationalises China's existing rural land tenure arrangement is that it is instrumental for the state to guarantee stable food supply (Yang and He, 2011; Jian, 2013). Note that China already has in place stringent zoning laws that prohibit the use of certain lands for purposes other than agricultural production, so the supposed purpose of insecure tenure and restrictions on transfer rights is to minimise the underutilisation of these lands. This begs the question of why these lands are underutilised in the first place. Our theory fills this gap. Instead of viewing underutilisation as the reason behind China's existing rural land tenure arrangement, we view the former as the result of the latter, and the latter in turn is driven by some other factors.

An important precursor to this article is Liu *et al.* (1998, hereafter LCY), which offers an informal theory for the kind of regional variation in China's rural land tenure arrangements observed in the data. LCY argues that much of this variation can be explained as different bargaining results between the state (who wants more control) and the peasants (who wants more privatisation). Specifically, the state wants more control because it wants to be able to redistribute, and it wants to guarantee stable food supply. Regional characteristics such as land scarcity, abundance of non-agricultural economic opportunities, and the importance of the region in national food supply affect the costs and benefits of control for the state, and the costs and benefits of

privatisation for the peasants. These in turn affect the bargaining result, which explains why tenure security and restrictions on transfer rights vary across regions. LCY, however, takes for granted that insecure tenure and restrictions on transfer rights are the appropriate policy instruments to achieve the two goals of the state, and hence are also what the state and the peasants bargain over. Other policy instruments such as monetary social security payments are precluded by assumption. Our theory, in contrast, is a formal policy design exercise where the appropriateness of insecure tenure and restrictions on transfer rights as policy instruments is derived rather than assumed.[6]

Our article also offers a different perspective when it comes to predicting where China's rural reform is headed. We regard China's rural land tenure arrangement as approximately a product of conscious design, and hence predicting how it will evolve requires monitoring how certain constraints and parameters evolve. The received view among economists, in contrast, is that China's rural land tenure arrangement is the legacy of the pre-reform era of surplus extraction (Lin, 2012), is slow to change due to ideological baggage (Zhang, 2011) and inadequate state capacity (Li, 2012). Given this received view, convergence towards secure and unrestricted property rights is a matter of time, and land privatisation is an inevitable eventuality. Time will tell which of these two perspectives is more helpful.

Finally, our article contributes to the literature on property rights.[7] Secure and unrestricted property rights are widely seen as necessary conditions for economic efficiency. When property rights are insecure and restricted, they are usually the results of imperfect law enforcement,[8] misguided policies,[9] or politics.[10] This article, however, takes the position that the insecure and restricted property rights over land in rural China are constrained efficient. An important precursor to this article is Banerjee *et al.*

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[6] Due to the informal nature of LCY's theory, many of its predictions by and large remain unclear. For example, in regions where land is scarcer, the fear of losing land looms larger, and hence high-risk peasants would resist insecure tenure more, but low-risk peasants would prefer more tenure insecurity in the hope of gaining more land at the expense of their high-risk peers. How land scarcity affects peasants' overall demand for privatisation is unclear. Similarly, in regions with abundant non-agricultural economic opportunities, to guarantee stable food supply the state needs more control, but the redistributive benefits of control are also smaller. How abundance of non-agricultural economic opportunities affects the state's overall demand for control is unclear. Finally, in regions that are important in national food supply, the benefits of control are higher, but the efficiency gain from privatisation is also more valuable. How the importance of a region in national food supply affects the state's overall demand for control is also unclear. These ambiguities make it easier for LCY's theory to explain the data. In contrast, our model has unambiguous predictions on how tenure insecurity and restrictions on transfer rights vary across time and regions.

[7] Alchian's (2008) delineation of different components of property rights has inspired many as well as this article. See also Anderson and McChesney (2003) and Besley and Ghatak (2010) for excellent surveys of this vast literature.

[8] Feder (1987) and Feder and Onchan (1987) showed that Thailand squatters' insecure property rights significantly reduced their investment incentives and financial resources. Squatters' property rights were insecure because they occupied their land illegally in the first place.

[9] de Vany (1977) and de Vany and Sanchez (1979) showed that Mexico's Agrarian Reform Program, which restricted peasants' rights to transfer their land, unintentionally resulted in less capital investment and larger families, de Janvry *et al.* (2015) further showed that the programme has led to inefficiency due to less migration of farm labour to high value-added non-farm works.

[10] Under America's Indian reservation policy (except during the Allotment Era of 1887–1934), Indian land is placed into trust, which individual Indians cannot sell off (Anderson and Lueck, 1992). Some authors (Royster, 1995) attributed this arrangement partly to the political need to 'ease hostilities and tensions between tribes and settlers by segregating the two groups from one another'.

(2002), which compares the equilibrium contracts and the accompanying efficiency implications when tenants' tenure is secure and insecure, respectively.

The rest of this article is organised as follows. Section 1 in broad strokes introduces the institutional background in rural China, with an emphasis on several key components that will later on play important roles in our model. In Section 2, we describe our model setup, and discuss some assumptions we make. In Section 3, we study a few benchmarks, including the benchmark with private ownership of land, and the benchmark without the corruption constraint. In Section 4, we solve for the efficient rural land tenure arrangement under the corruption constraint. In Section 5, we discuss how our model generates predictions that match a wide array of empirical patterns. Finally, we offer some concluding remarks on the prospect of land privatisation in rural China (Section 6).

1. Institutional Background

China started its economic reform in 1978. Rural reform, which among other things dramatically changed the tenure arrangement for rural land, came first. Although the economic reform soon spread to other areas, in a pace so breathtaking that one doubts whether the Chinese government still holds much ideological baggage, there have not been further big changes in China's rural land tenure arrangement ever since the early 1980s. There has been fine tuning at different times and in different regions, and new varieties have been experimented with locally, but the rural land tenure arrangement by and large remains as it was defined in the early 1980s, which is referred to as the household responsibility system (Kueh, 1984; Lin, 1992; Wen, 1993).[11]

At the core of the household responsibility system is that land within a village is owned collectively by all members of the village. The village government, known as the collective, managed and represented by village officials, then contracts out different parcels of land to different households, with the size of each parcel roughly matching the size of the corresponding household (Zhang and Makeham, 1992; Judd, 1992; Wen, 2000).

1.1. Restrictions on Transfer Rights

Village membership hence confers certain kinds of inalienable entitlement – here the rights to contract land from the collective (Kung, 1995; Kung and Liu, 1997). The rights to transfer the contracted land are restricted (Zhu and Jiang, 1993), although the exact restriction is ambiguous (which gives rise to variation across time and regions). Mortgaging the contracted land is clearly forbidden (Dong, 1996; Zhu and Prosterman, 2007). Transferring it to a city dweller with a business plan in mind is also discouraged (Chen *et al.*, 2008; Han, 2008). On the other extreme, transferring it to another household in the same village is almost always tolerated. Transferring it to another household from a different village is somewhere in between these two extremes (Zhang and Makeham, 1992; Brandt *et al.*, 2002).

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[11] The word 'responsibility' refers to the households' duty in early stages of reform to sell agricultural products to the government at below-market prices (Sicular, 1988; Cheng and Tsang, 1994; Cheng, 1996).

The parcel of land a household contracts from the collective is often further divided into several sub-parcels, with the restrictions on the rights to transfer vary across these sub-parcels. To signify these different restrictions, different names are used to refer to these different sub-parcels: contract land (*chengbao tian*), ration land (*kouliang tian*), responsibility land (*zeren tian*), commodity land (*shangpin tian*), private plots (*ziliu di*), etc. But the mapping between each name and its corresponding restrictions on the rights to transfer varies across time and regions (Judd, 1992; Cheng and Tsang, 1995; Brandt *et al.*, 2002; Lohmar and Somwaru, 2002).

1.2. *Tenure Insecurity*

Ambiguity also arises in actual implementation when it comes to defining membership, which leads to variation across time and regions. For example, when a household adds a new member (either by birth or by marriage), it may or may not entitle it to contract a larger parcel of land from the collective. In the case where it does, then some other households would see their responsibility contracts unexpectedly amended (because total land supply within a village is fixed). Similarly, when a household is found to have a member who has left the village and worked in the city for a long time, it may or may not lose some of its entitlement. Even renting out a household's contracted land may be perceived as a signal that it no longer needs the land, and may put its entitlement at risk as well (Brandt *et al.*, 2004; Deininger *et al.*, 2014).

The central government has from time to time reiterated a 'two-noes principle' ('no land increase due to increased population, no land decrease due to reduced population'; i.e. *zengren bu zengdi, jianren bu jiandi*), demanding that demographic changes should not be a reason to amend households' responsibility contracts unexpectedly (Wen, 1995; Deininger and Jin, 2003; Chen *et al.*, 2008). But it does not seem to be very sure of this principle, and often allows local officials to exercise their discretion (Benjamin and Brandt, 2002; Tao *et al.*, 2010). Again, actual implementation varies across time and regions. The problem of tenure insecurity is said to arise when local officials decide to accommodate demographic changes and unexpectedly amend households' responsibility contracts.

1.3. *Variation across Time and Regions*

Economists lament the efficiency loss due to both tenure insecurity and restrictions on the rights to transfer. Tenure insecurity is said to encourage short-term behaviour[12] (Li *et al.*, 1998; Jacoby *et al.*, 2002), while restrictions on the rights to transfer are said to hinder peasants' ability to leverage their endowments to raise capital (Besley, 1995; Zhu and Prosterman, 2007). Both problems are more severe at earlier stages of the reform and in inland regions.

Tenure insecurity can be proxied by the number of land reallocations due to demographic changes. A survey of Anhui villages conducted by Kong and Unger

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[12] For example, a household which is not sure whether it can keep the land it is farming today may use excessive chemical fertilisers to boost the yields immediately, without worrying too much about the damage that brings to its land (Zhu and Jiang, 1993; Dong, 1996).

(2013) indicates a clear declining trend of these numbers over time. Similarly, in a survey of villages in six provinces conducted by Tao *et al.* (2010), the average numbers of land reallocations (averaged across villages) decreased over time: over the 14-year period of 1984–98, there were on average 2.58 land reallocations in each village; whereas over the 10-year period of 1998–2008, there were only 1.03. In both periods, the average number of land reallocations is much lower in coastal provinces (Jiangsu, Hebei and Fujian) than in inland provinces (Sichuan, Shaanxi and Jilin).

Measurements of restrictions on the rights to transfer usually rely on peasants' self reports. In a survey reported in Huang *et al.* (2012), the share of peasants reporting minimal restrictions on their rights to transfer to another household within the same village increased from 75% to 97% during the period of 1995–2008. During this same period, the corresponding share for transferring to another household from a different village also increased from 65% to 79%. In a 1994 survey conducted by Liu *et al.* (1998), restrictions on the rights to transfer were weaker in the coastal province of Zhejiang than in the inland provinces of Henan, Jilin and Jiangxi.

1.4. Corruption Concerns

There have been many experiments of alternative tenure arrangements, some were initiated by the central government, some by local governments, while all were conducted locally (Cheng and Tsang, 1995; Han, 2008; Meng *et al.*, 2009). At the risk of oversimplification, one can lump many of them into a category called the co-op system.[13] Under this tenure arrangement, peasants in the same village pool their land and form a co-op to manage it, and rent out the pooled land with long-term leases to avoid short-term behaviour (Liu, 2010). The co-op then manages the rental income, distributes part of it to the villagers as dividends (with the distribution adjusted to demographic changes), and retains the other part for provision of local public goods, which villagers cannot enjoy unless they stay in the village. Shares of co-ops are typically not transferable, and the control of the co-ops stays in the hands of local officials.

The central government stopped some of the experiments in this category, citing corruption as a major concern (Dang, 2007; Ji, 2008; Yin, 2008), and was at best lukewarm to the others.[14] Among the problems cited by the central government, one of them was that the co-op management often diverted the resources it managed into risky investments, against the interests of the shareholder peasants, and took the money when these investments pay off, or ran away when those investments went bad. The corruption concern was reiterated by RGRCOE of the Ministry of Agriculture (1991), and was echoed by a survey conducted by Bledsoe and Prosterman (2000),

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[13] Experimental tenure arrangements that fall into this category include *gufen hezuo zhi*, *tongyi jingying*, *gutian zhi*, Nanhai model (a tenure arrangement experimented in Nanhai, Guangdong), Chongqing model (a tenure arrangement experimented in Chongqing), etc.

[14] For example, in one of the arguably most important official documents on rural policies, 'Decisions on some major issues regarding agricultural and rural policies' released by the 3rd Plenum of the Central Committee of the 15th Party Congress on 14 October 1998, the co-op system was not even mentioned at all. Only in the Land Contract Law enacted in 2003 was it mentioned as one of the many possible ways to manage rural land. The central government, however, has had a more positive attitude towards the co-op system lately, as reflected in Document No.1 of the Chinese Communist Party in 2015. This development is also consistent with our model (see Section 5).

which reports that peasants under the co-op system often do not receive the amount of dividends the local officials claimed to have distributed.[15] Chen (2006) points out that the problem is further accentuated by the non-transferability of the shares of the co-ops, because shareholder peasants cannot monitor the management by 'voting with their feet'.

1.5. *Rural Versus Urban Areas*

China adopts a *hukou* system that, among other things, divides its citizens into rural and urban residents. Rural residents are peasants attached to specific villages, and are entitled to contract land from the corresponding collectives. Urban residents, on the other hand, are attached to specific municipalities, and are entitled to various social services provided by the corresponding municipal governments (Chan, 2009, 2010). China is hence also geographically divided into rural and urban areas, where rural and urban residents reside, respectively. Peasants can work in the urban areas as migrant workers, but do not enjoy the same entitlements enjoyed by urban residents (Cheng and Selden, 1994; Song, 2014). While this avoids explicit costs on the part of municipal governments in accommodating these peasant migrant workers, implicit social costs exist due to the fact that a sizable population of temporary residents lack adequate social services (Bosker *et al.*, 2012; Wang *et al.*, 2013).

Geographically, urban areas are islands within the sea of rural areas. When peasants go to the urban areas for work, some 20% stay within the same county, while another 40% go beyond their counties but stay within the same province (Rozelle *et al.*, 1999). Under the policy of 'city administering county' (*shi guan xian*), which is widely adopted throughout much of the reform period, municipal governments ('cities') are also in charge of administering their nearby rural areas ('counties') (Yang and Wu, 2015).

As pointed out by Rozelle and Li (1998, p. 433), 'while central government policy allows for multiple tenure types, it does not clarify the level at which land-rights decisions are to be made'. Some scholars believe that the implementation of the policy of 'city administering county' empowers the municipal governments to become the major administrators of tenure arrangements in nearby rural areas (Meyer-Clement, 2016; Wang and Zhang, 2017). This belief finds some support in an episode during the 1990s, when the central government decreed that all rural land contracts (initially signed during the 1980s) should be extended. Numerous investigative studies on the implementation of this decree were conducted by Chinese officials/researchers at that time, which universally reported the heavy involvement of municipal governments, in activities ranging from formulating procedural guidelines, and experimenting implementation details, to training village officials.[16] This suggests that municipal governments may also be heavily involved in other matters related to tenure arrangements in nearby rural areas as well.

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[15] Similar stories have also been reported in, for example, 'What happened to Nanhai model', *Discoveries in Chinese Villages*, no. 2, 2008, and 'Four hurdles for new land reform', *China Economic Weekly*, no. 50, 2012. See also Liu (2008).

[16] Such investigative studies are too numerous to survey here. A partial list includes Agricultural Commission of Qinzhou, Guangxi (1996), Chen (1996), Zhang *et al.* (1997), Agricultural Office of Guangdong (1998), Cai and Liu (1998), Li *et al.* (1999) and Zhang (1999). A wide variety of regions were covered by these studies, including Guangdong, Guangxi, Hebei, Liaoning, Shandong, Shangxi, etc.

Under China's centralised political system, policy missions are transmitted from the central to local governments through its vertical control system of cadres (Edin, 2003; Heimer, 2006). Among these policy missions, social stability has been considered as among the highest national priorities (Birney, 2014). The emphasis on social stability is translated into performance indicators such as social protests and petitions to superior administrative bodies, and these indicators permeate the cadre responsibility system all the way down to the county level and below. There are targets for these indicators, and these targets are sometimes under the 'one item veto rule' such that failure to meet them will lead to nullification of all other achievements and result in punishment (Heberer and Trappel, 2013). Against this backdrop, it is plausible that a municipal government's concerns about social stability would directly or indirectly affect the tenure arrangements within the rural areas it administers.

Below, we present a stylised model that relates all the key components mentioned in this Section, and explain why tenure insecurity and restrictions on the rights to transfer can arise as parts of a constrained efficient design of property rights.

2. The Model

There are three agents: G (the Government; 'it'), P (the Peasant; 'he'), and A (an Alternative user of the land; 'she'). Strictly speaking, G is not a well-defined agent in this game. It is the social planner, and designs the rural land tenure arrangement. Its choices are our subject of exploration. We also have in mind more than one alternative user, with A being a generic one. Competition among these identical alternative users leaves A with zero bargaining power in any transaction with P. All agents are assumed to be risk neutral. There are two locations: the village, and the city.

It is a two-period model without discounting: $t = 1, 2$. At the beginning of period 1, P has one unit of land located in the village. By farming his land, he can produce 1 unit of output at the end of each period.

There is also an inferior technology called 'short-term behaviour', which is available only in period 1. This technology can increase the period-1 output from 1 to Y, where $Y > 1$, with the consequence of damaging the land and reducing its period-2 output from 1 to y, where $y < 1$. We assume that $Y + y < 2$, which justifies the description of this technology as 'inferior'.

ASSUMPTION 1. $Y < 2 - y$.

How inefficient short-term behaviour is can be measured by how much Y falls short of $2 - y$, and is subject to debate in the empirical literature (see Section 5). It turns out that this magnitude also has important implications on the efficient design of the rural land tenure arrangement. We therefore distinguish two cases. We say that short-term behaviour is strongly inefficient if $Y < 2 - 2y$, and is weakly inefficient if $2 - 2y < Y < 2 - y$.

The alternative user A has productivity λ times that of P. Many factors can affect the size of λ: from soil quality to geographical location, and from zoning law to the macroeconomic environment. A piece of land strictly designated for agricultural use and located in the mountainous area (and hence in isolation and not easily accessible

to other households) may have λ far below 1, whereas a piece that is suitable for many different crops and contiguous to other farmland or even the urban area may have λ far above 1. However, we in general regard λ as increasing over time, and as being higher in coastal regions and lower in inland regions.[17] This in turn results in different rural land tenure arrangements being optimal at different points in time and in different regions. Possible outputs by P and A in each period are summarised in Tables 1 and 2.

A crucial assumption is that both outputs and technology choices are private information of the user of the land. They are unobservable to any other agent, and hence *a fortiori* also non-verifiable to courts. This creates a moral hazard problem when the period-1 user of the land cannot guarantee that she will also be the period-2 user – she may have perverse incentives to engage in short-term behaviour, and such perverse incentive cannot be corrected contractually.[18]

To make sure that this moral hazard problem has bite, we assume that $Y + (1/2) y > 1 + 1/2$, and hence a period-1 user of the land will rationally engage in short-term behaviour if she believes that she will continue to be the user of the land in period 2 with probability at most $1/2$.

ASSUMPTION 2. $Y + (1/2)y > 1 + 1/2$.

At the beginning of period 1, P has a one-time opportunity to choose whether or not to go to the city to look for a job.[19] Since this is a one-time opportunity, if he chooses to stay in the village, he stays for both periods. If he chooses to go to the city, he earns 0

Table 1

Outputs in Period 1; with $Y > 1$

	P	A
Normal technology	1	λ
Short-term behaviour	Y	λY

Table 2

Outputs in Period 2; with $y < 2 - Y < 1$

	P	A
Land healthy	1	λ
Land damaged	y	λy

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[17] Among the many reasons why λ is increasing over time is that the identity of the best alternative user is changing over time. In earlier stages of the reform, the best alternative use remained mostly agricultural; whereas in later stages, it became increasingly often either industrial or commercial. Similar reasons explain why λ is higher in coastal regions and lower in inland regions.

[18] The assumption of unobservable output may seem extreme. However, a more complicated model with unobservable efforts and non-verifiable production externalities will deliver the same qualitative result.

[19] We assume that such opportunity is not available to all alternative users, and hence there are always some alternative users left in the village to use P's land if P goes to the city.

wage in the first period.[20] In the second period, a bad job in the underground economy is always available, while P can find a good job in the formal sector with probability $1/2$. We refer to the event that a good job is available as 'the good time', and the complementary event as 'the hard time'. For simplicity we think of the availability of a good job as P's private information.

At the beginning of period 2, after he learns the availability of a good job, P can choose whether to stay in the city in period 2, or return to the village. If he stays in the city in period 2, a good job in the formal sector pays $\overline{w}$, and a bad job in the underground economy pays $\underline{w}$, with $\overline{w} > \underline{w} > 0$. Let Ew denote $(1/2)\overline{w} + (1/2)\underline{w}$, the expected wage income in period 2. To conserve space we focus on the case where $\overline{w}$ is arbitrarily large, and hence letting P go to the city in period 1 is socially desirable. We also assume that $1 > \underline{w} > y$, and hence a bad job does not pay well but is still better than farming a piece of damaged land.

ASSUMPTION 3. $1 > \underline{w} > y$.

A crucial assumption is that, a peasant working in the underground economy of the city will generate a disutility for the government, which is a form of negative externality that the peasant does not internalise. We assume that a peasant is 'invisible' once he goes underground, and hence it is infeasible for the government to locate him, arrest him, and bus him back to the village to avoid this negative externality. What the government can do, however, is to provide him with economic incentives to return to the village instead of going underground. Let c denote that negative externality.[21] We in general think of c as very large, although not as large as $\overline{w}$ (so that the draconian pre-reform policy of locking P up in the village remains socially undesirable).[22]

In the main part of our analysis, we rule out monetary payments from G to P on the ground of corruption concerns. However, in Section 3, we briefly consider the benchmark where corruption is not a concern, and hence such monetary payments are feasible. For the purpose of that benchmark analysis, it suffices to allow for two kinds of contingent monetary payments. The first is a tax on the action of staying in the city in period 2, which can be captured by a negative monetary payment from G to P at the end of period 2 contingent on P staying in the city in that period. The second is a subsidy to the action of returning to the village in period 2, which can be captured by a positive monetary payment from G to P at the end of period 2 contingent on P returning to the village in that period. Allowing for other kinds of contingent monetary payments would

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[20] This is merely a normalisation, and is otherwise immaterial.

[21] Technically it is not necessary to assume that the negative externality is associated only with the bad job in the underground economy. Suppose there is some negative externality $c' > 0$ even when P takes up a good job in the formal sector. As long as $\overline{w}$ is sufficiently large relative to c', it is still desirable for the government to encourage P to go to the city to look for a job in period 1, and to stay in the city in period 2 when P manages to find a good job. Although $c > c'$ is not necessary for our results, it is nevertheless a very realistic assumption. For starter, examples of a bad job in the underground economy include criminal activities, which are especially costly to the society. Lower income may also result in more reliance on free government services and hence higher fiscal burden.

[22] As we shall see in Proposition 2, our analysis will go through as long as $3\underline{w} < c < \overline{w}$.

not add to the government's instruments in incentivising P to return to the village during the hard time.[23]

However, in conformity with our crucial assumption that P becomes 'invisible' once he goes underground, we shall impose the restriction that G cannot tax P in period 2 if P chooses to stay in the city but go underground in that period. An immediate implication of this restriction is that the government cannot really tax the action of staying in the city in period 2 – it can only tax the action of staying in the city during the good time, but not during the hard time. As we shall see in our benchmark analysis, such a restriction is not detrimental if corruption is not a concern, because the government can still incentivise P to return to the village during the hard time using subsidies. However, when corruption is a concern, even subsidies become infeasible, and we are led to a design problem if no monetary payment is feasible.

We assume that P's payoff, denoted by U, is his total income (including his wage income in the city, his income from farming his own land, his income from either selling or renting out his land, plus monetary payments from the government). A's payoff is her income from using the land minus the price she pays P for the right to use the land. The government's payoff, denoted by W, is the same as social welfare, which equals to the total output of the society (the land's total output plus P's wage income in the city), minus possibly its own disutility c of seeing P go underground.

The focus of this study is the design of P's property rights over his land. Should the government take away his tenure under certain circumstances? Should he be allowed to sell/rent his land to other users like A? If yes, should he be allowed to do so in period 1, or in period 2, or in both periods? Should he be allowed to do so when he is out of the village? And should he be allowed to do so if he leaves the village for a period but returns afterward? These are all design variables for the government. However, we postpone delineating the government's relevant design variables until Section 4, after studying a few benchmarks in Section 3, including in particular the benchmark without the corruption constraint. Without first studying these benchmarks, it may not be clear why there is any non-trivial design exercise to do at all; i.e. it may not be clear why secure and unrestricted property rights are not trivially the optimal design.

2.1. Discussion of the Model

In building a stylised model of how property rights over rural land are designed in China, we have made several simplifying assumptions for the sake of tractability. In order for the reader to evaluate these simplifying assumptions better, we briefly discuss the key ones here.

Our model features a single government who at the same time:

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[23] Our simplifying assumption that P's job opportunity is his private information conveniently precludes taxes/subsidies that explicitly contingent on such job opportunity. However, our analysis does not rely on this simplifying assumption. Suppose P's job opportunity were publicly observable and verifiable, and hence that it is feasible for the government to tax the action of staying in the city only during the hard time. If such a targeted tax can incentivise P to stay in the city if only if he has a good job, an un-targeted tax on the action of staying in the city can achieve the same goal as well because, given our assumption that $\overline{w}$ is arbitrarily large, P would rather pay the tax and stay in the city during the good time.

    (*i*) designs the rural land tenure arrangement; and

    (*ii*) internalises the negative externality a peasant migrant worker generates by going underground in the city.

Such an assumption would not be plausible if we interpret 'the city' and 'the village' in our model as a mega-city like Shanghai and an agricultural province like Sichuan, respectively, because one doubts whether Shanghai can influence the tenure arrangements in Sichuan, and whether it can talk Sichuan into internalising its social costs.

The assumption, however, would be more plausible if we interpret 'the city' as a municipal government, and 'the village' as its nearby rural areas. Moreover, the assumption is more plausible if the municipal government has more authority over these rural areas, and if a larger portion of peasants from these rural areas stay within their respective prefecture even when they go to the urban areas for work. Recall from Section 1 that, an average municipal government wields reasonable authority over nearby rural areas under the policy of 'city administering county', and on average somewhere between 20% and 60% of peasants stay within their respective prefecture when they go to the urban areas for work. Therefore, we believe that our assumption applies well on average, while also expecting exceptions in regions where municipal governments are administratively removed from nearby rural areas, and where most peasants go beyond their respective prefectures when they go to the urban areas for work.

We also abstract from the fact that, when peasants leave their farm work, they do not always go to work in the urban areas in the strictest sense. During the 1980s, many peasants left their land to work in township and village enterprises (TVEs), which did not locate in urban areas. When the economy contracted in the late 1980s, many of these TVEs closed down, creating pressure for villages to absorb these newly-jobless peasants, lest they flow into the nearby urban areas and generate social unrest. We hence intend to interpret the formal sector in our model more broadly to include TVEs, and the period-2 decision of P between staying in the city or returning to the village during the hard time more broadly to include the decision of a previous TVE-worker between staying in the village or going to the nearby urban areas (with the unintended consequence of contributing to social unrest) when his TVE closes down.

3. A Few Benchmarks

3.1. *The First-best Benchmark*

In this article, the first best refers to what the government can achieve if P and A would obediently follow whatever behavioural rules it recommends (i.e. if P's and A's incentive compatibility constraints can be ignored). According to this definition, the first best is achieved if P transfers his land to A and goes to the city at the beginning of period 1, but stays in the city in period 2 only if a good job in the formal sector is available, and moves back to the village during the hard time. When using the land in period 1, A should employ the normal technology instead of engaging in short-term behaviour. In period 2, A should continue to use the land when the economy is good, and if $\lambda > 1$ then during the hard time as well. If $\lambda < 1$ instead, then P should be the one to farm the land during the hard time.

The first-best behavioural rule is incentive compatible for neither P nor A. Consider $\lambda > 1$ first. Since P will not be the one farming the land during the hard time, he has no

reason to abandon his bad job in the underground economy and move back to the village only to sit idly. Next consider $\lambda < 1$. Once A realises that she will be the period-2 user with probability at most $1/2$, given our maintained assumption of $Y + (1/2) y > 1 + 1/2$, she has no reason to stick with the normal technology. And, if P anticipates that A will engage in short-term behaviour and leave a damaged land for him to farm during the hard time, given our maintained assumption of $\underline{w} > y$, he has no reason to abandon his bad job in the underground economy and move back to the village only to farm a piece of damaged land either.

3.2. *The Second-best Benchmark*

We can also consider the second-best benchmark, which corresponds to the behavioural rule that maximises social welfare if P's, but not A's, incentive compatibility constraint can be ignored. A's incentive compatibility constraint is that she will choose the technology that maximises her payoff (specifically, she will engage in short-term behaviour in period 1 if she anticipates that with probability of at least $1/2$ she will not be the period-2 user, but will employ the normal technology if she will for sure be the period-2 user).

In the second best, the behavioural rule for P is the same as in the first best: he should go to the city and look for a job at the beginning of period 1, but stays in the city in period 2 only during the good time, and should return to the village during the hard time. The second best differs from the first best in who should farm/use the land in different situations.

The land apparently should be used by A during the good time in period 2. So it remains to specify who should farm/use the land in period 1 and during the hard time in period 2, respectively. It can be shown that only three options can possibly be optimal:[24,25]

I: leaving the land idle in period 1, and having it farmed by P during the hard time in period 2; this option yields an expected social welfare of $W = (1/2)\overline{w} + 1/2 + (1/2)\lambda$;
R: letting A use the land in period 1, and having the land farmed by P during the hard time in period 2; since A necessarily engages in short-term behaviour in period 1, this option yields an expected social welfare of $W = (1/2)\overline{w} + \lambda Y + (1/2)y + (1/2)\lambda y$;
S: letting A use the land both in period 1 and during the hard time in period 2; since A will then employ the normal technology in period 1, this option yields an expected social welfare of $W = (1/2)\overline{w} + 2\lambda$.

The second best depends on whether short-term behaviour is strongly or weakly inefficient, and also on the size of λ. Intuitively, when λ is low, it makes sense to have P instead of A farm the land in period 2 during the hard time. But this would invite short-term behaviour if A is to use the land in period 1. When λ is sufficiently low, the extra output obtained from letting A use the land in period 1 is not worth the damage from her short-term behaviour, so it is optimal to leave the land idle instead in period 1 (option **I**). On the hand, if λ is sufficiently high, A should always be the user of the

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[24] The notations **I**, **R**, and **S** are meant to remind us that these three options correspond to 'leaving the land **i**dle (in period 1)', '**r**enting the land out', and '**s**elling the land', respectively.
[25] There are other, but dominated, options. For example, leaving the land idle during the hard time in period 2 is a dominated option. Another option is to leave the land idle in period 1, and to let A use it during the hard time in period 2. But this option is dominated by option **S**.

land, and hence it is optimal to simply sell the land to her (option **S**). Renting the land to *A* with the possibility of taking it back and letting *P* farm it during the hard time (option **R**) can be optimal only when λ is neither too low nor too high, and only when *A*'s short-term behaviour is not too inefficient.

LEMMA 1.

1. *If short-term behaviour is strongly inefficient, the second best is option **I** when $\lambda < 1/3$, and is option **S** when $\lambda > 1/3$. Option **R** will never be the second best.*
2. *If short-term behaviour is weakly inefficient, the second best is option **I** when $\lambda < \lambda^* := (1 - y)/(2Y + y - 1)$, option **R** when $\lambda^* < \lambda < y/(4 - 2Y - y)$, and option **S** when $\lambda > y/(4 - 2Y - y)$.*

3.3. *The Privatisation Benchmark*

Under privatisation, *P* has full property rights over his land, and can sign any long term state contingent contract with *A*.

We assume that *P* can commit not to renegotiate these long-term contracts. Among the implications of this no-renegotiation assumption is that, if *P* sells his land to *A* at the beginning of period 1, accompanying with the sales contract is a commitment of not buying it back after *A* has made her (private) technology choice. This assumption of commitment power simplifies our analysis. Indeed, after *A* has made her (private) technology choice and *P* observes his (private) job opportunity, any renegotiation between them will be an asymmetric-information bargaining game, which will unnecessarily complicate our analysis. If *P* can commit not to renegotiate, then it is without loss of generality to assume that *P* will always commit not to renegotiate any contract he offers.[26] We simplify our analysis by making use of this observation.

Incidentally, this assumption of commitment power also stacks the deck in favour of free market and makes our task of making sense of China's aversion towards privatisation more difficult. If privatisation proves inefficient, we can be assured that the inefficiency is not due to contractual friction.

To see how *P* will behave under privatisation, we first observe that *P*, being the residual-claimant of his own land under privatisation, possessing full bargaining power *vis-à-vis A* thanks to competition among alternative users, and, being able to commit

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[26] It is a general principle that, in a principal-agent problem, the principal should without loss of generality commit not to renegotiate his contract if he can make such a commitment. To see how this principle works in our specific application, suppose *P* expects that he can sell the land to *A* at price $a in period 1, and that he can buy back the land at price $b during the hard time in period 2. The period-2 transaction outcome (including the transaction price of $b) must be part of the equilibrium in the continuation game (including *A*'s private technological choice in period 1, and the subsequent asymmetric information bargaining game during the hard time in period 2) that immediately follows the sales of the land in period 1. By definition, both *P* and *A* know the equilibrium they are playing, and hence *A* anticipates this period-2 transaction outcome as well. *A*'s willingness to accept the sales contract in period 1 at the price of $a must have reflected her anticipation of this period-2 transaction outcome as well as her corresponding technological choice. Suppose *P* instead offers the following long-term conditional lease contract: '*A* shall pay *P* $a in period 1 and shall have the right to use *P*'s land in both periods. However, *P* reserves the right to reclaim the land in period 2 as long as he compensates *A* the amount of $b'. If *P* can commit not to renegotiate this long-term conditional lease contract, *A* will also accept it, and will make exactly the same technological choice subsequently. As a result, *P* replicates his equilibrium payoff under the original sales contract.

not to renegotiate any contract he offers, will simply maximise the sum of output from his land and wage income from the city, subject to A's incentive compatibility constraint, by directly specifying in the contract:

(i) who is to farm/use the land under different situations; and

(ii) his own migration plan.

Before we enumerate P's possible option, let us simplify things by observing that as long as P is in the city in period 2, it is optimal to let A use his land instead of leaving it idle – once we arrive at period 2, whatever damage done to the land is already sunk, and letting A use his land can cause no further damage. In particular, given our assumption that $\overline{w}$ is arbitrarily large, it is optimal for P to stay in the city during the good time in period 2, and hence P should let A use his land during the good time in period 2.

With this simplification, it remains to determine how P should handle his land in period 1, and also during the hard time in period 2. In period 1, P has two options: either to leave his land idle, or to let A use it. During the hard time in period 2, P has three options: either to stay in the city (and go underground) and let A use his land, or to return to the village and farm his land himself, or to return to the village but let A use his land. Here, we can further simplify things by observing that, no matter what P has done to his land in period 1, it is never optimal for him to return to the village during the hard time in period 2 only to sit idly and to let A use his land – if he were to sit idly, he could have done better by staying in the city (and going underground) while still letting A use his land. So we are left with only four combinations.

We can eliminate one more combination: letting A use his land in period 1 and returning to the village to farm his land himself during the hard time in period 2 is a dominated combination. It is dominated by letting A use his land in period 1 but staying in the city (and going underground) during the hard time in period 2. The reason is that, under the former combination, A will engage in short-term behaviour in period 1, anticipating that with probability $1/2$ she will not be the user in period 2. As a result, the land will be damaged in period 2. During the hard time in period 2, by farming his land himself P earns only y, whereas he can earn more by staying in the city (and going underground) because $\underline{w} > y$. In summary, if P is to return to the village to farm his land himself during the hard time in period 2, it only makes sense for him to also leave his land idle in period 1. Let us call this combination 'option $\mathbf{I}'$'.

Finally, if P is to stay in the city (and go underground) during the hard time in period 2, he is in effect letting A use his land in all circumstances in period 2. In this case, there is no more reason to leave his land idle in period 1 – he can let A use his land in period 1 without worrying that A would engage in short-term behaviour. Anticipating that she will use the land in all circumstances in period 2, A will employ the normal technology in period 1, resulting in total output of 2λ from the land. Let us call this combination 'option $\mathbf{S}'$', meaning that P sells his land to A at the price of 2λ and migrates to the city permanently at the beginning of period 1.

In summary, only two options can possibly be optimal for P:

$\mathbf{I}'$: leaving the land idle in period 1, renting it to A at the price of λ during the good time in period 2, and returning to the village to farm the land during the hard time

in period 2; this option yields P an expected payoff of $U = (1/2)(\overline{w} + \lambda) + 1/2$, and yields an expected social welfare of $W = (1/2)(\overline{w} + \lambda) + 1/2$;

S′: selling the land to A at the price of 2λ, and migrating to the city permanently; this option yields P an expected payoff of $U = 2\lambda + \mathrm{E}w$, and yields an expected social welfare of $W = 2\lambda + \mathrm{E}w - (1/2)c$.

P's optimal option depends on the size of λ. Similar to the intuition in the second-best benchmark, option $\mathbf{I'}$ is optimal when λ is low, and option $\mathbf{S'}$ is optimal when λ is high.

> Lemma 2. *Under privatisation*:
>
> 1. *if $\lambda < (1 - \underline{w})/3$, P will leave his land idle in period 1, rent it to A during the good time in period 2, and return to the village to farm it himself during the hard time in period 2, resulting in an expected social welfare of $W = 1/2(\overline{w} + \lambda) + 1/2$;*
> 2. *if $\lambda > (1 - \underline{w})/3$, P will sell his land and migrate to the city permanently, resulting in an expected social welfare of $W = 2\lambda + \mathrm{E}w - (1/2)c$.*

Comparing Lemmas 1 and 2, we find that privatisation achieves the second best only when λ is sufficiently small; more precisely, when $\lambda < (1 - \underline{w})/3$.[27] When $\lambda > (1 - \underline{w})/3$, privatisation results in P migrating permanently to the city, inflicting a negative externality of $1/2c$ to the government.

3.4. *Efficient Design without Corruption Constraint*

Basic economics suggests that the most direct way to make P internalise the negative externality going underground would inflict on the government is to tax such an action. However, by assumption, P would become 'invisible' when he goes underground, and hence cannot be taxed. Alternatively, the government can subsidise P for returning to the village. For example, the government can give P a monetary payment of $\underline{w}$ conditional on P returning to the village in period 2. Such a subsidy can be financed by a tax on a good job in the formal sector of $\underline{w}$. Note that such a tax would not deter P from taking a good job when such a good job is available, because his wage income from a good job, $\overline{w}$, is assumed to be arbitrarily large, and hence his post-tax income, $\overline{w} - \underline{w}$, is higher than the monetary payment, $\underline{w}$, he will receive upon returning to the village.

Under such a tax/subsidy scheme, P will return to the village during the hard time in period 2. If land is also privatised, P will be the residual claimant of his land. Possessing full bargaining power *vis-à-vis* A thanks to competition among alternative users, and being able to commit not to renegotiate any contract he offers, P will simply maximise the output from the land, subject to A's incentive compatibility constraint, and his own migration plan. P's problem hence will be exactly the same as the social planner's in Section 2, and the second best will be achieved.

> Lemma 3. *The second best can be achieved by privatisation of land plus a monetary payment of $\underline{w}$ to P conditional on P returning to the village in period 2. Such a transfer can, for example, be self-financed by a tax of $\underline{w}$ on a good job in the formal sector.*

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[27] To see this, it will be helpful to observe that $(1 - \underline{w})/3 < (1 - y)/(2Y + y - 1) < 1/3$.

The tax/subsidy scheme described above may not be feasible if disbursement of monetary transfers relies on local officials, while local officials are corrupt and would run away with any cash they are to disburse. If the government overlooks the existence of corruption and implements the scheme described in Lemma 3 nevertheless, P would not expect any monetary payment conditional upon returning to the village in period 2. P's behaviour would instead be exactly the same as described in Lemma 2. In particular, when $\lambda > (1 - \underline{w})/3$, he will sell his land to A and migrate to the city permanently, inflicting negative externality $(1/2)c$ on the government.

We close this Section by noting that the tax/subsidy scheme described in Lemma 3 resembles the co-op system discussed in Section 1. There are several features of the co-op system that suggest that it is meant to play the same role as the scheme described in Lemma 3. First, part of the co-op's income is retained for provision of local public goods, effectively making the distribution of dividends (a form of monetary payment) contingent on shareholder peasants' migration decisions. Second, the control of the co-ops stays in the hands of local officials, effectively guaranteeing that such a distribution policy will not be overruled by a 'shareholder vote'.[28] The central government's concerns over experiments of the co-op system also points to the very weakness of cash as a form of social security payment: it is too mobile and hence too easy for corrupt officials to run away with.

4. Efficient Design with Corruption Constraint

To capture the corruption concerns, we introduce the following assumption:

ASSUMPTION 4. *The government faces the following corruption constraint: any monetary payment from G to P must be non-positive.*

The idea is that disbursement of any monetary payment relies on local officials, who are corrupt and would run away with any cash they are to disburse. Therefore, the government can only tax P, but cannot subsidise him, rendering any monetary payment from G to P non-positive. This assumption, together with our earlier assumption that G cannot tax P when P goes underground (because P becomes 'invisible' once he goes underground), effectively render cash useless as an instrument to discourage P from going underground.

With cash out of the picture, one option for the government is simply to give up on discouraging P from going underground, and accept the accompanying negative externality of $(1/2)c$. Another option is to use land instead as an instrument to discourage P from going underground. Note that land, unlike cash, is immobile. A corrupt official may try to sell the land illegally and run away with the cash receipts, but the land necessarily stays behind and can be recovered from the illegal buyer. We take the extreme assumption that land allocation is hence completely immune from corruption, and explore in subsection 4.1 how the rural land tenure arrangement should optimally be designed if the government is to discourage P from going underground. In subsection 4.2 we compare the government's two options and

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[28] If the shareholder-peasants can, they may have incentives to vote for a distribution policy that does not depend on their migration decisions. Under such an alternative distribution policy, when λ is modestly large, shareholder peasants will not have incentives to return to the village.

determine when should the government tolerate permanent migration and when should it discourage P from going underground.[29]

4.1. *To Discourage P from Going Underground*

We consider a class of tenure arrangement where P's land is divided into three different parcels, each with different tenure security and restrictions on the rights to transfer. The design variables are the relative sizes of these three different parcels.

The first parcel is called private plot, which P possesses as a secure and unrestricted property right. Privatisation is equivalent to designating 100% of P's land as a private plot.

The second parcel is called contract land, of which P can be an absentee-landlord only in period 1. If P does not live in the village in period 2, it will be expropriated by the government, who we assume then reassigns it to a new alternative user.[30] Despite the insecurity of P's tenure over his contract land, there is no restriction on his rights to transfer. In particular, as long as he possesses its ownership, he can sign leases with alternative users and rent out his contract land.

The third parcel is called ration land, which is the same as contract land, except that it is absolutely non-transferable. P has to leave it idle if he does not farm it, and he will lose its ownership if he does not live in the village in period 2.

The taxonomy of these different parcels of land is summarised in Table 3.

Let $z \in [0, 1]$ denote the size of private plot, $x \in [0, 1 - z]$ the size of contract land, and $1 - x - z$ the size of ration land. The government's problem is to choose (x, z) to maximise social welfare subject to:

> (*i*) any alternative user who may use any parcel of the land chooses the technology that maximises her payoff; and

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[29] Our assumption that monetary payments are completely infeasible, while in-kind payments, especially those in the form of immobile factors such as land, are completely immune from corruption, is of course extreme and is made purely for simplicity. In reality, both kinds of payments involve 'leakage' due to corruption, with the 'leakage' involved in monetary payments more severe. For example, in the 'sloping land conversion programme' (SLCP), the government employs a combination of monetary and in-kind payments (the latter takes the form of grains and seedlings) to compensate peasants for sloping land conversion. Surveys conducted in various provinces found 'serious diversion of funds slated for farmer compensation', with undelivered payments ranging from 24% to 77%, while shortfalls in monetary payments often much more than shortfalls in in-kind payments (Bennett, 2008). However, when in-kind substitutes, especially those in the form of immobile factors, are hard to find, we expect that monetary payments would still be used by the government as a third-best option.

[30] In order for contract land to play any distinctive role in discouraging P from going underground, it is important that an expropriated piece of contract land will be reassigned to a different user from its period-1 user. This may be counter-intuitive, as one may conjecture that re-assigning an expropriated piece of contract land to its period-1 user, say A, would encourage the latter to employ the normal technology instead of engaging in short-term behaviour, which in turn improves efficiency. However, under this alternative policy, A's opportunity to rent P's contract land will be worth as much as her opportunity to buy P's private plot. Due to competition among alternative users, P can extract from his contract land as much as he can from his private plot. Specifically, P would tell A at the beginning of period 1 the following: 'Pay me $2x\lambda$ (where x is the size my contract land) now, and I shall let you use my contract land for as long as I legally own it. Of course, I may not own it forever. In particular, if I do not return to the village in period 2, I will forfeit my ownership. But you should not be worried about such an unfortunate event, because even when the government expropriates my contract land, they will still reassign it back to you. So rest assured that you will be able to use my contract land no matter what happens in period 2. In particular, you should employ the normal technology, and generate total output of $2x\lambda$.' This offer would be accepted by A, and P's contract land would contribute as little as his private plot in discouraging him from going underground. In short, under the alternative policy described above, contract land would be indistinguishable from a private plot.

Table 3

Taxonomy of Different Parcels of Land

	Tenure secure	Tenure insecure
Transferable in period 1	Private plot	Contract land
Non-transferable in period 1		Ration land

(*ii*) *P* is willing to return to the village instead of going underground during the hard time in period 2.

In this section, to the extent there is no confusion, we shall refer to (*ii*) above simply as the *IC constraint*, and to the solution of this problem simply as the *optimal tenure arrangement*.

Note that we do not introduce any parcel of land whose tenure is secure but is non-transferrable in period 1. Such a parcel is dominated by ration land, because it tightens the IC constraint and, conditional on the IC constraint being satisfied, does not generate any higher social welfare. Similarly, we do not introduce any parcel of land whose transferability in period 2 is restricted. Conditional on *P* possessing ownership of such a parcel in period 2, restricting his freedom to rent it out would only reduce social welfare without relaxing the IC constraint.

To see which (x, z) satisfies the IC constraint, we need to compare *P*'s payoffs if he migrates permanently and if he returns to the village during the hard time in period 2. If *P* migrates permanently, he will let *A* use his lands to the extent that is allowed, resulting in an expected payoff of:

$$U(x, z|\text{perm-migrate}) = z(2\lambda + \mathrm{E}w) + x(\lambda Y + \mathrm{E}w) + (1 - x - z)\mathrm{E}w$$
$$= z(2\lambda) + x(\lambda Y) + \mathrm{E}w,$$

where $z(2\lambda)$ is *P*'s income from selling his private plot, and $x(\lambda Y)$ is his rental income from renting out his contract land in period 1.

If *P* is to return to the village during the hard time in period 2, his expected payoff $U(x,z|\text{return})$ will depend on how he handles each of his three parcels of land. Note that *P* is the residual claimant of his private plot, and hence, conditional on his plan to return to the village during the hard time in period 2, his handling of his private plot conforms with the second best as described in Lemma 1. As for his ration land, it can only be optimal for *P* to farm it himself if $\lambda \leq 1$, and to rent to *A* if $\lambda > 1$, during the hard time in period 2. As for his contract land, only two options can possibly be optimal for *P*:[31]

I″: leaving the contract land idle in period 1, and farming it by *P* himself during the hard time in period 2; this option yields *P* an expected payoff of $U = (1/2)\overline{w} + 1/2$ per unit of contract land;

R″: renting the contract land to *A* in period 1, and during the hard time in period 2, farming it by *P* himself if $\lambda \leq 1$, and renting it to *A* if $\lambda > 1$; since *A* necessarily engages in short-term behaviour in period 1, this option yields *P* an expected payoff of $U = \lambda Y + (1/2)\overline{w} + (1/2)\max\{\lambda, 1\}y$ per unit of contract land.

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[31] Another option is to leave the contract land idle in period 1 and to let *A* use it during the hard time in period 2. But this option is dominated by option **R″**.

We summarise these in Table 4. Table 4 also contains the corresponding expected social welfare per unit of land. Social welfare differs from P's payoff in two aspects:

(*i*) if P is to migrate permanently, he reduces social welfare by $(1/2)c$; and

(*ii*) when a piece of expropriated (contract or ration) land is reassigned to a new alternative user in period 2, the output generated will count into social welfare but not into P's payoff.

Neither of these discrepancies arises for private plot when P is to return to the village during the hard time in period 2.

P's expected payoff conditional on his plan to return to the village during the hard time in period 2 is hence:

$$U(x, z|\text{return}) = z\left(\frac{1}{2}\overline{w} + M\right) + x\left(\frac{1}{2}\overline{w} + N\right) + (1 - x - z)\left(\frac{1}{2}\overline{w} + \frac{1}{2}\max\{\lambda, 1\}\right)$$

$$= zM + xN + \frac{1}{2}(1 - x - z)\max\{\lambda, 1\} + \frac{1}{2}\overline{w},$$

where
$$M = \max\left\{\frac{1}{2}\lambda + \frac{1}{2}, \lambda Y + \frac{1}{2}\lambda y + \frac{1}{2}y, 2\lambda\right\},$$

and
$$N = \max\left\{\frac{1}{2}, \lambda Y + \frac{1}{2}\max\{\lambda, 1\}y\right\}.$$

Table 4

Per Unit Land Expected Payoff, U, for P and Expected Social Welfare, W

	Permanent migration		Returning during the hard time
Private plot (z)		**I:**	$U = \frac{1}{2}\overline{w} + \frac{1}{2} + \frac{1}{2}\lambda$
			$W = \frac{1}{2}\overline{w} + \frac{1}{2} + \frac{1}{2}\lambda$
	$U = \mathrm{E}w + 2\lambda$	**R:**	$U = \frac{1}{2}\overline{w} + \lambda Y + \frac{1}{2}y + \frac{1}{2}\lambda y$
	$W = \mathrm{E}w + 2\lambda - \frac{1}{2}c$		$W = \frac{1}{2}\overline{w} + \lambda Y + \frac{1}{2}y + \frac{1}{2}\lambda y$
		S:	$U = \frac{1}{2}\overline{w} + 2\lambda$
			$W = \frac{1}{2}\overline{w} + 2\lambda$
Contract land (x)		**I″:**	$U = \frac{1}{2}\overline{w} + \frac{1}{2}$
	$U = \mathrm{E}w + \lambda Y$		$W = \frac{1}{2}\overline{w} + \frac{1}{2} + \frac{1}{2}\lambda$
	$W = \mathrm{E}w + \lambda Y + \lambda y - \frac{1}{2}c$	**R″:**	$U = \frac{1}{2}\overline{w} + \lambda Y + \frac{1}{2}\max\{\lambda, 1\}y$
			$W = \frac{1}{2}\overline{w} + \lambda Y + \frac{1}{2}\max\{\lambda, 1\}y + \frac{1}{2}\lambda y$
Ration land ($1 - x - z$)	$U = \mathrm{E}w$		$U = \frac{1}{2}\overline{w} + \frac{1}{2}\max\{\lambda, 1\}$
	$W = \mathrm{E}w + \lambda - \frac{1}{2}c$		$W = \frac{1}{2}\overline{w} + \frac{1}{2}\max\{\lambda, 1\} + \frac{1}{2}\lambda$

A tenure arrangement (x, z) satisfies the IC constraint if:

$$\Delta U(x, z) := U(x, z|\text{return}) - U(x, z|\text{perm-migrate}) \geq 0. \tag{1}$$

The government's problem is to maximise the expected social welfare, denoted by $W(x, z)$, by choosing tenure arrangement (x, z) subject to the IC constraint (1).

Recall from Lemma 2 that, when $\lambda < (1 - \underline{w})/3$, privatisation (i.e. $(x, z) = (0, 1)$) not only satisfies the IC constraint, but also achieves the second best. However, as can be easily verified using Table 4, when λ is that small, both privatisation and $(x, z) = (0, 0)$ (i.e. pure ration land) would satisfy the IC constraint and can achieve the second best, yet the latter is more robust in the sense that, if the true λ is ever slightly above $(1 - \underline{w})/3$, privatisation would violate the IC constraint, while pure ration land would not. In what follows, when λ is sufficiently small so that $(x, z) = (0, 0)$ is an optimal tenure arrangement but not a unique one, we always for robustness reason break ties by speaking of $(x, z) = (0, 0)$ as the optimal tenure arrangement. For other ranges of λ, optimal tenure arrangement is generically unique.[32]

It turns out that the optimal tenure arrangement depends on whether short-term behaviour is strongly or weakly inefficient. We hence plot the optimal tenure arrangement separately for these two cases in Figure 1. The formal description of the optimal tenure arrangement is presented in Proposition 1, while the proof can be found in the Appendix.

PROPOSITION 1.

1. *When short-term behaviour is strongly inefficient (i.e. when $Y < 2 - 2y$), it is optimal to designate all land as ration land when λ is small (i.e. when $\lambda < 1/3$), and to designate $\underline{w}/\max\{\lambda, 1\}$ of land as ration land and the rest as a private plot when λ is big (i.e. when $\lambda > 1/3$).*
2. *When short-term behaviour is weakly inefficient (i.e. when $2 - 2y < Y < 2 - y$), it is optimal to designate all land as ration land when λ is small (i.e. when $\lambda < \lambda^* := (1 - y)/(2Y + y - 1)$), to designate $(\underline{w}/\max\{\lambda, 1\} - y)/(1 - y)$ of land as ration land and the rest as contract land when λ is intermediate (i.e. when $\lambda^* < \lambda < \underline{w}/y$), and to designate $\underline{w}/\lambda y$ of land as contract land and the rest as a private plot when λ is large (i.e. when $\lambda > \underline{w}/y$).*

In both cases, as λ increases, restrictions on the rights to transfer are relaxed (i.e. $x + z$ weakly increases), and tenure becomes more secure (i.e. z weakly increases).

The proof of Proposition 1 is in the Appendix. Here we sketch the intuition. When alternative users are very unproductive, even the second best requires that P leaves the

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[32] Whenever $\lambda < \min\{1/3, \lambda^*\}$ (where λ^* is defined in Lemma 1), expected welfare is invariant in z. If, furthermore, $\lambda > (1 - y)/2Y$, then P prefers option $\mathbf{I}''$ to option $\mathbf{R}''$ when it comes to handling his contract land, and hence expected welfare is invariant in x as well. In this case, any (x, z) such that $\Delta U(x, z) \geq 0$ is optimal. If, instead, $(1 - y)/2Y < \lambda < \min\{1/3, \lambda^*\}$, then expected welfare is decreasing in x, and any optimal tenure arrangement must have $x = 0$. In this case, any (x, z) such that $x = 0$ and $\Delta U(0, z) \geq 0$ is optimal. In both cases, since $\Delta U(0, 0) = (1/2)(1 - \underline{w}) > 0$, with $\Delta U(x, z)$ decreasing in x and z, pure ration land is always one of (and also the most robust one of) the optimal tenure arrangements.
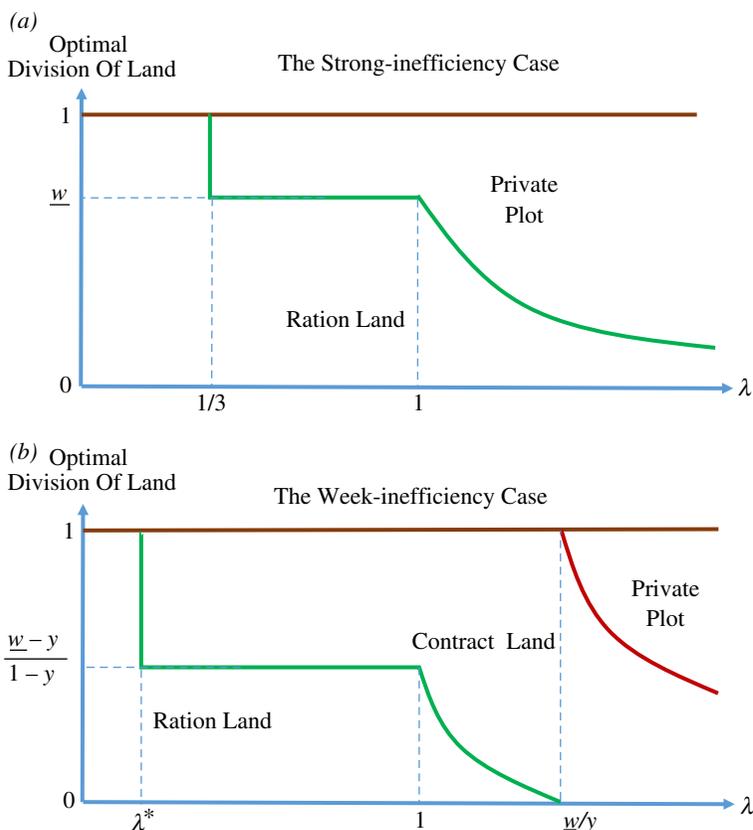
(a)
Optimal
Division Of Land

Fig. 1. *Optimal Division of Land (Optimal if the Government is to Discourage P from Going Underground (Proposition 1), and also Optimal Overall if c is Sufficiently Large (Proposition 2)).*
Note. Colour figure can be viewed at wileyonlinelibrary.com.

land idle in period 1 (lest damaging the land for no good reason). Pure ration land achieves exactly that, and hence is optimal in such situations.

So let us assume alternative users are not too unproductive, and hence leaving the land idle in period 1 is socially undesirable. To understand why the optimal tenure arrangement then takes the form as described in the Proposition, it is important to understand the different roles played by different parcels of land. Conditional on the IC constraint is satisfied, a private plot always generates the highest expected welfare. However, when it comes to relaxing the IC constraint, ration land is always the best. Therefore, the only chance that contract land is useful is when it generates higher expected welfare than ration land does, which is possible only if P prefers option $\mathbf{R}''$ to option $\mathbf{I}''$ when it comes to handling his contract land. When P rents out his contract land in period 1, there is efficiency loss due to A's short-term behaviour. If short-term behaviour is strongly inefficient, contract land is never useful, and the optimal tenure arrangement is just a mixture of a private plot and ration land. The government increases the size of a private plot as much as possible, and keeps barely enough ration

land to generate a period-2 rental income of $\underline{w}$ (that P would risk losing if he does not return to the village) to discourage P from going underground. As the alternative users' productivity increases, the minimal size of ration land necessary to generate a period-2 rental income of $\underline{w}$ decreases.

If short-term behaviour is only weakly inefficient, contract land can be more useful than a private plot. Let us continue to assume that alternative users are sufficiently productive so that leaving the land idle in period 1 is socially undesirable, and that P prefers option $\mathbf{R}''$ to option $\mathbf{I}''$ when it comes to handling his contract land. Since the tenure of contract land is insecure, contract land is more powerful than a private plot in discouraging P from going underground. Therefore, by replacing a parcel of private plots with a same size parcel of contract land, the government can reduce the size of ration land necessary to satisfy the IC constraint. The part of ration land thus saved can further be turned into more contract land. As the efficiency loss due to A's short-term behaviour on contract land is small, such a transformation increases efficiency. As the government replaces more and more private plots with contract land through such a transformation, either all private plots are replaced, in which case the optimal tenure arrangement is just a mixture of contract land and ration land, or all ration land is gone and hence no more ration land can be saved by such a transformation. The latter case is more likely to happen when alternative users are more productive, because then the size of ration land necessary to satisfy the IC constraint is small to begin with.

4.2. *The Overall Optimal Rural Land System*

Recall that if the government is to tolerate permanent migration, it is optimal to privatise the land, with the accompanying expected welfare described in Lemma 2. If the government instead is to discourage P from going underground, the optimal tenure arrangement is as described in Proposition 1, with the accompanying expected welfare being:

$$
W = \begin{cases}
\dfrac{1}{2}\overline{w} + \dfrac{1}{2} + \dfrac{1}{2}\lambda & \text{if } \lambda < 1/3 \\[2mm]
\dfrac{1}{2}\overline{w} + \dfrac{1}{2}\underline{w} + \lambda\left(2 - \dfrac{3}{2}\underline{w}\right) & \text{if } 1/3 < \lambda < 1 \\[2mm]
\dfrac{1}{2}\overline{w} + 2\lambda - \underline{w} & \text{if } \lambda > 1
\end{cases} \; ,
$$

if short-term behaviour is strongly inefficient, and being:

$$
W = \begin{cases}
\dfrac{1}{2}\overline{w} + \dfrac{1}{2} + \dfrac{1}{2}\lambda & \text{if } \lambda < \lambda^* \\[2mm]
\dfrac{1}{2}\overline{w} + \dfrac{1}{2}\underline{w} + \lambda\left(Y\dfrac{1 - \underline{w}}{1 - y} + \dfrac{\underline{w}}{2}\right) & \text{if } \lambda^* < \lambda < 1 \\[2mm]
\dfrac{1}{2}\overline{w} + \dfrac{Y}{1 - y}\lambda - \underline{w}\dfrac{Y + y - 1}{1 - y} & \text{if } 1 < \lambda < \underline{w}/y \\[2mm]
\dfrac{1}{2}\overline{w} + 2\lambda - \underline{w}\dfrac{2 - Y - y}{y} & \text{if } \underline{w}/y < \lambda
\end{cases} \; .
$$

if short-term behaviour is weakly inefficient (both calculated using Table 4).

In Figures 2 and 3, we plot these different expected welfares for easy comparison. For λ sufficiently large (i.e. for $\lambda > (1 - \underline{w})/3$), expected welfare under privatisation is $W = \mathrm{E}w + 2\lambda - (1/2)c$ (see Lemma 2), which grows with λ at the rate of 2. Suppose short-term behaviour is strongly inefficient. Then, when λ is sufficiently large (i.e. when $\lambda > 1$), expected social welfare under the optimal tenure arrangement described in Proposition 1 is $W = (1/2)\overline{w} + 2\lambda - \underline{w}$, which also grows with λ at the rate of 2. Therefore, if c is sufficiently large (i.e. if $c > 3\underline{w}$), it is never optimal for the government to tolerate permanent migration no matter how large λ grows. The optimal tenure arrangement described in Proposition 1 is hence also the overall optimal tenure arrangement.

Next suppose short-term behaviour is weakly inefficient. Then, when λ is sufficiently large (i.e. when $\lambda > \underline{w}/y$), expected social welfare under the optimal tenure arrangement described in Proposition 1 is $W = (1/2)\overline{w} + 2\lambda - \underline{w}(2 - Y - y)/y$, which also grows with λ at the rate of 2. Therefore, if c is sufficiently large (i.e. if $c > 4 - \underline{w} - 2Y(1 - \underline{w})/(1 - y)$),[33] it is never optimal for the government to tolerate permanent migration no matter how large λ grows. The optimal tenure arrangemet
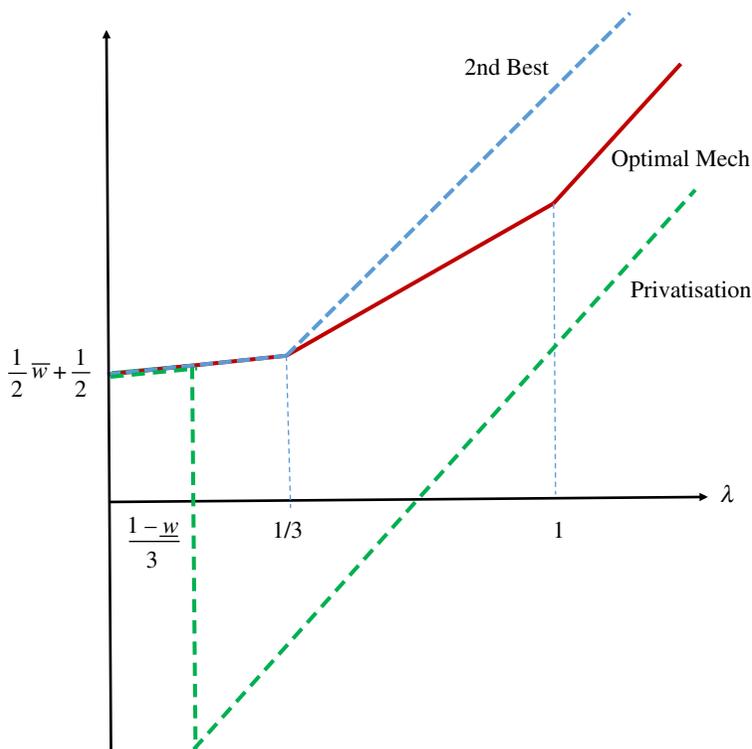

Fig. 2. *Welfare under the Second Best (Upper Dashed Line), the Optimal Tenure Arrangement Described in Proposition 1 (Middle Solid Line), and Privatisation (Lower Dashed Line): The Strong-inefficiency Case.* *Note.* Colour figure can be viewed at wileyonlinelibrary.com.

[33] The minimum c for this statement to be true is determined by the points J and K in Figure 3.
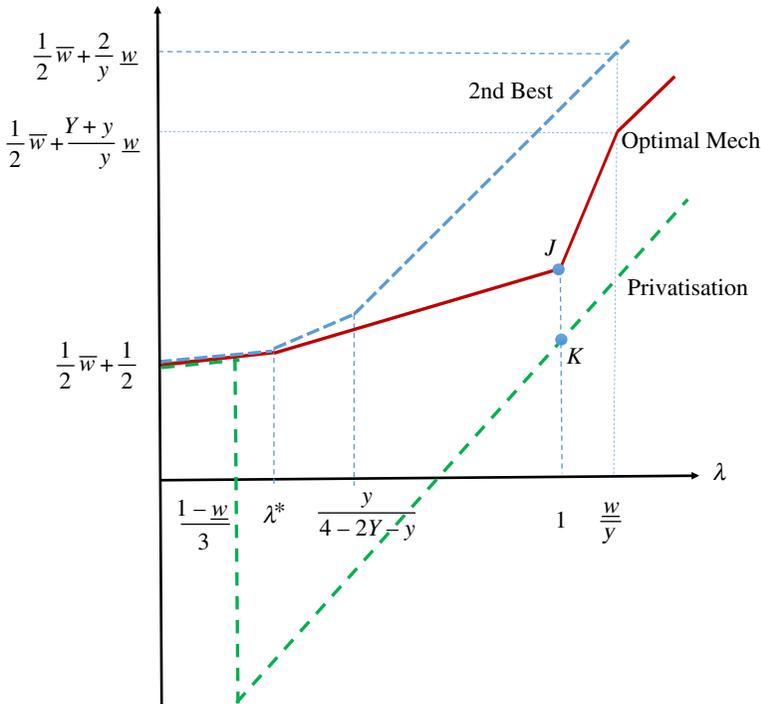
Fig. 3. *Welfare under the Second Best (Upper Dashed Line), the Optimal Tenure Arrangement Described in Proposition 1 (Middle Solid Line), and Privatisation (Lower Dashed Line): The Weak-inefficiency Case*
Note. Colour figure can be viewed at wileyonlinelibrary.com.

described in Proposition 1 is hence, again, also the overall optimal tenure arrangement.

Since $3\underline{w} > 4 - \underline{w} - 2Y(1 - \underline{w})/(1 - y)$ when short-term behaviour is weakly inefficient (i.e. when $Y > 2 - 2y$), a sufficient condition for privatisation of land never to be optimal (or, equivalently, for the tenure arrangement described in Proposition 1 to always be the overall optimal tenure arrangement) is hence $c > 3\underline{w}$.

PROPOSITION 2. *Suppose by going underground P would inflict a sufficiently large negative externality on the government (i.e. suppose $c > 3\underline{w}$). Then the tenure arrangement described in Proposition 1 is also the overall optimal tenure arrangement. In particular, as λ grows, a larger and larger portion of the land should optimally be designated as private plot. However, complete privatisation of all land is never optimal.*

5. From Theory to Reality

In this Section, we discuss how our model generates predictions that match a wide array of empirical patterns, some are obvious, while others are more subtle.

5.1. *Variation Across Time and Regions*

The most obvious empirical success of our model is that it predicts a kind of variation across time and regions that matches the observed pattern. As mentioned in Section 1, the common basic structure underlying China's rural land tenure arrangements masks much variation across time and regions, with tenure more insecure, and restrictions on the rights to transfer more severe, in earlier stages of the reform and in inland regions. This variation can be explained by a single parameter in our model, namely the productivity of the best alternative users, λ. It is plausible that the productivity of the best alternative users is higher in later stages of the reform, because economic reform lifted restrictions on more and more alternative uses, pushing up the productivity of the best one among those allowed. It is also plausible that the productivity of the best alternative users is higher in coastal regions, because a piece of land in coastal regions is more likely to be contiguous to other farmland or even the urban area, and less likely to be located in the mountainous area (and hence in isolation and not easily accessible to other households). According to Proposition 1, tenure will therefore be more secure, and restrictions on the rights to transfer less severe, in later stages of the reform and in coastal regions.

5.2. *Widespread Under-utilisation of Land in the* 1980*s*

Widespread underutilisation of farmland was once considered a problem of China's rural reform, especially in the 1980s. A lot of peasants moved away from farming activities, leaving only women, children and the elderly behind to do the farming.[34] Some went into the city to look for jobs, many more worked in township and village enterprises (Guo, 1995; Liu, 2009). This was considered a problem because of the apparent waste of resources. Our model suggests that such phenomenon can be explained by peasants' concerns over short-term behaviour of alternative users. Indeed, we can see from Table 4 that, when λ is sufficiently small (i.e. when $\lambda < \min\{(1 - y)/(2Y + y - 1), 1/3\}$), P would rather leave his private plot idle instead of renting it out or selling it in period 1 (conditional on his plan of returning to the village during the hard time in period 2). Similarly, when λ is sufficiently small (i.e. when $\lambda < (1 - y)/2Y$), P would rather leave his contract land idle instead of renting it out in period 1 (again, conditional on his plan of returning to the village during the hard time in period 2). Since λ was small in early stages of the reform, widespread underutilisation of farmland hence appeared. Instead of being a problem, leaving private plot and contract land idle is P's way to preserve the health of his land in preparation for his return to the village during the hard time in period 2. Indeed, the second best is achieved notwithstanding the widespread underutilisation of farmland when $\lambda < \min\{(1 - y)/(2Y + y - 1), 1/3\}$.

5.3. *Relative Prevalence of Contract Land* vis-à-vis *Private Plot*

According to Proposition 1, contract land appears in the optimal tenure arrangement only if short-term behaviour is weakly inefficient but not strongly inefficient. Since

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[34] The women, children and the elderly left behind to do the farming had been nicknamed the 386199 brigade, where 38 stands for women, 61 for children, and 99 for the elderly.

contract land indeed plays a heavy role in China's rural land tenure arrangement (Li *et al.*, 1998), our model 'predicts' that short-term behaviour is at most weakly inefficient. Since whether short-term behaviour is actually strongly or weakly inefficient is an empirical question, this 'prediction' of our model can be readily verified empirically.

Given the vast number of Chinese agricultural experts who openly expressed concerns of underinvestment in land (a form of short-term behaviour), one generally has an impression that short-term behaviour is strongly inefficient in real life. However, while there are many studies documenting that insecure tenure has significant effects on investment behaviour (Zhu *et al.*, 2006), we are not aware of any study suggesting that such investment behaviour has significant effects on efficiency. On the contrary, there are careful studies suggesting that its overall effects on efficiency are small. For example, Jacoby *et al.* (2002) empirically showed that tenure insecurity (measured by hazard of expropriation) significantly affects farmers' application of organic fertiliser in China, confirming previous studies. However, the associated cost is small, because the yield elasticity of organic fertiliser is small.[35]

5.4. *Why Tenant Identity Matters*

In our model, since all alternative users are identical, restrictions on the rights to transfer take two extreme forms – either there is no restriction at all, as in the case of contract land, or there is a complete ban, as in the case of ration land. In a richer model, alternative users can be heterogenous, and can differ in how severely their respective short-term behaviour may damage the land. In that case, the optimal restriction on the rights to transfer can take some intermediate forms, with less-damaging tenants being allowed, and more damaging ones disallowed. For example, if the potential tenant is another household of the same village, she may be less motivated to engage in the most severe forms of short-term behaviour due to her involvement in other long-term relationships with P.[36] The contrary will be true if the potential tenant is another household from a different village, or a city dweller with a business plan in mind. Therefore, with judicious modifications, our model can also match the variation in restrictions on the rights to transfer across different potential tenants.

6. Concluding Remarks: Prospect of Privatisation

In this article, we suggest the constraints against which China's rural land tenure arrangement may be constrained efficient, and show how our stylised model generates predictions that match a wide array of empirical patterns. We close this article by using this stylised model to ponder the prospect of privatisation of rural land in China.

Proposition 2 suggests that we should not expect any constitutional change that fundamentally redefines the property rights of all rural land. Instead, we should expect to see gradual changes at the margin, with a larger and larger portion of rural land

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[35] They estimated that the social gain from better tenure security (and hence less short-term behaviour) will be less than 1% when evaluated by median percentage change in plot value (i.e. discounted stream of profits from a plot).

[36] Or, more realistically, due to her sheer love of the village.

being designated as private plots, while the rest continues to feature insecure tenure. Such kinds of gradual change would be most conveniently implemented within the current household responsibility system. This prediction stands in sharp contrast with the previous literature, which tends to portray China's current rural land system as transitional, with the reason why the transition towards eventual privatisation cannot be faster being either ideological (Zhang, 2011) or technical (Li, 2012).

However, one may argue that such a prediction is too rosy to be warranted even if we take our model literally. This is because, in our model, social welfare is measured by aggregate output, and is unaffected by how the corresponding surplus is distributed among different parties. Therefore, the same social welfare can be generated no matter whether it is the peasants or some unmodelled ruling elites who capture the surplus generated from the peasants' private plots. Our model hence may as well predict that, as λ grows over time, the government will increasingly tolerate illegal and inadequately compensated land grab by the (unmodelled) ruling elites. As long as the scale of such land grab is within the bound set in Proposition 2 for private plot, such land grab will not generate the negative externality c and hence is acceptable. Such a prediction, incidentally, is also consistent with the escalating number of incidences of illegal land grab bing in rural China (Lin, 2009; Ong, 2014).

Without a richer model where the government also cares about how surplus is distributed, our article is hence inadequate in distinguishing these two (one rosy and one gloomy) predictions, and in giving sharp prediction on how peasants will fare as λ grows over time.

Appendix A. Proof of Proposition 1

Recall that there are three potentially optimal options (**I**, **R** and **S**) for P to handle his private plot, and two (**I″** and **R″**) for him to handle his contract land, totalling at most six combinations, as tabulated in Table A1. These six combinations can also be regarded as partitioning the relevant parameter space (of parameters λ, Y, and y) into six regions.

Among these, the parameter region of (**R**, **I″**) is impossible. Indeed, since P is not a residual claimant of his contract land, he does not internalise the full damage A's short-term behaviour inflicts on his contract land. He is hence more eager to rent it out his contract land than his private plot.[37]

Table A1

Partitioning the Relevant Space of Parameters λ, Y, and y

	I″	R″
I	$x^* = 0 = z^*$	$x^* = 0 = z^*$
R	impossible	$x^* = \dfrac{1 - w}{1 - y}; z^* = 0$
S	$x^* = 0; z^* = 1 - \dfrac{w}{\max\{\lambda, 1\}}$	

[37] Formally, P prefers option **R** to option **I** when $\lambda > \lambda^* = (1 - y)/(2Y + y - 1)$, and prefers option **R″** to option **I″** when $\lambda > (1 - y)/2Y$. The impossibility of (**R**, **I″**) follows from the fact that $\lambda^* > (1 - y)/2Y$.

Option **I** is P's optimal option for handling private plot if and only if option **I** is the second best option for handling all land (see Lemma 1).[38] The corresponding second-best expected welfare of $W = (1/2)\overline{w} + 1/2 + (1/2)\lambda$ can be achieved by pure ration land. Therefore, in the parameter regions of (**I**, **I''**) and (**I**, **R''**), it is optimal to set $(x, z) = (0, 0)$.[39]

In the parameter region of (**R**, **R''**), P prefers option **R** to option **S** when it comes to handling his private plot. This requires $\lambda < y/(4 - 2Y - y) < 1$, and hence we have $\max\{\lambda, 1\} = 1$. Therefore, both the private plot and contract land generate the same expected welfare of $W = (1/2)\overline{w} + \lambda Y + (1/2)y + (1/2)\lambda y$, where as ration land generates an expected welfare of $W = (1/2)\overline{w} + 1/2 + (1/2)\lambda$. Since P prefers option **R** to option **S** when it comes to handling his private plot, the former is larger than the latter. Therefore, expected welfare is increasing in $x + z$ but is invariant in how the sum is divided between x and z. However, the private plot tightens the IC constraint more than contract land does.[40] Therefore, it is optimal to set $z = 0$ and increase x as much as possible until the IC constraint binds. This results in $x^* = (1 - \underline{w})/(1 - y)$.

In the parameter region of (**S**, **I''**), P prefers option **I''** to option **R''** when it comes to handling his contract land. This requires $\lambda < (1 - y)/2Y < 1$, and hence we have $\max\{\lambda, 1\} = 1$. Since contract land generates the same expected welfare as ration land does, but tightens the IC constraint, x should optimally be set to 0.[41] On the other hand, P prefers option **S** to option **I** when it comes to handling his private plot, implying that the private plot generates a higher expected welfare than ration land does, and hence it is optimal to increase z as much as possible until the IC constraint binds.[42] This results in $z^* = 1 - \underline{w} = 1 - \underline{w}/\max\{\lambda, 1\}$.

In the parameter region of (**S**, **R''**), the IC constraint can be simplified as $x(1 - y) + z \leq 1 - \underline{w}/\max\{\lambda, 1\}$. When $\lambda < \underline{w}/y$, the constrained set is a triangle (in the x–z space) with vertices $\mathbf{0} = (0, 0)$, $\mathbf{a} = (0, 1 - \underline{w}/\max\{\lambda, 1\})$, and $\mathbf{b} = [(1 - \underline{w}/\max\{\lambda, 1\})/(1 - y), 0]$. When $\lambda > \underline{w}/y$, the constrained set is a quadrangle with vertices $\mathbf{0}$, $\mathbf{a}$, $\mathbf{c} = (\underline{w}/\lambda y, 1 - \underline{w}/\lambda y)$, and $\mathbf{d} = (1, 0)$. Since expected welfare $W(x, z)$ is linear in x and z, it suffices (for generic parameter values) to consider only these vertices as candidate optimal tenure arrangements. We first observe that private plot generates a higher expected welfare than ration land does. Indeed, if $\lambda < 1$, this follows from exactly the same argument in the above paragraph; and if $\lambda > 1$, this also follows from a direct comparison. Therefore, $\mathbf{0}$ is never optimal, as it is dominated by $\mathbf{a}$. A second observation is that $\mathbf{d}$ is dominated by $\mathbf{c}$, because:

$$
\begin{aligned}
W(\mathbf{c}) &= \frac{1}{2}\overline{w} + 2\lambda - (2 - Y - y)\frac{\underline{w}}{y} \\
&> \frac{1}{2}\overline{w} + 2\lambda - (2 - Y - y)\lambda \\
&= \frac{1}{2}\overline{w} + (Y + y)\lambda \\
&= W(\mathbf{d}),
\end{aligned}
\tag{A.1}
$$

where we have made use of $\lambda > \underline{w}/y > 1$, which is the case when the comparison between $\mathbf{c}$ and $\mathbf{d}$ is relevant. Therefore, it remains to compare $\mathbf{a}$ against $\mathbf{b}$ when $\lambda < \underline{w}/y$, and to compare $\mathbf{a}$ against $\mathbf{c}$ when $\lambda > \underline{w}/y$.

---

[38] The corresponding parameter regions are $\lambda < 1/3$ if $Y < 2 - 2y$, and $\lambda < \lambda^*$ if $2 - 2y < Y < 2 - y$.

[39] However, $(x, z) = (0, 0)$ is not the unique optimal tenure arrangement in these parameter regions. See Footnote 1 for more discussion on the multiplicity issue.

[40] Formally, $\partial \Delta U(x, z)/\partial z = -1/2(1 - y) - \lambda(2 - Y - 1/2y) < -1/2(1 - y) = \partial \Delta U(x, z)/\partial x$.

[41] Formally, they both generate $W = (1/2)\overline{w} + 1/2 + (1/2)\lambda$, but $\partial \Delta U(x, z)/\partial x = 1/2 - 1/2\max\{\lambda, 1\} - \lambda Y < 0$.

[42] Formally, private plot and ration land generate expected welfare of $W = (1/2)\overline{w} + 2\lambda$ and $W = (1/2)\overline{w} + 1/2 + (1/2)\lambda$, respectively. The former is larger than the latter because P prefers option **S** to option **I** when it comes to handling his private plot.

After some algebraic manipulation, it can be shown that:

$$W(\mathbf{a}) = \frac{1}{2}\overline{w} + \frac{1}{2}\left(1 + \frac{\lambda}{\max\{\lambda, 1\}}\right)\underline{w} + 2\lambda\left(1 - \frac{\underline{w}}{\max\{\lambda, 1\}}\right)$$

$$\text{and}\quad W(\mathbf{b}) = \frac{1}{2}\overline{w} + \frac{1}{2}\left(1 + \frac{\lambda}{\max\{\lambda, 1\}}\right)\underline{w} + \frac{\lambda Y}{1 - y}\left(1 - \frac{\underline{w}}{\max\{\lambda, 1\}}\right).$$

Therefore, we have:

$$W(\mathbf{a}) \gtrless W(\mathbf{b}) \quad \text{iff} \quad 2 - 2y \gtrless Y.$$

When $\lambda > \underline{w}/y$, we can simplify $W(\mathbf{a})$ as:

$$W(\mathbf{a}) = \frac{1}{2}\overline{w} + 2\lambda - \underline{w}.$$

Using (A.1), we have:

$$W(\mathbf{a}) \gtrless W(\mathbf{c}) \quad \text{iff} \quad 2 - 2y \gtrless Y.$$

To summarise, in the parameter region of $(\mathbf{S}, \mathbf{R}'')$, we have:

$$(x^*, z^*) = \begin{cases} \left(0, 1 - \dfrac{\underline{w}}{\max\{\lambda, 1\}}\right) & \text{if } Y < 2 - 2y \\[2mm] \left(\dfrac{1 - \underline{w}/\max\{\lambda, 1\}}{1 - y}, 0\right) & \text{if } 2 - 2y < Y < 2 - y \ \text{ and } \ \lambda < \underline{w}/y \, . \\[2mm] \left(\dfrac{\underline{w}}{\lambda y}, 1 - \dfrac{\underline{w}}{\lambda y}\right) & \text{if } 2 - 2y < Y < 2 - y \ \text{ and } \ \lambda > \underline{w}/y \end{cases}$$

To prove Part 1 of Proposition 1, we observe that, when $Y < 2 - 2y$, the parameter region of $(\mathbf{R}, \mathbf{R}'')$ is impossible as well, because option $\mathbf{R}$ is never optimal for P in handling his private plot when short-term behaviour is strongly inefficient (see Lemma 1). Therefore, the optimal land system always has $x^* = 0$, and has $z^* = 0$ when P prefers option $\mathbf{I}$ to option $\mathbf{S}$ (has $z^* = 1 - \underline{w}/\max\{\lambda, 1\}$ when P prefers option $\mathbf{S}$ to option $\mathbf{I}$) when it comes to handling his private plot, which in turn happens when $\lambda < 1/3$ (respectively, when $\lambda > 1/3$).

To prove Part 2 of Proposition 1, we observe that, when $2 - 2y < Y < 2 - y$, the parameter region of $(\mathbf{S}, \mathbf{I}'')$ is impossible as well, because option $\mathbf{S}$ is optimal for P in handling his private plot only when $\lambda > y/(4 - 2Y - y) > (1 - y)/(2Y + y - 1)$ (see Lemma 1), in which case P would have preferred option $\mathbf{R}''$ to option $\mathbf{I}''$ instead. Therefore, the optimal tenure arrangement has $(x^*, z^*) = (0, 0)$ when option $\mathbf{I}$ is optimal for P in handling his private plot (i.e. when $\lambda < \lambda^*$), has $(x^*, z^*) = [(1 - \underline{w})/(1 - y), 0]$ when option $\mathbf{R}$ is optimal (i.e. when $\lambda^* < \lambda < y/(4 - 2Y - y)$), and has:

$$(x^*, z^*) = \begin{cases} \left(\dfrac{1 - \underline{w}/\max\{\lambda, 1\}}{1 - y}, 0\right) & \text{if } \ \lambda < \underline{w}/y \\[2mm] \left(\dfrac{\underline{w}}{\lambda y}, 1 - \dfrac{\underline{w}}{\lambda y}\right) & \text{if } \ \lambda > \underline{w}/y, \end{cases}$$

when option $\mathbf{S}$ is optimal (i.e. when $\lambda > y/(4 - 2Y - y)$). Part 2 of Proposition 1 is proved by observing that $y/(4 - 2Y - y) < 1 < \underline{w}/y$.

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