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The Effects of Rural Land Right Security on Labour Structural Transformation and Urbanization

Evidence from Thailand

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Abstract

This paper attempts to contribute to the understanding of the impacts of secure rural agricultural land rights on labour structural transformation from agriculture to non-agriculture as well as on urbanization, with a specific focus on Thailand. Using province-level panel data and instrumental variable strategy, partial land right entitlement (known in Thailand as SPK4-01 titling) is found to have a positive impact on labour movement towards the non-agricultural sector. In particular, approximately 27 per cent of this impact can be explained by enhanced farm productivity. This, in addition, implies that the reduction of the opportunity costs of off-farm employment, which is also a predicted positive impact of titling on non-agricultural employment, should account for the rest of the overall impact on labour structural transformation. …/.

Keywords: land right security, labour structural transformation, urbanization

JEL classification: O13, O18, Q15

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Although SPK4-01 titling alone is found to have no significant effect on urbanization, its impact depends significantly on within-province transport infrastructure. More specifically, rural land right security increases urbanization more in provinces with poorer road networks. In other words, secure land rights lead to urban concentration and urban non-farm diversification only when it is relatively costly to commute within the province.

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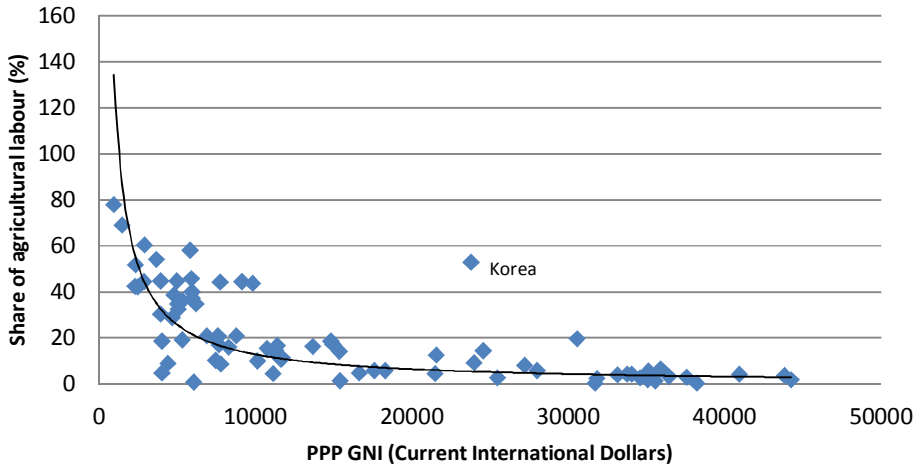
1 Introduction

An empirical regularity, which is common to all economies that have evolved to high-income status, is that as income growth has occurred, the structure of the economy has shifted from one that relies on agriculture to one that is increasingly based on manufacturing and service sectors, both in terms of output and employment. Older literature (for a review, see Syrquin 1988) and recent studies, such as Temple and Wößmann (2006), and Vollrath (2009), suggest that structural transformation plays an important role in accounting for international differences in output and growth. Hayashi and Prescott (2008) show that the major cause of the pre-war Japanese stagnation was the absence of a release of farm workers to non-farm activities. Structural transformation is, therefore, crucially linked to the development process. Nonetheless, for some countries, there is still lag in such a process (for example, see Duarte and Restuccia 2010). Poorer economies differ from richer ones not only in terms of income level, but also in terms of the composition of economic activities or employment allocation across different sectors. For example, Figure 1 shows that whereas a large share of the labour force in poorer countries is engaged in agriculture, this share for developed economies is almost negligible.

Motivated by the above, this paper aims to investigate one of the potential sources that prevents the allocation of labour from agriculture towards non-agriculture. More specifically, it proposes that the rural institutions that govern agricultural activities—rural land rights in particular—can act as a force affecting the reallocation of labour away from agriculture through different channels that also work in different directions. For this investigation, I introduce four mechanisms through which an improvement in the security of rural land rights can have an impact on the allocation of labour between farm and non-farm jobs. First, based on the assumption that the demand for agricultural products is relatively inelastic, better land tenure security, through productivity enhancement, means that there is less need for farm labour to meet the demand for farm

Figure 1
Cross-country correlations between the share of agricultural labour and per capital income



Note: The share of agricultural labour is from the years 2002 to 2004, depending on each country's data availability, and the corresponding per capita income is in dollar.

Source: Computed by the author based on the data from World Bank (2008, 2009).

products. This, in turns, facilitates the movement of labour to the non-agricultural sector. Second, rural land right security reduces the risk of income shocks to farmers. As a result, this may reduce the need for income portfolio diversification and hence discourage the shift of labour from agriculture to other economic activities in non-agricultural sectors. Third, tenure security may raise outmigration from the farm sector since it potentially reduces the loss of opportunity cost of land resulting from such outmigration. And last, specifically in the context considered in the subsequent empirical investigation, as partial land right entitlement in Thailand restricts transfer rights and land inheritance to family members not employed in agriculture, it increases the tie of workers to land and agricultural jobs and, as a result, may depress labour structural transformation. The brief introduction to the conceptual mechanisms above clearly illustrates that the overall direction of the impact of rural land right security on structural transformation is nonetheless theoretically ambiguous. Hence, the question of the overall direction of impact becomes an empirical one.

On another level, the empirical results[1] show that based on the within-country evidence from Thailand, land right insecurity acts as a 'tax' on land. Such a distortion has an adverse effect not only on farm outcomes (Chankrajang 2011) but also on structural transformation. Based on an instrumental variables strategy, I find that a one standard deviation (i.e., 9.67 per cent) increase in the share of land under the partial land right entitlement (which encompasses only tenure security but not tradability or full pledgeability) is associated with an average provincial reallocation of 54,452 farmers to non-farm activities. This is as much as 21 per cent of the average provincial agricultural population during the years of study. In addition, I quantify that based on the first theoretical conjecture, the productivity–improvement channel can account for approximately 27 per cent of the overall rural land right security effect.

By addressing the effect on structural transformation, this paper is also linked to the determinants of urbanization. Although structural transformation and urbanization are not explicitly used as interchangeable terms, the literature on urbanization has acknowledged and emphasized that the two concepts are closely linked and overlap in several key areas. It is also common that productivity in agriculture and non-agriculture is used to proxy wages and productivity in rural and urban areas, respectively.[2] In particular, by using cross-country panel data, Davis and Henderson (2003) estimate that a decline of one standard deviation (0.163) in the agricultural share increases urbanization by 10 per cent. The strong negative correlation between the share of agricultural labour and the share of urban population in Figure 2 is also consistent with the theory that urbanization occurs as a country shifts from an economy based on rural-agricultural activity to urban-industrial activity. In other words, the choice of location is potentially tied to economic sectors of the economy. Structural transformation can, to some extent, be thought of as urbanization in occupational space. Migration can be regarded as the adjustment mechanism by which workers allocate themselves between different labour markets, some of which are located in urban areas and some in rural areas, i.e., in an attempt to maximize expected utility. Although there are jobs in rural areas that are non-agricultural in nature, virtually all jobs in the city, whether formal or

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1 Discussed in detail in section 6.

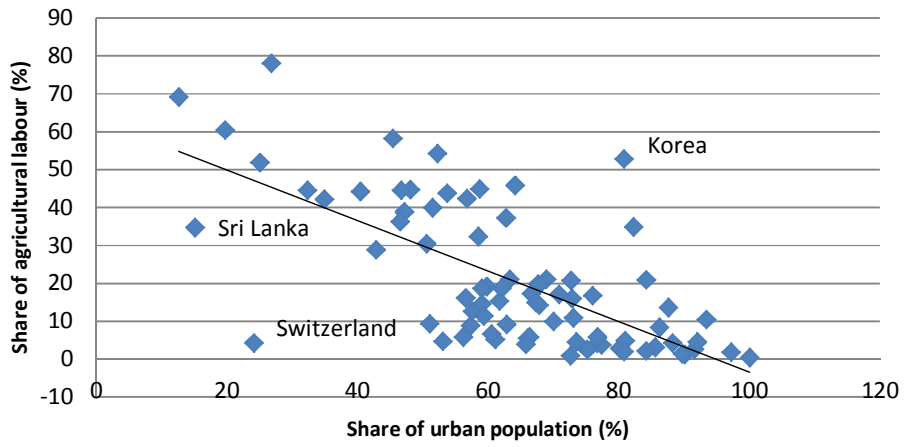
2 See, for example, Fields (1975); Fay and Opal (2000); Davis and Henderson (2003); Deng et al.-(2008); Michaels, Rauch and Redding (2008); and Poelhekke (2011).

informal, are non-agricultural based. Thus, it is possible to treat structural transformation as an approximate upper bound for urbanization. As such, the knowledge of how countries transform economically can also be important for understanding the urbanization process.

Nevertheless, the evidence from the Thai dataset used here shows (i) a weak correlation between the share of labour in agriculture and the share of urban population, and (ii) a divergence between the effects of stronger rural property rights on job diversification (structural transformation) and the diversification of area of residence (urbanization). In other words, once the panel data with the fixed effect is considered instead, there is a breakdown of the correlation usually found in the cross-sectional setup. Despite the caveats that could generate such results,[3] this evidently calls for a more careful use and interpretation of the substitution of these two types of variables, i.e., between those of agricultural and non-agricultural nature and those of the rural and urban sphere.

While the literature on structural transformation and rural-urban migration is in general voluminous,[4] the relationship between rural land institutions and structural transformation has been scarcely studied. The only two investigations of which the author is aware (Rozelle et al. 1999; Mullan, Grosjean and Kontoleon 2010) explore this relationship, using evidence from China. Rozelle et al. (1999) surmise that land tenure insecurity acts as a tax on rural outmigration. As households fear losing 'their' lands, weak security may keep more members in the village in order to protect their holdings.

Figure 2
Cross-country correlations between the shares of agricultural labour and of urban population



Note: The share of agricultural labour is from the years 2002 and 2004: the share of urban population is from the year 2005.[5.]

Source: Computed by the author based on the data from World Bank (2008, 2009).

3 The details are discussed in section 8.

4 The review is given in the literature section.

5 The difference in the years of the share of urban population and the share of agricultural labour reflects the limitation of data availability from the World Development Reports.

Nonetheless, based on village data, these authors find no statistically significant relationship between the Chinese rural land institution and the diversification of labour away from farming activities. However, using household data, Mullan, Grosjean and Kontoleon (2010) find that for non-forest land, an improvement in tenure security without rental rights depresses the likelihood of rural out-migration, thanks to the complementarity between land and labour. Nonetheless, both studies are based on cross-sectional data. Although an attempt is made (for example, in Mullan, Grosjean and Kontoleon 2010) to control for various household characteristics such as assets, number of children and education, the results can still be biased owing to the existence of unobserved heterogeneity either at the household or village level. In addition, as mentioned in Rozelle et al. (1999), in the absence of information on past migration, cross-sectional data may obscure the relationship. For example, remittances from past migrants could increase income and the likelihood of farmers in their villages of origin to out-migrate, due to better information and low transaction costs.

Consequently, this paper complements these two existing studies by proposing additional channels through which land tenure security can affect structural transformation. Studying the situation in an alternative setup, Thailand, this paper applies (i) a panel data that also helps to control for any unobserved time-invariant characteristics. In addition, (ii) the construction of other independent variables based on past information and the application of IV on the independent variable of interest (land tenure security) should help to overcome problems of endogeneity as well as identification. In addition, by using province-level data instead of household or village-level data, it is possible to robustly control for and investigate other macroeconomic-level determinants of urbanization and structural transformation such as economy-wide income, growth, relative wage, and relative output volatility between the two sectors that have been put forward in the literature.

Thus, this paper contributes not only to the structural transformation and urbanization literature, but also to the rural land rights literature in general. Whilst the evolution of rural land rights and its effects on farm productivity, investment and the pattern of land use have been a central issue in development research, its impacts on and the channels through which it can influence a wider set of economic variables that are also crucial to development has been understudied. This paper complements and contributes to the existing literature by illustrating that strengthening rural land ownership can have effects that extend beyond the agricultural sector; in this case, significant macroeconomic effects on the economy-wide labour allocation.

The rest of the paper is organized as follows. The next section reviews the literature on factors determining structural transformation and urbanization. Section 3 outlines the background of the partial land rights entitlement in Thailand. Section 4 illustrates the theoretical mechanisms through which rural land right security can influence the allocation of labour between the agricultural and non-agricultural sectors. Section 5 explains the data, and section 6 outlines the empirical strategy used to investigate the effects of rural land right security on structural transformation and urbanization. Section 7 presents the empirical results of rural land right security on labour diversification away from agriculture, while section 8 illustrates the empirical results on urbanization. Section 9 concludes.

2 Factors determining the employment diversification away from agriculture and urbanization

Two broad strands of explanations for the allocation of labour across farm and non-farm sectors, as well as across rural and urban locations have been presented and substantially studied. Whilst the first strand involves *pull* factors from non-agricultural sectors and cities, the second set of explanations is based on the *push* factors from within agriculture.

2.1 Structural transformation and urbanization: the pull factors

The first *pull* factor explanation is based on the classical demand-pull two-sector model proposed by Lewis (1954). This model suggests that as capital accumulation and savings expand, the modern sector grows and attracts labour from the traditional agricultural sector, which is assumed to have a surplus supply of labour and to make no use of capital. Due to the 'unlimited' labour supply in the traditional sector, such demand-pull structural transformation does not impose any change in agricultural production.

Another pull factor analysis (for an excellent review, see Syrquin 1988) emphasizes the role of Engel effects—as an economy's income grows, the share of food in consumption declines and the share of resources allocated to investment rises. As the agricultural sector produces mainly food and as the share of food in consumption declines, the need for farm workers also declines when countries grow richer.

The importance of the pull factors, generated by an economy-wide economic improvement depicted by these two main theories, is empirically investigated in a number of studies. For instance, using cross-country panel data to examine the macroeconomic and social conditions that determine a country's urbanization process, Fay and Opal (2000) find a strong and positive correlation between the level of income and urbanization, if not between income growth and urbanization. Davis and Henderson (2003: 116), also based on panel data and using an IV strategy, show that a one-standard deviation increase in log income leads to a 19 per cent increase in urbanization, a reasonably substantial effect. In addition, da Mata et al. (2007), in examining the determinants of city growth in Brazil between 1997 and 2000, find a positive correlation between the elasticity of population supply in cities and income per capita.

Arguably, the most frequently cited and studied pull factor explanation is based on Todaro (1969) and Harris and Todaro (1970). The Harris-Todaro model attempts to explain the puzzle of persistent rural-urban migration despite high unemployment rates in developing country cities. In particular, the literature highlights the difference in the expected income (a composition of wages and the probability of getting jobs) between the two locations as a driving force for rural-urban migration. It suggests that job growth in the cities need not reduce urban unemployment rates, contrary what intuition might suggest. This is because due to an initial drop in the unemployment rate, the probability of getting urban jobs increases, which, in turn, raises the expected urban wage. This subsequently induces more migration from rural areas. Equilibrium is restored only when the urban population has grown enough to raise the unemployment rate back to its original level.

A number of studies have elaborated and expanded the original Harris-Todaro model. For example, Fields (1975) extends the mechanism by introducing a more generalized model of job searching behaviour as well as the urban informal sector. Workers not only choose between staying or returning to agriculture and being either employed or unemployed in the cities, but they can also voluntarily decide to be underemployed in the urban informal sector while searching for formal sector jobs. As a result, the model implies a lower urban unemployment rate and higher national income than the original Harris-Todaro model, as some urban migrants work for very low wages in the informal sector in order to have a better chance of being hired for formal jobs. In addition, Brueckner and Zenou (1999) incorporate the land market into the mechanism. It emphasizes the fact that larger urban populations tend to raise the cost of living, including the land prices, in cities. In turn, this can lower the utility levels of all urban residents, helping to close the gap between rural utility and expected utility of residing in urban area, and thus providing an additional force to restore migration equilibrium.

Empirical studies based on the Harris-Todaro model include Fay and Opal (2000), for example. They show that lower rural wage relative to urban wage, proxied by the relative average productivity of agricultural and non-agricultural sectors, is associated with stronger incentives for rural-urban migration. Based on data on emigrant stocks in OECD destinations according to schooling level and country of origin, Grogger and Hanson (2011) suggest that differences in wages between origin and destination countries are the most important determinant of both the direction and volume of international migrant flows. Nevertheless, Becker and Morrison (1988), focusing on sub-Saharan African (SSA) countries, estimate that only 8 per cent of the variation in African urban population growth rates can be accounted for by employment growth rates in the non-agricultural sector. Although this pull factor from the modern urban sector contributes to urbanization, the magnitude of the effect in SSA is small.

The finding in Becker and Morrison (1988) is not uncommon as far as developing countries (in particular SSA) are concerned. Elements other than the pull factors also play an important role in determining structural transformation and rural-urban migration. More specifically, it is the *push* factors—the economic conditions and development within agriculture and rural areas itself—that are potentially co-responsible for such phenomenon.

2.2 Structural transformation and urbanization: the push factors

The *push* factors can be categorized into two main groups: (i) favourable farm-condition push factors, and (ii) adverse farm-condition push factors.

Favourable farm-condition push factors

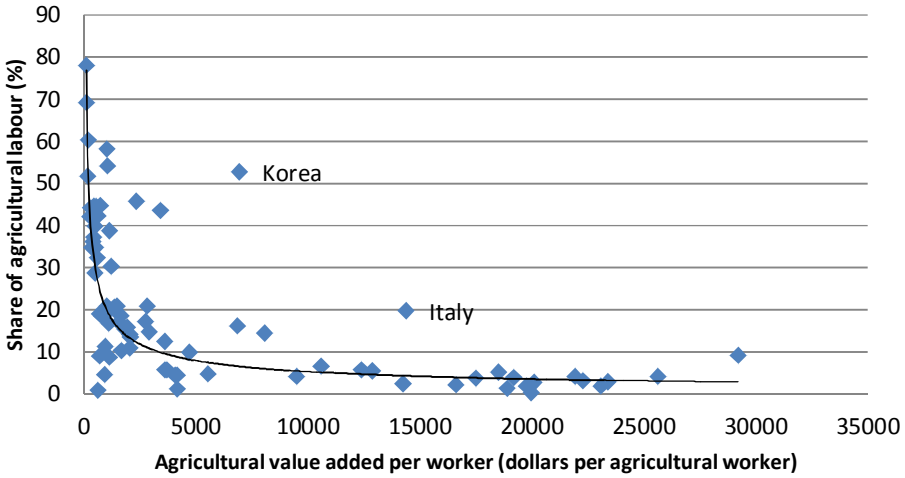
The first strand of literature recognizes elements in agriculture itself as a push force for transferring labour to the rest of the economy. Based on the assumption that the demand for farm products is inelastic, the literature[6] suggests that an increase in aggregate agricultural productivity allows a movement of labour out of the sector. Productivity improvement in agriculture at the aggregate level implies that less labour is needed to produce the same amount of agricultural output and this facilitates the release of

6 Recently revived by Gollin, Parente and Rogerson (2002).

workers into other sectors. In other words, productivity growth in agriculture leads to labour-saving in the sector itself. Figure 3 also illustrates simple correlations consistent with the above theoretical supposition, highlighting the negative correlations between the share of workers in agriculture and agricultural productivity.

In addition, older development literature, exemplified by Nurkse (1953) and Rostow (1960), report other favourable links between agricultural productivity and industrialization. Higher income generated in agriculture provides greater domestic demand for industrial products, and increases the supply of domestic savings available to finance industrialization.

Figure 3
Cross-country correlations between share of agricultural labour and agricultural worker productivity



Note: The share of agricultural labour is from the years 2002 to 2004 and data on agricultural worker productivity (measured in dollars per agricultural worker) are from the years 2003 to 2005, depending on data availability in each country.

Source: Computed by the author based on data from World Bank (2008, 2009).

Adverse farm-condition push factors

In the second strand of the push factor literature, adverse conditions in agriculture have been highlighted as one of the causes of labour structural transformation and urbanization. An increasing number of studies, including Fay and Opal (2000), observe that recent experiences from developing countries, in particular in SSA, show that urbanization continues even during low or negative growth periods at both economy-wide and farm sector levels. Barrios, Bertinelli and Strobl (2006) point out that movement towards cities may not be a result of an income gap between rural and urban areas, or improvements in farming, but a survival strategy in response to climate change or water shortages. Agricultural jobs in rural areas, especially in SSA where farm technological progress is relatively low, are dependent on climatic conditions. By using cross-country data, Barrios, Bertinelli and Strobl find that climatic change as proxied by rainfall is associated with acceleration in urbanization in SSA, but not elsewhere in the developing world. Rose (2001), based on household panel data and district-level rainfall

data, shows that Indian households are more likely to participate in the labour markets of regions more at risk from lack of rainfall.

More specifically, general uninsured agricultural risks—climate-related or not—can act as a push factor, inducing rural-urban migration. Economic activity in rural areas is dominated by agriculture and other natural resource production, which are risky due to their dependence on nature (such as rainfall) and on the demand for—and price shocks to—natural products (for example, see Poelhekke 2011). Furthermore, the rural area is commonly a single sector economy with little scope for diversification. A wider range of economic activities exists in cities, including jobs in formal manufacturing, service, and informal sector. There is also a greater possibility for workers to obtain government jobs or receive subsidies as well as having greater access to credit and financial institutions (see Fay and Opal 2000: 8). If households are unable to save or insure against risk effectively, they are forced to migrate to cities to avoid being hit by large negative shocks; the ex ante response to risk. Migrants shift to urban areas not only for maximizing their incomes but also for diversifying household income portfolio and insuring against rural risks.

For example, based on data for the period 1986-97, Giles (2006) finds that rural households in China have used off-farm labour markets to reduce exposure to ex ante risks since the legalization of temporary migration to urban areas in 1988. Fay and Opal (2000) show that shocks to agriculture, measured by the deviation of actual crop yields from anticipated yields estimated from the regression of actual yields over time, are positively associated with urbanization. Using cross-country panel data spanning from 1970 to 2000, Poelhekke (2011) measures rural and urban sector risks as five-year volatility of agricultural and non-agricultural value added, dealing with endogeneity by instrumenting present changes in risks with past risk levels. He finds that higher aggregate agricultural risk induces rural-urban migration. In particular, the effect is more pronounced when the credit market is limited. Moreover, he finds that risks are more likely to result from higher price fluctuation in agriculture compared to manufacturing, and not to poor rainfall. Paulson (2003), utilizing household cross-sectional data from Thailand, demonstrates that remitters are significantly less likely to move to Bangkok if the covariance between income shocks and the provinces to which they send remittances is higher. Such an effect is also found to be particularly important to remitters who support rural households that are generally poorer with more limited access to financial institutions. The findings suggest that families not only seek to maximize their income streams but also to diversify income across locations, which are not perfectly correlated.

2.3 Structural transformation and urbanization: government policies

In addition to these pull and push factors, government initiatives that directly restrict mobility, such as the Chinese Hukou system, can significantly depress rural-urban migration. The Hukou system, restricting migration between rural and urban areas, within the rural areas, across cities, over regions or even within the rural sector, has resulted in a surplus of farm labour. Furthermore, Au and Henderson (2006) also find that Chinese cities are undersized because of this restriction.

Government policies favouring or biased against a particular location or sector are also known to affect rural-urban migration, even though these may not be directly aimed at

restricting labour mobility. For example, Gugler and Flanagan (1978) point out that education in west Africa may have an aspect of urban bias, as students in rural areas are not necessarily taught agricultural skills. Fafchamps and Shilpi (2009) show that even after controlling for income differentials between locations, amenities such as paved roads and better housing premium, if not financial institutions, are important determinants of destination choice. Becker and Morrison (1988) find that rural policies, which result in an increase in minimum calorie intake, depress urban growth rates by reducing the adverse rural push force. Based on an IV strategy, Emran and Shilpi (2010) show that restrictions on rural land markets in Sri Lanka significantly depress rural wages. This indirectly suggests a weaker employment diversification away from the agricultural sector, although the effects gradually fade as the distance to an urban centre increases.

3 Background of partial land right entitlement (SPK4-01 titling)

Land titles in Thailand can be categorized into three main types: (i) titles with full security and alienated rights, (ii) partial titles (SPK4-01), and (iii) others, such as land tax receipts, which can be used as a counter-claim against other private claims, offer no formal rights that would be universally recognized by all state authorities.

Prior to 1975, all titles were either types (i) and (iii). It was not until the mid-1990s that partial titles were distributed on a wider scale to farmers with category (iii) titles working on state forested land. The partial land rights entitlement, carried out by the Agricultural Land Reform Office (ALRO), is central to rural farmers' security of land ownership. Introduction of the Western Land Code in 1901 not only undermined traditional usufructuary rights,[7] its slow implementation also implied that most rural land holdings were not formally recognized and were thus subject to government challenge. In 1970, with the exception of the central plain, less than 5 per cent of the areas had been surveyed, and by 1985, only 15 per cent of private land was held with full title deeds (Vandergeest and Peluso 1995). Ignoring customary holdings, a sweeping declaration of areas to be designated as national forest reserves exposed local farmers, who had long expanded into the frontiers, to the risk of state expropriation. By 1985 the Royal Forest Department (RFD) had declared approximately 45 per cent of the country's area as forest reserves (Vandergeest and Peluso 1995).

But a significant portion of Thailand's 'forest reserves' were treeless (Hirsch 1990; Vandergeest and Peluso 1995), and it has been estimated that one-third of all farmland was situated within the forest reserves. At least 1.2 million families, or approximately 20 per cent of Thai farmers, lived in these areas and relied on them for their livelihood. The impact of the Western Land Code of surveyed title deeds affected not only the pioneer farmers who had expanded into the frontier territories, but their informal land possession was challenged under the Forest Reserves Act by the RFD, despite the fact that these were recognized by another government agency, the Ministry of Interior. Receipts for land taxes collected by the Ministry of Interior and the certificates of land

7 Usufructuary rights refer to specific rights granted and secured as long as the cultivators remained on the land. This deviated from the western land code then common in Europe, North America and colonial states, where rights are based on title deeds or ownership certificates issued by the state.

use have become important documentation of local land occupancy. Under the Civil and Commercial Code of 1936, possession is sufficient testimony for establishing cultivating rights and defending rival, non-state claims to the same rights. However, the Land Code overlooks this ruling, and to establish either the right to sell land or to continue to hold rights on the land against possible counter-claims by the state, the land must be surveyed and registered. Land tax receipts, therefore, merely guarantee 'squatter's right' against private rivals. Government agencies such as the RFD can easily confiscate these lands at any time as state territory.

According to Chirapanda (2006), agricultural extension officials were, on the one hand, helping farmers to grow new crops, while on the other hand, forestry officials could arrest them on the grounds that their landholdings were illegal. Kemp (1981) emphasizes that local peasants, particularly the hill tribes, lived in constant danger of tenure restrictions or outright dispossession of their landholdings.[8] According to Sato (2003), the land allotment project under the National Rural Scheme in 1991 which was targeted to poor farmers living in forest reserves sought to evict these by compensating them with a small piece of land elsewhere.[9] More than 250,000 households covering about one million people were to be relocated by the end of 1996. Strong protests by the affected farmers during the early stages of the plan led to its cancellation, but the example illustrates the sheer magnitude of the eviction threat, which could be avoided only with some opportunity costs[10] to the agriculturalists themselves. In addition, in the early 1990s, lured by the prospects of potential profits from eucalyptus plantations, the RFD aligned itself with paper pulp companies and many farmers in the northeast were displaced to make way for the eucalyptus (Phongpaichit 1995). Without formal or legal status, landholders are subject to expropriation of land and arrests for opposing various government schemes, such as in the case of resistance to resettlement schemes by the oustees of dam sites. In March 1997, an NGO supporting the 'Assembly of the Poor' demonstration, identified 121 sites where potentially violent conflicts between the government and farmers were taking place (Sato 2003). Among these sites, dam construction was involved in 12 per cent of the incidents and about 75 per cent were related to the use and the ownership of land and forests. Moreover, villagers in Phattalung province who were concerned by outsider activities turned to the RFD for help, only to find out that their landholdings within the local forest had, in fact, been declared a national park (Ridmontri 1997) and they were subsequently expelled.

Partial land right titles (SPK4-01) have been issued since 1975 to farmers squatting on public land and having some proof of their informal possession, such as issuance land tax numbers. The deeds within this formal partial ownership provide rights that are recognized by law, even though the land cannot be sold, transferred, mortgaged or passed onto heirs who work outside agriculture. The titles can also be inherited by heirs

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8 During an interview with farmers who are currently SPK4-01 holders living in Nong Panchan District in Ratchaburi province, it became apparent that prior to 1996 (the year SPK4-01 certificates were granted) they were chased off the lands by RFD officials at least once a year.

9 Although the size of the compensation might reflect the productivity of the farmer, eviction potentially posed transaction costs, and hence the threat of eviction could be a disincentive to any productive investment.

10 Participation in protests meant that farmers were foregoing the potential income from any productive farm activities during that period, on top of which they also had costs for transport and the organization of the protest

working in agriculture and can be used as evidence of ownership in disputes with private or public parties. In effect, government agencies such as the RFD are forced to recognize the land ownership of holders of SPK4-01 certificates. SPK4-01 titles, as with issuance tax numbers, are not accepted as collateral by formal commercial banks, except by the state-owned Bank of Agricultural Cooperatives, which does not, however, recognize issuance tax numbers as collateral. Although the SPK4-01 titles are conditional, with a restriction on transferability, they do offer permanent land right security that cannot be challenged by the state. According to Hirsch (1990), the consensus is that the certificate, despite its shortcomings, is seen by landholders as better than having no legal title at all.

Nonetheless, prior to the mid-1990s, SPK4-01 certificates were infrequently issued. For example, from 1975 to 1992, only 170,000 SPK4-01 certificates were awarded, covering an area of a mere three million *rais*. This is a stark contrast to the 52 million *rais* of land covered by SPK4-01 titles in 2005.[11] Titling became commonly implemented after the massive transfer of degraded forests from the RFD to the ALRO, which was completed in 1994.[12] Nevertheless, based on pre-feasibility studies, the National Agricultural Land Reform Executive Committee still selects and approves suitable sites within the transferred areas for designation as land reform locations. These land reform areas are then jointly re-evaluated by the RFD and the Ministry of Sciences to make certain that they are indeed depleted forests. Only then can the SPK4-01 titles be distributed; this on-going process is partly supervised by the Provincial Land Reform Committee. This suggests that such careful titling is most likely linked to those sections of forests that have designed as national reserves but are in fact depleted and inhabited. This fact is used to construct and establish the validity of a proxy for prior degraded forests as instrumental variables, the discussion of which is covered below.

In addition, due to the evaluation process outlined above, there was a lag[13] between 1994 and the accelerated distribution of entitlement certifications. This confirms that the time-period (1996-2005) studied in this paper is relevant, and that it covers the period of the most noticeable changes in the entitlement process.

4 Mechanisms through which partial land right security in Thailand can affect structural transformation

This section elaborates several theoretical mechanisms on how strengthened rural land rights can influence the allocation of labour between sectors and the subsequent structural transformation. Although it is clear that an improvement in land property

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11 Land in Thailand is measured in the unit of *rai*, with 2.5 *rais* equivalent to one acre.

12 Forest zones for economic use covering 52 million *rais* and forest sectors suitable for agriculture covering seven million *rais* were transferred from the RFD to the ALRO for distributing SPK 4-01 titles . These targeted forest zones were defined as already being devastated and occupied by many farmers and villagers.

13 Despite the lag, it was difficult for the farmers to anticipate which parcels of land would be entitled. This mitigates a concern that the farmers might have increased investment or changed the land use patterns in anticipation of titling by 1996.

rights in agriculture is seen as a push factor, as it comes from within the farm sector, the direction of the overall impact is harder to determine given that the various mechanisms considered act in opposite directions.

4.1 SPK4-01 entitlement as a favourable push factor through farm productivity improvement

First, the SPK4-01 can act as a favourable farm-condition push factor. Chankrajang (2011) notes that better security of rural land rights (i) encourages farm investment and (ii) improves rice productivity. In a similar vein to Gollin, Parente and Rogerson (2002) and based on the assumption that the demand for agricultural products is inelastic, it is suggested that such a development within agriculture should help diversify labour resources to other sectors of the economy. To illustrate this mechanism, a simple framework is developed below.

Assume that the economy consists of *N* representative consumers who are also workers. The representative worker's utility is defined over the non-agricultural product (*c*) and the agricultural good (*a*) as follows:

$$U(c,a) = \begin{cases} \log(c) + \bar{a} & if\, a \geq \bar{a} \\ a & if\, a < \bar{a}. \end{cases}$$

As in Gollin, Parente and Rogerson (2002), the utility function embodies a simplified version of the importance of the role of demand for agricultural products for structural transformation. When farm production is low, lower in particular than an exogenous constant $\bar{a}$, agents care only about agricultural or food consumption. In other words, the economy is in a subsistence stage. However, as agricultural output increases, households become satiated with agricultural consumption at $a = \bar{a}$ and devote remaining expenditure to non-agricultural consumption. This implies that if agricultural production is below $\bar{a}$, the economy devotes all its labour to agricultural production. However, once agricultural output reaches $\bar{a}$, all remaining labour will move out of the sector to non-agricultural activities, regardless of the state of that sector.

The agricultural sector is populated with N_a workers. Each worker (indexed by *i*) produces agricultural output[14] of:

$$y_a^i = el_aA_a,$$

where l_a is the land held by each farmer, which, for simplicity, is assumed to be fixed and e is the effort exerted by the worker ($e > 0$). Effort can be perceived as an input from the worker to increase productivity that is over and above the productivity due to existing technology A_a. This can also be the effort to cultivate land more intensively. The optimal choice of effort chosen by the farmer satisfies:

$$\max_e \pi el_aA_a - \frac{1}{2}e^2,$$

14 This is the same production function as used in Chankrajang (2011).

where $0< \pi < 1$ represents the security of land rights, or the probability of keeping y_a^i. Identical to the previous section, the optimal effort $e^* = \pi l_a A_a$ increases with land right security.

Optimal output of each worker is therefore $y_a^{i*} = \pi l_a^2 A_a^2$. Total agricultural output in the economy, by aggregation across farmers, is $Y_a^* = \pi l_a^2 A_a^2 N_a$ and agricultural output per capita for the aggregate economy is $y_a^* = \pi l_a^2 A_a^2 n_a$, where n_a is the share of workers in the agricultural sector and $y_a^* = \frac{Y_a^*}{N}$.

Preferences imply that labour will be allocated entirely to the agricultural sector until $\pi l_a^2 A_a^2 n_a \geq \bar{a}$. Once this equality is satisfied, some fraction of labour will move from agriculture. In particular,

$$n_a = min\left\{\frac{\bar{a}}{\pi l_a^2 A_a^2}, 1\right\}$$

and $n_m = 1 - n_a$, where n_m is the share of labour outside agriculture. Thus, an improvement in security of land rights (an increase in the value of π) is shown in this framework to be associated with a fall in the share of labour working in agriculture. In other words, according to the above relationship, $\frac{\partial n_a}{\partial \pi} < 0$.

4.2 SPK4-01 entitlements and a reduction in risks within the agricultural sector

Second, greater rural land right security can be perceived as rural development that reduces the adverse push factor. As reviewed in section 2, off-farm employment or rural-urban migration for rural households is a means of coping with negative shocks to income arising within the agricultural sector. Insecure land property rights imply that households face risks of both land and output expropriation from the government. To avoid or mitigate such income shocks, households may decide to diversify outside the agricultural sector. More secure rural land rights introduced by the partial land titling programme in Thailand should reduce the negative income shocks associated with farming by eliminating an aspect of agricultural risks that is attached to land and output expropriation. As a result, in contrast to the first effect, secure land rights can potentially depress the reallocation process.

4.3 SPK4-01 entitlements and a reduction in the opportunity cost of off-farm employment

On the other hand, by reducing the adverse farm condition through the elimination of land and output expropriation risks, secure rural land rights may accelerate the diversification of labour away from the farm sector. This is because stronger rural land ownership potentially decreases the opportunity cost of working outside rural areas or agriculture. Without secure formal titles, households generally have to expend their time and human resources maintaining tenure security through informal means. For example, they may spend more time on the land site to deter expropriation from other private parties (Field 2007), or they may lavish more human resource on visible agricultural investment such as tree cultivation, which could support their claim to the land. Prior to the issuance of partial land right ownerships, a number of farmers in Thailand had to

spend both time and human resources in lobbying and demonstrating against particular government projects that could result in the expropriation of their lands. Consequently, formal land ownership shifts the burden of property right protection from individuals and frees up the time and the resources initially devoted to supporting informal claim. For example, Field (2007) finds that a titling programme aimed at urban squatters in Peru led to a labour supply shift away from local employment to work the outside urban market. Iyer, Meng and Qian (2009) look at the Chinese housing privatization reforms in cities that transferred property rights from the state to the individual and opened access to urban housing for those working in state sector jobs. These authors note that such reforms lowered the opportunity cost of working in private sectors and resulted in increased labour in these sectors. In this particular context, greater rural land security via by partial property titling can potentially reduce the opportunity cost of off-farm employment in Thailand and enable rural households to make unconstrained decisions on labour allocation across different sectors. In contrast to the second effect, this can enhance structural transformation..

4.4 SPK4-01 entitlement and land market restriction

Nonetheless, partial land right titling in Thailand, in addition to granting secure ownership, places certain restrictions on the land with regard mortgage, sale, inheritance to family members working outside agriculture, and its off-farm usage. Such restrictions can potentially impede structural transformation, as they increase the tie of the workers to the land and agricultural jobs through greater emigration cost. In particular, off-farm employment diversification can result in a loss of land ownership. Emran and Shilpi (2010) study similar land restriction in Sri Lanka, where public lands previously abandoned by private parties during a malaria epidemic were given to landless Sinhalese with certain restrictions on land sale, leasing and mortgage. Such land market restrictions are found to be associated with low labour market wage, supposedly the result of the area's high labour supply due to land market restrictions that increase the marginal cost of emigration.

As was seen above, there are four different channels and mechanisms through which partial rural land titling programmes can theoretically affect labour allocation between agriculture and non-agriculture, albeit some of these work in the opposite direction. Whether the overall impact will enhance or depress structural transformation is by and large an empirical question.

5 Data

Thailand offers the ideal setup for studying the effects of land right structure on the allocation of labour across sectors. In recent decades, Thailand has undergone a relatively rapid 'industrialization', and the structure of the economy has changed from an agricultural-based economy to one that also relies on manufacturing and services. Thus while the agricultural sector accounted for 23 per cent of the national GDP in 1980, it accounted for only 9 per cent in 2005. Despite the transformation, some provinces within the country have undergone structural transformation and urbanization rapidly, while others still lag behind. Next, this paper exploits this divergence and explores its roots, in particular those related to rural land right institution.

5.1 Measures of structural transformation

To measure the allocation of labour between agricultural and non-agricultural sectors, this section considers two main dependent variables representing (i) the size of agricultural workforce and (ii) the population residing in agricultural households. Both measures are relevant in examining the decline in the share of labour in agriculture. Although some of the population residing in agricultural households may be engaged in non-agricultural activities, child labour and parttime adult farm labour are also used in agriculture, and this can be captured to some extent in the number of people residing in agricultural households.[15] Hence, in addition to the variable capturing agricultural workers, the variable representing those residing in agricultural households is also fairly accurate at capturing agricultural employment.

Tables 1 and 2 provide summary statistics for the two measurements. To facilitate the comparison across provinces and over time, both tables give these measurements in terms of percentage shares, constructed from the two main data sources. The data on province-level agricultural workers and population residing in agricultural households are from the National Agricultural Households and Workforce Surveys (Office of Agricultural Economics, 1996, 1999, 2002, and 2005), while the data on overall province population and workers are from the Labour Force Survey (National Office of Statistics, 1996, 1999, 2002, and 2005).

As Tables 1 and 2 indicate, there is a strong, statistically significant correlation between the share of agricultural workforce and the share of agricultural population. In particular, the correlation coefficient of the two shares is 0.709, and 0.776 when time and province dummies are taken into account. There is also considerable variation in the shares across provinces. For example, in Table 2, on average 71 per cent of the population of Kalasin are in agricultural households, but only 5 per cent of Nonthaburi's population constitute the agricultural sector. Although the shares had been rather stable across time in some provinces (Nakhon Phanom and Bangkok), in others there has been a significant shift of workforce and population from agriculture to non-agriculture. For instance, the share of agricultural population in Mukdahan dropped from approximately 71.0 per cent in 1996 to 58.2 per cent in 2005, and in Mae Hong Son from approximately 84.1 per cent in 1996 to 52.8 per cent in 2005. The years 1996 to 2005 cover a period during which some Thai provinces have undergone rapid employment diversification away from agriculture.

5.2 Measures of urbanization

Most empirical analyses on urbanization utilize cross-country data. Urbanization (as in Ades and Glaeser 1995; Brueckner 1990) is measured as the population size of the largest city of each country.[16] Alternatively, it is measured as the population share in cities in relation to a country's total population (for example, Barrios, Bertinelli and Strobl 2006). Such an empirical cross-country study on urbanization is, however, plagued by the problem that different countries define cities differently, and the

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15 In this dataset, agricultural workers include only those older than 13 years.

16 This measure is, nonetheless, a measure of urban primacy rather than urbanization per se.

Table 1
Summary statistics of agricultural labour force shares

Province	Share %			Province	Share %		
	Mean	1996 (Start)	2005 (End)		Mean	1996 (Start)	2005 (End)
Khon Kaen	40.909	40.459	35.887	Ranong	26.37	31.858	21.666
Udon Thani	45.707	44.853	36.36	Phangnga	33.938	29.251	35.092
Loei	45.425	45.098	42.46	Krabi	38.756	39.623	-
Nong Khai	44.228	54.751	28.947	Chumphon	39.314	38.39	39.506
Mukdahan	44.595	47.256	40.914	Nakhon Si Thammarat	40.616	29.835	39.609
Nakhon Phanom	46.271	44.941	47.411	Songkhla	27.726	32.54	24.251
Sakon Nakhon	46.303	46.572	37.832	Satun	39.738	42.989	32.994
Kalasin	51.235	51.09	40.431	Yala	29.892	28.452	-
Nakhonratchasima	33.877	35.579	23.867	Trang	30.224	27.45	32.337
Chaiyaphum	49.06	43.846	36.876	Narathiwat	29.453	32.547	-
Yasothon	46.168	45.752	42.446	Phatthalung	47.268	51.773	37.757
Ubon Ratchathani	42.135	35.148	36.504	Pattani	30.526	29.621	-
Roi Et	57.114	64.605	38.499	Chon Buri	8.727	9.225	9.949
Buri Ram	41.559	47.795	30.93	Chachoengsao	27.084	32.834	25.626
Surin	42.079	43.017	34.34	Rayong	18.659	23.057	18.733
Maha Sarakham	52.475	46.053	47.73	Trat	24.091	22.152	22.816
Si Sa Ket	44.934	42.249	40.388	Chanthaburi	36.626	34.592	30.741
Nong Bua Lam Phu	47.234	51.868	27.028	Nakhon Nayok	22.477	32.092	22.364
Am Nat Chareon	41.616	-	29.098	Prachinburi	23.538	25.491	21.745
Chiang Mai	30.233	32.959	28.088	Sa Kaeo	40.204	47.448	21.331
Lampang	35.151	29.893	34.361	Ratchaburi	23.004	26.676	20.085
Uttaradit	40.374	47.198	47.648	Kanchanaburi	26.256	31.573	19.897
Mae Hong Son	45.478	54.196	34.819	Phachuap Khiri Khan	26	30.787	22.213
Chiang Rai	35.655	40.582	31.508	Phetchaburi	24.85	22.222	-
Phrae	39.621	48.457	36.367	Suphan Buri	31.866	34.731	24.88
Lamphun	38.548	28.203	48.807	Samut Songkhram	14.563	12.878	18.645
Nan	53.372	53.481	41.635	Saraburi	16.102	34.731	12.352
Phayao	41.491	49.466	29.925	Singburi	21.413	20.737	19.788
Nakhon Sawan	27.284	24.561	22.468	Chai Nat	28.074	27.271	-
Phitsanulok	31.403	28.74	25.009	Ang Thong	17.085	25.109	23.092
Kam Phaeng Phet	32.438	28.825	23.323	Lop Buri	23.024	25.301	17.356
Uthai Thani	40.049	40.89	29.975	Nonthaburi	3.636	2.306	-
Sukothai	34.161	38.557	28.006	Ayuthaya	13.591	21.73	16.877
Tak	36.055	43.013	27.62	Bangkok metropolis	0.502	0.429	0.424
Phichit	31.822	25.58	33.316	Samut Prakan	3.996	6.004	-
Phetchabun	30.312	33.836	27.321	Samut Sakhon	7.969	8.316	7.805
Phuket	7.415	13.48	-	Pathum Thani	8.552	12.977	8.997
Surat Thani	34.168	36.645	28				
				AVERAGE	33.74	34.329	28.944

Note: Data cover four periods: 1996, 1999, 2002 and 2005.

Source: Computed by the author based on data from the Office of Agricultural Economics, Thailand.

Table 2
Summary statistics of agricultural population shares

Province	Share %			Province	Share %		
	Mean	1996 (Start)	2005 (End)		Mean	1996 (Start)	2005 (End)
Khon Kaen	56.613	56.047	52.768	Ranong	38.865	46.85	32.92
Udon Thani	61.241	59.088	50.497	Phangnga	45.991	41.838	51.338
Loei	62.746	64.407	61.827	Krabi	53.485	58.542	-
Nong Khai	61.104	74.609	41.509	Chumphon	56.348	57.076	57.957
Mukdahan	63.773	71.011	58.165	Nakhon Si Thammarat	53.784	56.883	39.609
Nakhon Phanom	64.262	65.493	65.727	Songkhla	38.688	47.164	31.933
Sakon Nakhon	65.855	69.372	58.852	Satun	57.217	63.709	48.658
Kalasin	71.187	71.526	59.399	Yala	45.138	45.421	-
Nakhonratchasima	47.084	51.298	36.144	Trang	42.874	37.937	45.526
Chaiyaphum	69.712	62.556	55.183	Narathiwat	45.061	49.263	-
Yasothon	65.085	64.67	59.997	Phatthalung	63.858	73.87	51.04
Ubon Ratchathani	59.94	49.548	53.755	Pattani	48.544	46.278	-
Roi Et	69.65	90.167	54.651	Chon Buri	11.935	12.164	13.898
Buri Ram	58.567	66.638	44.482	Chachoengsao	37.718	46.316	34.951
Surin	61.731	61.93	53.211	Rayong	25.252	30.68	26.149
Maha Sarakham	70.54	62.353	66.135	Trat	34.437	30.752	33.108
Si Sa Ket	64.236	60.205	59.53	Chanthaburi	51.201	37.171	43.499
Nong Bua Lam Phu	64.626	69.115	41.926	Nakhon Nayok	32.452	45.718	33.922
Am Nat Chareon	58.178	-	40.424	Prachinburi	34.05	37.171	31.231
Chiang Mai	40.243	44.913	36.138	Sa Kaeo	56.473	65.801	31.592
Lampang	47.85	39.27	49.145	Ratchaburi	31.506	35.119	27.823
Uttaradit	53.729	61.795	46.863	Kanchanaburi	36.332	43.809	29.058
Mae Hong Son	68.286	84.052	52.807	Phachuap Khiri Khan	37.341	41.261	30.991
Chiang Rai	47.678	54.913	43.938	Phetchaburi	34.135	30.744	-
Phrae	53.07	64.059	52.637	Suphan Buri	44.288	53.473	35.038
Lamphun	51.614	37.485	67.28	Samut Songkhram	20.946	18.439	27.644
Nan	70.623	70.419	58.407	Saraburi	22.281	25.695	16.999
Phayao	54.672	65.538	37.604	Singburi	30.325	29.044	30.486
Nakhon Sawan	39.727	35.184	35.914	Chai Nat	38.88	37.348	-
Phitsanulok	42.124	39.675	34.347	Ang Thong	25.785	36.022	36.578
Kam Phaeng Phet	44.791	40.529	33.681	Lop Buri	31.629	34.235	26.494
Uthai Thani	55.728	58.632	43.43	Nonthaburi	4.856	-	-
Sukothai	46.193	52.289	38.128	Ayuthaya	23.777	27.808	23.111
Tak	46.787	56.547	41.674	Bangkok Metropolis	0.685	0.601	0.592
Phichit	44.366	37.33	46.598	Samut Prakan	5.481	7.884	-
Phetchabun	42.456	47.269	37.845	Samut Sakhon	10.722	11.511	10.077
Phuket	10.228	17.117	-	Pathum Thani	11.587	18.046	11.524
Surat Thani	48.795	53.472	41.815				
				AVERAGE	46.357	48.204	41.3

Note: Data cover four periods: 1996, 1999, 2002 and 2005.
Source: Computed by the author based on data from the Office of Agricultural Economics, Thailand.

Table 3
Summary statistics of urban population shares

Province	Share %			Province	Share %		
	Mean	1996 (Start)	2005 (End)		Mean	1996 (Start)	2005 (End)
Khon Kaen	11.38	10.23	11.363	Ranong	10.121	11.257	9.074
Udon Thani	11.442	10.85	12.759	Phangnga	7.545	7.641	7.511
Loei	3.74	3.803	3.703	Krabi	6.485	6.355	-
Nong Khai	5.618	5.209	7.549	Chumphon	9.713	9.989	9.711
Mukdahan	10.546	10.647	10.264	Nakhon Si Thammarat	8.956	8.344	10.357
Nakhon Phanom	4.31	4.539	3.995	Songkhla	25.268	22.333	31.065
Sakon Nakhon	10.112	4.817	4.886	Satun	8.2	8.417	7.737
Kalasin	3.859	3.854	3.896	Yala	22.493	22.768	-
Nakhonratchasima	12.751	9.549	8.719	Trang	9.967	11.917	2.179
Chaiyaphum	3.745	4.125	3.358	Narathiwat	11.947	11.872	-
Yasothon	4.015	4.065	3.905	Phatthalung	8.138	7.937	7.707
Ubon Ratchathani	8.752	8.989	8.074	Pattani	7.446	7.413	-
Roi Et	2.729	2.776	2.616	Chon Buri	28.337	23.436	33.094
Buri Ram	3.269	3.327	3.217	Chachoengsao	6.713	7.07	6.129
Surin	3.585	2.928	5.306	Rayong	18.459	16.568	20.53
Maha Sarakham	4.787	4.798	4.301	Trat	6.621	6.986	5.363
Si Sa Ket	3.553	2.884	4.054	Chanthaburi	13.106	11.91	13.03
Nong Bua Lam Phu	4.59	4.487	4.162	Nakhon Nayok	7.398	7.651	7.013
Am Nat Chareon	7.499	-	7.138	PRACHINBURI	4.773	5.014	4.428
Chiang Mai	12.074	10.88	12.882	Sa Kaeo	7.305	6.667	8.192
Lampang	10.393	8.682	15.741	Ratchaburi	9.388	10.218	8.226
Uttaradit	8.484	8.516	7.736	Kanchanaburi	6.425	7.158	5.295
Mae Hong Son	6.331	17.094	2.375	Phachuap Khiri Khan	12.781	12.55	13.498
Chiang Rai	5.176	4.112	5.644	Phetchaburi	13.427	13.47	13.627
Phrae	4.071	4.259	3.812	Suphan Buri	4.866	5.058	4.61
Lamphun	3.59	3.492	3.476	Samut Songkhram	16.934	17.288	15.869
Nan	4.484	4.525	4.27	Saraburi	20.642	19.689	20.214
Phayao	8.884	4.201	6.924	Singburi	9.411	9.707	9.046
Nakhon Sawan	12.52	12.934	12.176	Chai Nat	4.489	4.605	-
Phitsanulok	9.979	10.415	9.543	Ang Thong	4.575	4.494	4.841
Kam Phaeng Phet	4.025	3.816	4.135	Lop Buri	4.523	4.756	4.088
Uthai Thani	5.686	5.975	5.359	Nonthaburi	59.192	-	-
Sukothai	6.087	6.303	5.897	Ayuthaya	10.413	11.552	11.516
Tak	10.099	10.472	10.244	Bangkok Metropolis	100	100	100
Phichit	9.341	9.6	8.886	Samut Prakan	16.095	16.536	-
Phetchabun	5.11	3.958	6.149	Samut Sakhon	24.651	27.157	21.909
Phuket	34.783	32.53	-	Pathum Thani	20.007	14.398	29.745
Surat Thani	19.457	16.573	22.163				
				AVERAGE	10.984	10.69	10.495

Note: Data cover four periods: 1996, 1999, 2002 and 2005.

Source: Computed by the author based on data from the Office of Agricultural Economics, Thailand.

definition of urbanization is not consistent across countries (Barrios, Bertinelli and Strobl 2006). Within-country investigations on urbanization have so far been carried out on relatively large countries such as China and Brazil. Da Mata et al. (2007), for instance, use 123 Brazilian agglomerations with population sizes ranging from 80,000 to more than five million.

Even though a relatively small country, Thailand has a number of large cities, and there is at least one well-populated urban centre in each province. According to the Department of Provincial Administration, Ministry of Interior Affairs, there are presently 28 cities in Thailand with populations in excess of 50,000, and 146 towns, either provincial capitals or urban areas, with more than 10,000 inhabitants. Both towns and cities have municipality status with their own elected boards and elected mayors, as well as sufficient tax revenues for the execution of administrative responsibilities.

In this paper, cities and towns are used as a proxy for urban centres, and the degree of urbanization is captured by the share of urban population within each particular province. This information, from the Department of Provincial Administration, Ministry of Interior Affairs, is provided annually at the sub-district level for approximately 22,100 sub-districts. In order to construct the dataset for urbanization and urban growth in Thailand, each sub-district was reviewed to determine whether it had been awarded city or town status. Those with city-town status were then selected, the data manually inputted and double checked against the official decrees for each city or town. Total urban populations as a share of each province's whole population over the four periods of study are given in Table 3. There is a substantial variation across provinces, although the variation across time within each province is relatively smaller. In addition, it is important to bear in mind that this dataset is based on official registrations overseen by the Ministry of Interior, and it is not unusual for a person's place of residence to differ from his or her place of registration. For example, a person may be registered as being born and raised in a rural area, but still be working in a city or town. In other words, the urbanization variable based on this dataset may not be an accurate reflection of urbanization. Nonetheless, it can potentially indicate a reasonable lower bound for provincial urbanization for the periods considered here.

6 Empirical strategies

6.1 Baseline specifications: Fixed-effect specification

To investigate the effects of strengthened rural land rights on structural transformation and urbanization, the first baseline empirical strategy is based on the following fixed effects specification:

$$y_{it} = \alpha_i + \beta_t + \gamma r_{it} + \boldsymbol{\theta}' \boldsymbol{x_{it}} + u_{it}$$

where y_{it} is the absolute size of the agricultural workforce, population in agricultural households or urban population in province i and time t (t = 1996, 1999, 2002, and 2005), α_i is a province fixed effect, β_t is year dummy variable, r_{it} is the share of land holding under partial property right titles (SPK4-01 titles, the main variable of interest), $\boldsymbol{x_{it}}$is a vector of exogenous control variables, and u_{it} is an error term representing the

effects of all remaining omitted variables, which are assumed to be uncorrelated with the explanatory variables. u_{it} is adjusted for within-province correlation, since the data consist of repeated observations over time in each province.

It is important to note that similarly to Davis and Henderson (2003), absolute numbers of workers and population are used, instead of percentage shares of the overall provincial population. This is to avoid the issue of truncation of the dependent variable, where the percentage shares are capped at 100. This means that to control for the effect of the absolute size of the population and labour force in each province and in each period, the absolute overall provincial population is added as one of the control variables.

The availability of the panel data enables us to control for any time-invariant province-level characteristics by including the province fixed effect. This is important for the analysis, as the allocation of labour between agricultural and non-agricultural activities could depend, for example, on geographical elements such as average weather conditions, precipitation, land elevation, coastal distance and natural resources. The year dummy variable, β_t, also helps to control for nation-wide changes in economic conditions and central government policies crucial to the industrialization and urbanization process (such as the 1997 financial crisis, the 1999 Foreign Business Act allowing 75-100 per cent ownership to foreign investors in a wide range of business activities, or the beginning of FTA negotiation participation in 2003).

Other control variables are discussed in the section where the empirical results are presented.

6.2 Instrumental variables strategy

Similarly to empirical analyses that involve general property titling, there are concerns that the issuance of partial rural land rights potentially poses endogeneity problems. The first endogeneity concern is that of an omitted variable. For example, the poorer and less dynamic provinces may be characterized by (i) a smaller share of their labour working in the more 'modern' sectors that generally are non-agricultural, and (ii) greater attention from government bodies implementing development programmes including partial land right titling. Second, there could be endogeneity of a reverse causality type. The more agriculturally-intensive provinces may demand a greater level of rural and farm development, such as strengthening agricultural land rights, in comparison to provinces that are more reliant on industries and services. As a result, the existing structure of labour allocation itself may determine the type and intensity of government intervention, instead of the other way around.

One way to deal with potential endogeneity is to use an instrumental variables strategy. The preferred choice of instruments here is based on the observation that the areas awarded partial land right titles (SPK4-01 certificates) were regions which had been declared forest reserves, despite long occupancy by farmers who have moved into the frontier areas. Accordingly, provinces with larger sectors of degraded forests being transferred from the ALRO to the RFD for the distribution of entitlements, should have a greater ratio of lands being granted SPK4-01 titles. Lags of portion of degraded forests are thus potentially robust excluded instruments that should explain the variation in the share of lands under partial rights titles.

In addition, the transferred degraded forests are intuitively exogenous to any process or shock that could drive the variation in structural transformation and urbanization. First, according to Chirapanda (2006) and Sato (2003), the RFD has no interest in agriculture and is continually in conflict with the farmers occupying frontier lands as well as with other government agencies working with the farmers such as the ALRO.[17] Its sole objective is to protect and conserve forests, preventing their degradation. Its decision regarding the parcels of forest reserves to be declared as degraded and to be transferred to the ALRO was completely independent of factors related to the labour sector choice or location of economic activities. Furthermore, prior to being designated as land reform areas, the lands are re-evaluated jointly with the ALRO to ensure that they are indeed unsuitable for conservation. There is, however, concern that the lagged degraded forests may not be exogenous if farmers keep encroaching into the forests in the hope that these areas are eventually declared degraded, and that the lands in their possession might possibly be secured later. But the rapid expansion of agriculturalists into the hinterlands has slowed down since the 1950s. Furthermore, prior to 1989 most degraded forests were the result of legal logging operations; since logging was banned in 1989, most of Thailand's timber has been sourced from neighbouring countries[18] (Hirsch 1995). Although local inhabitants may have moved into these lands after loggers had cleared the forests, the extent of forest damages is not related to their actions.

There is a paucity of data on lagged degraded forests. As a result the data on official forests and actual forests are used; in particular, the lagged differences between the official forest reserves as stipulated in the royal decree and actual forests identified from satellite pictures since 1961 are the excluded instruments. These lagged differences are proxies for the lags of degraded forest areas that should intuitively be related to the proportional change in current-day areas where partial property rights have been granted, but which alone have no direct influence on the diverging farm outcomes or contemporaneous shocks to outcomes. In addition, the declaration of national forest reserves in 1964 was carried out by the government without consultation with the local community. This implies their exogeneity to shocks to any provincial activity. Furthermore, forests are naturally endowed, and lagged forests should to a large extent be exogenous to any process driving the present diverging agricultural outcomes. Hence, the difference between the two exogenous variables should offer sound excluded instruments.

I adopt an instrumental variable technique of generalized method of moments (IV/GMM) that is robust to both heteroscedasticity and intra-group correlation to find an efficient and consistent estimate for γ.

In particular, I use a set of instruments that gives the corresponding set of moments:

$$Z'_{is}\left(\ddot{y}_{it} - \ddot{\beta}_{it} - \hat{\gamma}\ddot{r}_{it} - \widehat{\boldsymbol{\theta}}'\ddot{\boldsymbol{x}}_{\boldsymbol{it}}\right),$$

where Z'_{is} is the excluded instruments that are based on lagged differences between the official and actual forests constructed from all available data from 1961 and $s=t-q$.

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17 Examples are given in section 3.

18 Although illegal logging continues within Thailand, it is concentrated in border regions under the umbrella of cross-frontier operations.

$\left(\ddot{y}_{it} - \ddot{\beta}_{it} - \hat{\gamma}\ddot{r}_{it} - \widehat{\boldsymbol{\theta}}'\ddot{\boldsymbol{x}}_{\boldsymbol{it}}\right)$ is the residual based on the transformation of the basic specification such that:

$$y_{it} - \bar{y}_{it} = \left(\beta_t - \bar{\beta}\right) + \gamma(r_{it} - \bar{r}_i) + \boldsymbol{\theta}'(\boldsymbol{x_{it}} - \bar{\boldsymbol{x}}_{\boldsymbol{i}}) + (u_{it} - \bar{u}_i),$$

or

$$\ddot{y}_{it} = \ddot{\beta}_{it} + \hat{\gamma}\ddot{r}_{it} + \boldsymbol{\theta}'\ddot{\boldsymbol{x}}_{\boldsymbol{it}} + \ddot{u}_{it},$$

where

$$\ddot{y}_{it} = y_{it} - \bar{y}_{it}, \ddot{\beta}_{it} = \left(\beta_t - \bar{\beta}\right), \ddot{r}_{it} = (r_{it} - \bar{r}_i),\ \ddot{\boldsymbol{x}}_{\boldsymbol{it}} = (\boldsymbol{x_{it}} - \bar{\boldsymbol{x}}_{\boldsymbol{i}}), \text{and } \ddot{u}_{it} = (u_{it} - \bar{u}_i).$$

The transformation is taken for the following reason. Although lagged degraded forests are strongly exogenous to any process that drives the variation in economic activities or location of activities, there is a concern that it may be correlated with time-invariant provincial characteristics, captured by α_i. For example, provinces with dense tropical forests like those in the south may have a smaller ratio of degraded forests due to poorer accessibility. Provinces endowed with more productive soil or better average land quality that is suitable for farming activities may have less deforestation, as the need to expand into the frontiers for increased food production is smaller. The state of the forests may also depend on exogenous geographical conditions like the course of a river. Thus, α_i should be eliminated by differencing or demeaning, and only the coefficients of time-varying regressors will be identified. Demeaning is used instead of differencing to avoid losing data points.

The strong exogeneity of instruments means that there are corresponding moment, or orthogonality, conditions:

$$E\left(\left(\ddot{y}_{it} - \ddot{\beta}_{it} - \hat{\gamma}\ddot{r}_{it} - \widehat{\boldsymbol{\theta}}'\ddot{\boldsymbol{x}}_{\boldsymbol{it}}\right)\middle| Z_{is}\right) = 0,$$

implying

$$E\left(\left(\ddot{y}_{it} - \ddot{\beta}_{it} - \hat{\gamma}\ddot{r}_{it} - \widehat{\boldsymbol{\theta}}'\ddot{\boldsymbol{x}}_{\boldsymbol{it}}\right)Z_{is}\right) = 0$$

which will be satisfied at the true value of the parameters. The above condition is then used to construct GMM estimator.

In addition, by using lagged degraded forests as instruments for the extent to which SPK4-01 titles have been distributed in each province also helps isolate unexpected factors that can arise as a result of the implementation of other rural development policies.

As mentioned in the introduction, the existing works on the relationship between tenure security and rural-urban or agricultural-non-agricultural migration are based on either cross-sectional village data (Rozelle et al. 1999) or cross-sectional household data (Mullan, Grosjean and Kontoleon 2010) with OLS empirical strategy and empirical strategies based on binary choice models such as logit and probit. As a result, this empirical strategy with panel data and IV strategy has an advantage over existing studies by (i) controlling for unobserved time-invariant characteristics with the use of

the panel data instead of cross-sectional data and (ii) addressing and mitigating endogeneity problems with the use of instrumental variables.

7 Empirical results: rural land right security and structural transformation

Under simple fixed effect specifications, columns (1) and (2) of Tables 4 and 5 show that although the coefficients of the share of land under SPK4-01 titles are negative, they do not exert any statistically significant relationship on either the agricultural workforce (Table 4) or agricultural population (Table 5).

To mitigate the endogeneity concerns mentioned in section 6.2, columns (3), (4) and (5) of Tables 4 and 5 present the results from the IV strategy with lagged degraded forests as the instrument. Column (3) of both tables illustrates that without control variables but with province and year dummies, statistically significant associations exist between the share of land under SPK4-01 titles and the diversification of labour from farm activities. In other words, this reduced-form result shows that the improved security in rural land rights brought about by SPK4-01 titles is related to the labour and population shift from the agricultural sector into non-agricultural sectors. In particular, the coefficient magnitudes, when compared to those in columns (1) and (2) of both tables, are substantially larger. This upwards bias (towards zero) reflects the endogeneity problem of the baseline fixed-effect specification mentioned in section 6.2. This bias is potentially the result of policy targeting in an area that is less developed and has a greater share of its workforce in farming, i.e., the less 'modern' sector.

In column (4), when the control variables that matter for structural transformation are added, we observe that the negative and statistically significant relationship in column (3) is still robust. More specifically, an increase of one standard deviation in the average provincial share of land under SPK4-01 titles (i.e., 9.67 per cent) reduces (i) the number of agricultural workers by approximately 54,454 persons, an effect that is statistically significant at the 1 per cent level (Table 4), and (ii) size of the agricultural population by approximately 45,877 persons, an effect that is statistically significant at the 5 per cent level (Table 5). This corresponds to approximately 21 per cent of the average provincial agricultural workers and approximately 13 per cent of the average provincial agricultural population during the period of study.

I also report test results for the over-identification restrictions for the IV regressions in both tables. This enables me to check the validity of the instruments, and provides a check of the model specification. When the relevant control variables are included (better model specifications), the high reported p-value for the tests implies that the degraded forests (the instruments) are statistically uncorrelated with the error process, and that the model specifications are reasonable. Note, however, that the p-value of the over-identification restriction for the model with agricultural labour is higher than that with agricultural population, which suggests a better model specification for the first case.

Table 4
Rural land rights and number of workers in agriculture

	FE	FE	IV	IV	IV
	[1]	[2]	[3]	[4]	[5]
Share of land under SPK4-01 titles	-26.1	-186.006	-4745.385	-5631.253	-4097.827
	[835.004]	[836.92]	[1731.798]***	[1594.016]***	[1489.032]***
Population or workforce	-0.008	0.053	0.06	0.106	0.168
	[0.086]	[0.069]	[0.076]	[0.058]*	[0.073]**
Share of land under full titles		165.333		-324.82	-158.303
		[576.979]		[415.566]	[381.326]
Average GPP per capita over past 5 yrs		-0.028		-0.026	-0.082
		[0.094]		[0.088]	[0.109]
Average growth of GPP per capita over past 5 yrs		-101505.7		-64019.84	98012.76
		[177429.6]		[133357.2]	[128526.5]
Relative average productivity over past 5 yrs		6492.614		9375.52	9820.342
		[4443.138]		[2945.672]***	[2832.731]***
Relative average productivity growth over past 5 yrs		-36.113		-1.338	10.675
		[184.435]		[106.682]	[104.262]
Volatility of farm productivity over past 5 yrs		13.878		15.271	1.433
		[15.68]		[13.054]	[14.781]
Volatility of non-farm productivity over past 5 yrs		-2.339		-2.139	-3.271
		[1.374]*		[0.948]**	[0.814]***
Covariance of productivity over past 5 yrs		45.47		26.754	48.395
		[24.421]*		[18.881]	[15.933]***
Present agricultural productivity					-777.86
					[214.935]***
Year dummies	YES	YES	YES	YES	YES
Province dummies	YES	YES	YES	YES	YES
Observations	285	279	257	254	254
Number of groups	75	75	70	69	69
Adjusted R-squared	0.865	0.867			
Under-identification test: p-value			0.155	0.032	0.057
Over-identification test: p-value			0.445	0.62	0.469

Note: Standard errors, clustered by province, are in parentheses. *, **, *** denote significant levels at 10%, 5% and 1%, respectively.
Source: See text.

Table 5
Rural land rights and agricultural population

	[1]	[2]	[3]	[4]	[5]
Share of land under SPK4-01 titles	-247.291	-662.519	-5236.4	-4744.265	-3942.481
	[885.527]	[891.406]	[2111.507]**	[2148.648]**	[2073.822]*
Population or workforce	-0.047	0.296	0.049	0.0458	0.117
	[0.101]	[0.076]	[0.094]	[0.061]	[0.073]
Share of land under full titles		-118.925		-515.565	-401.478
		[687.976]		[430.171]	[417.417]
Average GPP per capita over past 5 yrs		-0.142		-0.029	-0.062
		[0.107]		[0.099]	[0.113]
Average growth of GPP per capita over past 5 yrs		16236.62		70892.54	192518.3
		[186018.7]		[145718.8]	[143721.6]
Relative average productivity over past 5 yrs		9416.535		11502.95	11781.01
		[4333.181]**		[3004.23]***	[2917.242]***
Relative average productivity growth over past 5 yrs		12.686		65.003	70.267
		[197.975]		[125.646]	[123.966]
Volatility of farm productivity over past 5 yrs		17.69		15.796	3.253
		[14.804]		[13.515]	[13.871]
Volatility of non-farm productivity over past 5 yrs		-3.175		-2.941	-3.968
		[1.008]***		[0.778]	[0.902]***
Covariance of productivity over past 5 yrs		39.615		25.463	43.736
		[22.295]*		[17.707]	[17.794]**
Present agricultural productivity					-639.59
					[187.534]***
Year dummies	YES	YES	YES	YES	YES
Province dummies	YES	YES	YES	YES	YES
Observations	285	279	257	254	254
Number of groups	75	75	70	69	69
Adjusted R-squared	0.939	0.944			
Under-identification test: p-value			0.155	0.032	0.057
Over-identification test: p-value			0.345	0.394	0.325

Note: Standard errors, clustered by province, are in parentheses. *, **, *** denote significant levels at 10%, 5% and 1%, respectively.
Source: See text.

It is also of importance to diagnostically check the second requirement for the instruments, i.e., the 'relevance' requirement. To this end, I use the rank test based on Kleibergen and Paap (2006), where under the null hypothesis the equation is under-identified and the instruments, jointly, are not correlated with the endogenous regressors. Under-identification tests with a consideration of intra-group correlation between disturbances reject the null hypothesis and hence imply that the instruments are correlated with the endogenous regressors.

7.1 Discussion of control variables

First, to control for the effect of the workforce and population sizes, the provincial workforce or population is added. This is due to the assumption that agricultural workforce and population may rise or fall simply because of their overall size. In both Tables 4 and 5, size of the workforce and population are, as expected, positively associated with agricultural workforce and population, however only when the dependent variable is the number of agricultural workers (Table 4, column (4)) do we observe a statistically significant association.

There are many types of land titles in Thailand. To robustly investigate the effect of the tenure security which is proxied by the entitlement of partial land rights (SPK4-01 titles), the control for other types of landholdings is added to both (column 4). The various titles are categorized into groups: (i) titles with full security and transfer rights or full title deeds, (ii) partial titles (SPK4-01) which encompass full security but no transfer rights, and (iii) other certificates that offer no formal rights which would be universally recognized by state authorities. The influence of type (ii) title on structural transformation is the main interest of this paper. The share of landholdings under type (i) is added as a control. As the variables are measured as proportions, the share of land under type (iii) is omitted.

To help control for economy-wide improvements that could attract more capital investment into industry and hence pull workers away from agriculture Lewis (1954), as well as to account for the importance of the Engel effect, province-level income per capita and income per capita growth are included. But such contemporaneous variables may be subject to endogeneity problems. For instance, a decline in the importance of agriculture in itself may drive increases in the provincial-level income per capita, thus raising concern of reverse causality. To formally address this problem, instead of using present-day variables, I employ lagged variables of (i) the average province-level income per capita over the past five years and (ii) the average income per capita growth for the same period. Neither Table 4 nor 5 exhibit a statistically significant relationship between the economy-wide improvement either in terms of the level or growth and the diversification of labour from farm activities.

To control for the expected earning gap (wage or productivity) between farm and non-farm sectors, which can act as a pull factor (Harris and Todaro 1970), the relative average productivity of non-agriculture to agriculture over the past five years, and relative average growth over the past five years are included. Nonetheless, while the relative average growth has no statistically significant effect, the relative average level of productivity (estimated relative wage) exerts a positive and statistically significant impact in both tables. This seems to go against the Harris–Todaro conjecture. However, this could be due to the fact that as the probability of getting an industrial job (another

main component of the expected earning) is not captured, the expected earning gap may not be accurately recorded by the measure of relative average level of productivity. In other words, the result could be driven by measurement error.

Lastly, following Poelhekke (2011), to control for the push factors resulting from adverse farm conditions, average volatility of both agricultural and non-agricultural productivity is constructed for the past five-year period, as is their average covariance for the same period. This should also enable to test whether migrants, as a means of minimizing income risks (Paulson 2003), are more likely to move to locations (occupations) that covary less with their hometowns or the locations to which they are sending remittances. Although average volatility in the agricultural sector does not exert any statistically significant effect, in the non-agricultural sector it has a negative and statistically significant relationship with the share of labour and population in agriculture. This seems rather puzzling, as the results imply that worker movement into the non-agricultural sector seems to be stronger in provinces where the sectors' productivity is more volatile. Nevertheless, one potential explanation could be that high volatility is a reflection of positive shocks in productivity over the past five-year period, which leaves large gaps and hence large volatility between the productivity of different years in that period. Such favourable shocks could potentially encourage workers to shift into non-agricultural sectors. The summary statistics of non-agricultural productivity in Table 6 support the above explanation to a certain extent by showing that there is an overall increase in non-agricultural productivity from 1996 to 2005.

Table 6
Summary statistics of non-agricultural productivity

	1996	1999	2002	2005
Non-agricultural productivity	52.426	60.109	48.335	64.233
	[39.602]	[44.747]	[54.432]	[86.371]

Note: Non-agricultural productivity is proxied by non-agricultural wage. Standard deviations are in parentheses.

Source: See text.

7.2 Mechanisms

There are four main mechanisms through which an improvement in rural land security can affect structural transformation, as outlined in section 4. However, only the first mechanism—tenure security as a favourable push factor through farm productivity improvement—can be captured quantitatively. As a result, an attempt is made to identify this mechanism by adding a measure of contemporaneous province-level agricultural productivity to the regressions (column (5), Tables 4 and 5). In both tables (column 5), the estimated coefficients of agricultural productivity are negative and statistically significant, confirming the proposed theoretical model that as farm productivity improves, there is less need for agricultural labourers to satisfy the relatively inelastic demand for food. As a result, there is a release of labour from the agricultural to the non-agricultural sector. In addition, since the magnitude of the estimated coefficients of the share of land under SPK4-01 titles falls towards zero when the contemporaneous agricultural productivity is included, it is reasonable to conclude that this mechanism is one of the channels through which rural land right security can affect employment diversification from agriculture to non-agriculture. More

specifically, the productivity channel accounts for 27 per cent of the overall tenure security effect in the case of a reduction in agricultural workforce, and 17 per cent in the case of a reduction in agricultural population.

Even with the inclusion of the quantifiable channel (contemporaneous agricultural productivity), the estimated coefficients of the share of SPK4-01 titles still remain negative and statistically significant in both tables. This suggests a role for the other channels or mechanisms mentioned in section 4. In particular, having controlled for the productivity-improvement channel, the estimated coefficient should capture the net effect of other mechanisms. Given that only the third mechanism—the reduction of the opportunity cost of off-farm employment—has a predicted negative impact of titling on agricultural employment and population, the results suggest that this mechanism must be particularly strong.

In addition, in column (5) of both tables, the estimated coefficients of the relative average productivity over the past five years and the volatility of non-farm productivity over the same period remain statistically significant. With the inclusion of contemporaneous farm productivity, the covariance of productivity in both sectors becomes statistically significant with a positive sign. This supports the income-risk minimization theory: in provinces with higher covariance there is a higher fraction of labour remaining in agriculture, and in provinces with lower covariance, reflecting a greater chance of income diversification between the two sectors, there is a larger diversification out of the farm sector.

8 Empirical results: rural land right security and the level of urbanization

As mentioned in the introduction, the literature has long acknowledged the close link between off-farm labour diversification and urbanization. Such a link is also supported by the cross-country correlation of the two variables shown in Figure 2. This section, therefore, repeats the empirical analysis of the previous section, but employing a measure of urbanization as the dependent variable.

8.1 Province level

It is of interest to investigate first whether the correlation observed in cross-country data also holds in this set of Thai data for the four periods under study. The link emphasized in the literature and the cross-country correlation seem to be supported by the result in column (1) of Table 7, where it is shown that there is a negative and statistically significant relationship between the agricultural labour force and urban population at the province level. However, this relationship does not take into account yearly time effects or any observed and unobserved provincial characteristics. When year dummies are included in column (2), the result observed in column (1) is still robust. But the relationship breaks down (column 3) when the province dummies are added. This implies that the relationship between the two variables no longer holds in a study in which the panel data used to control for possible province-specific characteristics driving the correlation between agricultural labour force and urban population observed in cross-sectional study. This suggests that time-invariant province-specific characteristics can spuriously drive the correlation observed in simple cross-sectional

data. However, it should also be borne in mind that what we observe in column (3) may be specific to Thailand for the period under study, or may be due to the fact that the urbanization information is based on official registrations that may diverge from actual places of residence. Table 8 presents the empirical results of the impact of an improvement in land right security on the level of overall urbanization.

Table 7
Correlation between Thailand's urban population and agricultural labour force

Urban population	[1]	[2]	[3]
Agricultural labour force	-0.4539 [0.0463]***	-0.49 [0.0479]***	-0.0038 [0.0461]
Year dummies	NO	YES	YES
Province dummies	NO	NO	YES
Observations	285	285	285
Number of groups	75	75	75
Adjusted R-squared	0.251	0.263	0.998

Note: Standard errors, clustered by province, are in parentheses. The analysis covers the four periods of 1996, 1999, 2002 and 2005. *, **, *** denote significant levels at 10%, 5% and 1% respectively.

Source: See text.

If the association between the share of land under SPK4-01 entitlements and the level of urbanization is expected to follow the relationship between the share of land under SPK4-01 and the diversification of labour from agriculture, we should see positive and statistically significant coefficients on the share of SPK4-01 certified land (Table 8). Although positive correlations are observed throughout, with the exception of column (2), none of these exert a statistically significant relationship. This could be a reflection of what is observed in column (3) of Table 7. Although an improvement in the security of land rights has a significant impact on structural transformation, in the context of this study structural transformation diverges from urbanization and consequently there is no evidence of a similar effect from rural land right security to the level of urbanization, even though the expected direction of impact is present.

Additionally and alternatively, the statistically insignificant results could be a consequence of the quality of the urbanization data. Urbanization data are based on registry information, which can differ from the actual place of residence. As a result, variables representing total urbanization could potentially be only the lower bounds of Thailand's actual rural-urban migration during the period of study. This could well explain why the estimated coefficient on the share of land under SPK4-01 titles is not statistically significant.

Furthermore, it is possible that even though strengthening land right security encourages labour away from agriculture, these workers may be engaged in non-farm activities located in rural communities. In other words, the empirical evidence suggests diversification is to rural non-farm activities, instead of urban non-farm jobs. Furthermore, unlike what was observed in Tables 4 and 5, the contemporaneous agricultural productivity has no statistically significant effect on urbanization, even though the coefficients are of the right sign.

Table 8
Rural land rights and urban population

	FE	FE	IV	IV	IV	IV	IV
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Share of land under SPK4-01 titles	99.956	-143.078	991.283	542.472	571.94	609.74	645.0825
	[422.813]	[477.546]	[1193.844]	[955.542]	[954.973]	[966.895]	[943.927]
Population or workforce	0.014	0.013	0.01	0.008	0.008	0.008	0.01
	[0.017]	[0.014]	[0.012]	[0.011]	[0.011]	[0.011]	[0.01]
Share of land under full titles		-467.666		71.879	22.52	37.399	21.703
		[407.407]		[219.57]	[226.934]	[235.683]	[215.731]
Average GPP per capita over past 5 yrs		0.052		0.026	0.016	0.01	-0.002
		[0.085]		[0.063]	[0.066]	[0.066]	[0.061]
Average growth of GPP per capita over past 5 yrs		-132152.5		-165473.4	-119513.9	-142012.7	-132144.4
		[70028.59]		[157433.4]	[168021.3]	[167435.8]	[171443.6]
Relative average productivity over past 5 yrs		155.177		-361.971	-316.647	-304.057	-479.745
		[503.88]		[623.286]	[619.805]	[628.741]	[609.734]
Relative average productivity growth over past 5 yrs		194.858		-10.951	-6.909	-10.91	-14.563
		[243.831]		[41.045]	[41.209]	[41.044]	[41.494]
Volatility of farm productivity over past 5 yrs		20.833		17.957	19.084	19.789	19.205
		[16.888]		[13.409]	[12.629]	[12.531]	[12.57]
Volatility of non-farm productivity over past 5 yrs		-0.964		-0.829	-1.068	-1.019	-1.055
		[0.517]**		[0.397]**	[0.503]**	[0.513]**	[0.516]**
Covariance of productivity over past 5 yrs		13.793		18.073	22.855	22.345	23.574
		[12.324]		[11.463]	[13.054]**	[13.225]*	[13.323]*
Present agricultural productivity					-85.973	-69.377	-78.323
					[74.135]	[82.01]	[87.119]
Investment in road system						0.414	0.128
						[0.345]	[0.335]
(Share of land under SPK4-01 titles)*(Investment in road system)						-0.337	[0.11]***
Year dummies	YES	YES	YES	YES	YES	YES	YES
Province dummies	YES	YES	YES	YES	YES	YES	YES
Observations	284	279	257	254	254	253	253
Number of groups	74	74	70	69	69	69	69
Adjusted R-squared	0.998	0.998					
Under-identification test: p-value			0.1702	0.041	0.048	0.043	0.061
Over-identification test: p-value			0.7702	0.72	0.762	0.717	0.75

Note: Standard errors, clustered by province, are in parentheses. *, **, *** denote significant levels at 10%, 5% and 1%, respectively.
Source: See text.

Table 9
Rural land rights and municipality-level urban population

	FE	FE	IV	IV	IV	IV	IV
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Share of land under SPK4-01 titles	1.867	-78.415	345.435	125.432	88.539	85.715	98.947
	[141.606]	[185.181]	[210.96]	[195.235]	[198.635]	[197.878]	[191.011]
Population or workforce	0.006	0.004	0.004	0.004	0.004	0.004	0.004
	[0.004]	[0.003]	[0.003]	[0.002]**	[0.002]**	[0.002]**	[0.002]**
Share of land under full titles		-171.911		-9.28	-18.902	-18.566	-15.842
		[161.557]		[58.977]	[52.682]	[52.804]	[52.026]
Average GPP per capita over past 5 yrs		-0.011		0.003	-0.0001	-0.0003	-0.0003
		[0.3]		[0.019]	[0.023]	[0.023]	[0.023]
Average growth of GPP per capita over past 5 yrs		-12976.47		-7045.586	-4715.375	-4584.577	-5430.732
		[26176.3]		[12779.12]	[17419.3]	[17457.58]	[17402.84]
Relative average productivity over past 5 yrs		368.949		-90.406	-75.252	-70.495	-76.658
		[494.23]		[287.33]	[300.591]	[301.917]	[305.01]
Relative average productivity growth over past 5 yrs		133.498		13.751	9.941	9.998	11.511
		[165.491]		[75.76]	[77.16]	[77.204]	[76.977]
Volatility of farm productivity over past 5 yrs		15.517		7.2024	8.945	8.515	8.519
		[13.588]		[8.136]	[7.836]	[7.8421]	[7.886]
Volatility of non-farm productivity over past 5 yrs		-0.587		-0.252	-0.319	-0.321	-0.318
		[0.494]		[0.32]**	[0.318]	[0.431]	[0.433]
Covariance of productivity over past 5 yrs		11.403		6.422	7.76	7.803	7.1974
		[10.106]		[6.367]	[8.425]	[8.421]	[8.451]
Present agricultural productivity					-8.492	-8.702	-0.009
					[50.887]	[50.978]	[0.077]
Investment in road system						0.012	0.018
						[0.067]	[0.017]
(Share of land under SPK4-01 titles)*(Investment in road system)							-8.622
							[50.93]
Year dummies	YES	YES	YES	YES	YES	YES	YES
Province dummies	YES	YES	YES	YES	YES	YES	YES
Observations	546	532	508	498	498	498	498
Number of groups	165	160	157	152	152	152	152
Adjusted R-squared	0.998	0.998					
Under-identification test: p-value			0,001	0	0	0	0
Over-identification test: p-value			0.735	0.78	0.758	0.76	0.735

Note: Standard errors, clustered by province, are in parentheses. *, **, *** denote significant levels at 10%, 5% and 1%, respectively.
Source: See text.

On the other hand, the absence of evidence for urbanization and urban non-farm diversification as a result of improved security for land rights could be driven by other determinants of urban concentration that generally may not affect employment diversification. Although manufacturing and services are more efficacious when concentrated in cities, investment in inter-district infrastructure such as on road networks may decrease urbanization and urban concentration. For example, Henderson (2000)[19] uses national road densities to capture the investment in interregional road system, and finds that a one standard deviation increase in road density reduces urban primacy by about 10 per cent of one standard deviation (Henderson 2000: 24). In particular, increases in road network density significantly depress urban concentration, with the effect rising with income. In addition, in their study of commute mode choices for households living in 114 urban areas in the United States in 1990, Bento et al. (2005) show that the higher the road density, the greater the probability of commuting by car.

Similarly, urbanization in Thailand could be affected by similar investments in infrastructure. To capture this, planned expenditures on road network development and reparation per square kilometre at the province level are used as a measure of infrastructure investment. But as Table 8 (column 6) indicates, there is no statistically significant association between investment in road density and urban population, or between the share of SPK4-01-certified land and urban population when investment in road density is controlled for. In other words, the share of land under SPK4-01 and the investment in road density, independently and individually, have no absolute or impact upon urbanization. However, the results in column (7) suggest that the effect of each depends significantly on the level of the other. The estimated coefficient of the interaction term implies that the increase in urbanization, resulting from the improvement in rural land right security, is significantly greater in provinces with poorer road infrastructure. In other words, rural land right security leads to urbanization and urban non-farm diversification only when it is relatively difficult to commute between districts, or more specifically, when the inter-district transport infrastructure within the province is relatively poor.

8.2 Municipality level: a robustness check

The data from the Ministry of Interior Affairs are available at the sub-district level, or in the case of towns and cities, municipality level. This makes it possible to construct the measure of urbanization at the town and city level (municipality level) in addition to aggregate urbanization at the province level. The empirical results at the municipality level can help provide a robustness check for the results at the province level. Nevertheless, apart from the variables capturing urban population, we continue to measure all remaining variables at the province level because of data limitations. The subsequent empirical results are given in Table 9. The positive but statistically insignificant relationship between better land right security and urbanization observed at the province-level is still present at the municipality-level, albeit of different magnitude. There are differences in the direction and significance of the effects of other explanatory variables, but these are not large. In addition, it is worth noting that taking a finer unit of analysis, thus having a greater number of observations, improves the results of under-

19 The study is based on a panel of 80-100 countries, every 5 years from 1960 to 1995.

identification and over-identification tests substantially. However, the statistically significant estimated coefficient of the interaction term between the share of land under SPK4-01 titles and road network investments observed at the province level is no longer robust at the municipality level. This could potentially be driven by the fact that as road network investment is measured at the province level, it may not accurately represent the transport infrastructure of a smaller unit such as the municipality.

9 Conclusion and caveats

This paper contributes to both structural transformation and the rural land rights literature by theoretically and empirically investigating whether land tenure security influences the allocation of labour between agricultural and non-agricultural activities. It is noted that security of rural land tenure has a sizeable impact on the changing structure of the economy in terms of labour use. Using the data from Thailand and based on the IV strategy, on average 21 per cent of provincial agricultural workers diversify away from farming into non-farming activities due to an improvement in rural land security, of which approximately 27 per cent can be explained through the effect of a more productive agricultural sector itself.

This paper also contributes to the literature on urbanization, which is usually linked to the off-farm diversification of labour. With the use of a Thai panel dataset and instrumental variable strategy, a breakdown in the relationship between structural transformation and urbanization is observed. While better land right security encourages the movement of labour into the non-agricultural sector, it has no statistically significant impact on the movement of populations into urban centres. This suggests diversification to rural non-farm activities rather than urban non-farm jobs. Nevertheless, care should be taken in the interpretation of these results, as construction of the urbanization data used here is based on information from the official registry which may not be an accurate indication of actual place of residence. The results can, however, be seen as the lower bounds of such impacts.

Although security of rural land rights, independently and individually, has no statistically significant effect on the level of urbanization, it is noted that its impact on urbanization depends significantly on the transport network investments within a province. In particular, rural land right security significantly increases urbanization more in provinces with poorer road infrastructure. In other words, when the inter-district transport infrastructure within a province is relatively poor, making commuting between rural and urban areas costly, strengthening rural land right security can lead not only to non-farm labour diversification, but also to urbanization.

Nonetheless, the unit of study in this paper is the provincial level which enables information on the reallocation of labour to be collected only within the province but not across provinces, thus these measures could bias the effect of improved rural land rights on structural transformation downward and urbanization towards zero. In other words, there may be an under-estimation of the impact of rural land right security on the off-farm diversification of labour and on urbanization. This, however, implies that the results of this paper (particularly in section 6) are empirically strong, since the effects are both large in magnitude and statistically significant despite the potential downward

bias. To provide a simple robustness check to determine whether labour structural transformation also occurred across provinces, the decline in agricultural employment is compared to a possible decline in provincial population: the correlation coefficient between the two variables is only -0.004 and is statistically insignificant. Similarly, the correlation coefficient between the urbanization counterparts is -0.03 and statistically insignificant. This implies that at the provincial level, neither a change in agricultural employment nor urban population matches a change in population. Since the change in provincial population could be caused by cross-provincial population movement (which is not directly observed in this dataset) such as cross-provincial labour structural transformation and cross-provincial urbanization, the absence of the correlation observed above enables us to deduce that there is not enough evidence to conclude that there is labour structural transformation or urbanization across provinces

In summary, both the theoretical conjectures and the empirical results in this paper (particularly in section 7) confirm and highlight the importance of rural land right security. Insecurity of tenure, in addition to dampening agricultural performance, could potentially impede economic transformation towards manufacturing and services. Policies that seek to strengthen agricultural land right security, even without transfer rights, can have a sizeable impact in a country that would go beyond the boundary of agricultural sector itself.

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