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Impact of Property Rights Reform to Support China's Rural-Urban Integration

Village-Level Evidence from the Chengdu National Experiment

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Abstract

As part of a national experiment, in 2008 Chengdu prefecture implemented ambitious property rights reforms, including complete registration of all land together with measures to ease transferability and eliminate labor market restrictions. This study uses a discontinuity design with spatial fixed effects to compare 529 villages just inside and outside the prefecture's border. The results suggest that the reforms increased tenure security, aligned land use closer to economic incentives, mainly through market transfers, and led to an increase in enterprise start-ups. These impacts, most of which are more pronounced for villages with lower travel time to Chengdu city, point toward high potential gains from factor market reform.

Impact of Property Rights Reform to Support China's Rural-Urban Integration:

Village-Level Evidence from the Chengdu National Experiment [¶]

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1. Introduction

While the rapid economic growth observed in China over the last decade is the result of many factors, a land tenure system that strictly separates rural from urban land and that allows expropriation of rural land and its conversion to urban land in a way that provides large margins to local governments has significantly contributed to the associated expansion of industrial activity. At the same time, this dualism between rural and urban land and the ability of local governments to generate enormous amounts of revenue by expropriating land cheaply and selling it to developers at prices that are orders of magnitude higher than what is being paid in compensation has also contributed to income inequality. Moreover, it led to inefficient land use, large 'land banks' by local governments, rural unrest, and -given China's limited agricultural land endowment- concerns about negative impacts on food security. The latter may arise either directly -by irreversibly converting land from agricultural to non-agricultural uses- or indirectly by reducing investment and efficiency-enhancing land transfers by farmers who fear expropriation with limited compensation. Most experts agree that this situation is not sustainable and that, to change it, simultaneous action in a number of areas is needed (World Bank and DRC, 2014).

Cognizant of this challenge, a number of national experiments were conducted to explore the scope for alternative and potentially more sustainable arrangements. In this context, the city of Chengdu in Sichuan Province was selected by the central government as a "rural-urban integration reform experiment zone" in 2008. Efforts undertaken in the context of the experiment are of interest as they involved systematic verification of all types of land assets, relaxation of the restrictions imposed by the *hukou* system of urban residency permits, and measures to improve land market functioning. They were expected to enhance tenure security and reduce transaction costs in land and labor markets so as to encourage land-related investment, enhance allocative efficiency, create jobs, and improve overall economic performance. But there was also concern that far-reaching reforms in this area would be costly to implement and give rise to disputes or socially undesirable land transfers and migration.

As property rights and their links to rural-urban integration have recently been identified as key reform areas by China's leadership, drawing the lessons from past reform experiments is important. Yet, beyond anecdotal accounts, few studies aim to assess either the magnitude of associated impacts or their incidence among different types of households. We use a survey of 529 neighboring villages that are separated from each other by the prefecture boundary to analyze reform effects on tenure security, land use, and land as

well as labor market functioning. Noting that before the intervention counties on both sides of the border followed similar trends and that we can control for other government programs, the fact that the experiment was implemented in Chengdu prefecture but not in neighboring administrative units allows us to implement a triple difference discontinuity design where reform effects are identified by comparing changes in the same village before and after the reform between villages inside and outside the prefecture boundary.

Results suggest that about 3-4 years after it had been completed, rural-urban integration reform had helped to significantly increase tenure security by reducing the incidence of administrative reallocations and expropriation. This led to an increase in the share of arable agricultural land (compared to less intensive pastures) and the share of construction land devoted to economic activities rather than residential use while preserving the level of non-productive 'waste' land including forests. Reform-induced increases in levels of market-mediated transfers of construction land as well as formal and informal transfers of agricultural land are consistent with the notion that higher levels of tenure security created a basis for the operation of land markets that transferred land to better uses. While we can only evaluate the impact of the reform package overall, reform-induced increases in the rate of new enterprise startups suggest that labor market reforms had an independent impact as well. These effects are estimated to be more pronounced close to Chengdu city, in line with significant scope for exploitation of agglomeration benefits.

The paper is structured as follows. Section two provides context, discusses salient features of the Chengdu experiment, and introduces analytical methodology and data sources. Section three presents descriptive statistics on economic structure, land endowments and transfers, as well as enterprise start-ups from the village survey, complemented by information on nature and cost of land certification in sample villages. Section four discusses impacts on tenure security, changes in land use, activity in land markets, and formation of new enterprises. Section five concludes with implications for policy and future research.

2. Motivation and background

Between 2000 and 2010, rural-urban land conversion in China expanded at rates that are among the highest in East Asia. As such changes are not easily reversed, this poses vast challenges for China's development for decades to come. While piecemeal efforts to change this pattern had proved largely ineffective, the rural-urban integration reforms undertaken in Chengdu prefecture followed a more integrated approach that could hold broader lessons. We describe the nature of the reforms and our analytical approach to evaluating their impact.

2.1 The challenges of rural-urban land conversion in China

In the 2000-2010 period, the size of urban areas in China expanded enormously: use of satellite imagery to define 'urban' consistently across countries reveals that, with an average annual area expansion of 9.8% for

Hangzhou, 8.1% for Shanghai, 6.1% for Chongqing, 5.9% for Chengdu, 4.5% for the Pearl River Delta and 4.0%, for Beijing, most Chinese cities expanded at a rate well in excess of the East Asian average of 2.8% (World Bank 2014).[1] At the same time, and despite numerous measures to the contrary, rural-urban income inequality widened. While clear causality is difficult to establish, most experts agree that high rates of land conversion make a key contribution to this and, in addition, give rise to factor market distortions and often inefficient and unsustainable land use. This can largely be attributed to structural factors, most importantly the fact that, as rural land is owned by village collectives and not tradable, conversion of land from agricultural to non-agricultural use is possible only via acquisition by local governments. While farmers receive compensation for their agricultural land based on the value of land for agricultural production,[2] land acquired in this way can be transferred by local government at prices hundred times or more what was paid in compensation.

The scope for realizing such windfall gains made land acquisition a preferred means for funding local governments, with far-reaching implications for overall land supply, land prices, and the operation of land and other factor markets. Land lease fees accounted for an average of 60% of local budgetary revenues in 2003/04 (Su *et al.* 2013), a figure that has risen further as fiscal decentralization reduced alternative revenue sources for local governments (Qun *et al.* 2015).[3] Revenue generated in this way provides a huge implicit subsidy to industrialization. (Ding and Lichtenberg 2011), with negative impacts on availability of land for residential and housing purposes (Peng and Thibodeau 2012).

This pattern of land development, which would be difficult to maintain without complementary restrictions in labor markets that in and of themselves may lead to considerable efficiency losses (Au and Henderson 2006b), has several consequences. First, as local governments compete to attract industry, prices for industrial land in China have remained very low (World Bank and DRC, 2014). Supplying land to industry below its real value led to inefficient use of a valuable resource; in fact a nation-wide survey in 2003 suggests that 70% of land in China's development zones was unused (Du and Peiser 2014). Meanwhile, residential land prices in Chinese cities increased dramatically, affecting affordability of housing for most of the population: in Beijing, real constant quality values for residential land rose by nearly 800% since 2003 with half of the increase having occurred during the 2008-10 period (Wu *et al.* 2012). Second, expropriations without what is perceived to be fair compensation contribute to conflict between farmers

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[1] The average is for urban areas in East Asia with more than 5 million inhabitants in 2010 (World_Bank and DRC 2014).
[2] Farmers' residential land is often not expropriated, something that led to the spread of 'urban villages', i.e. unplanned neighborhoods that tend to provide shelter for migrants tend exert negative externalities on prices for neighboring properties (Song and Zenou 2009). It is estimated that 140-150 mn migrants are estimated to live in some 50,000 urban villages (Tan *et al.* 2011).
[3] Total construction land in 2005 was estimated at about 17 million ha, about 64% of which in rural areas. A number of innovative, though not entirely legal models whereby villages brought this land directly to the market and reaping large profits from doing so (Su *et al.* 2013).

and government (Nitikin *et al.* 2012).[4] They also undermine security of property rights, investment, land market functioning, and thus the efficiency of land use. Third, use of one-off land transfer revenue to finance recurrent local government expenditure is not viable in the long term and, in light of China's limited endowment with fertile land, will affect long-term food security. Local governments' high levels of collateralization of 'land banks', accumulation of bad debts, and 'land hoarding' all can lead to serious problems in the financial sector (Du and Peiser 2014).[5]

As land acquisition has increasingly become a focal point for legal disputes and rural unrest (Whiting 2011), efforts to find solutions focused on two areas. First, there have been calls to increase compensation paid to farmers and to make auctions rather than negotiation mandatory for all cases where land is made available for industry use. But determining an 'appropriate' level of compensation in a dynamic market is difficult. More importantly, local governments compete fiercely for industrial investment and auctions have been shown to be easily manipulated so that even their systematic use will not stop corruption (Cai *et al.* 2013). While these problems would be eliminated if direct rural-urban land transfers were allowed, few rural residents would be willing to give up their land unless an equivalent social safety net and source of income in old age was available (Ong 2014). Failure to capture the gains in land value from changing from rural to urban land use in a more sustainable way also undermines local governments' ability to provide social services. A tax on land or capital gains could help to do so but can only be implemented if institutional preconditions are met, in particular if a proper cadastral database is in place (Nitikin *et al.* 2012).

This suggests that viable reforms would need to pursue a multi-pronged approach, including (i) registration of all rural land; (ii) a possibility for migrants to get an urban *hukou* that provides access to social services, especially if they give up part or all of their rural land rights; (iii) allowing rural collectives or individuals to enter into direct land transactions at freely negotiated prices, subject to compliance with planning standards; and (vi) taxation of land so as to generate the revenue to support urban welfare packages while also contributing to more efficient land use (Tao and Xu 2007). Several experiments were undertaken to explore available options. These include integration of construction and collective land markets in Shenzen, land security development in Chongqing, urban fringe redevelopment in Beijing, land readjustment in Meitan, and the rural-urban integration in Chengdu to be studied here (World_Bank and DRC 2014). While some appear to have had positive effects, a more systematic evaluation of their impact on household welfare could help distill lessons to inform the potential nature and direction of future policy reforms in this area.

2.2 The Chengdu experiment

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[4] It is estimated that, during the 1987-2001 period alone, 40-50 million farmers lost half or more of their land to expropriation and that only about half of them obtained an urban residence permit (*hukou*) providing access to social services and education for their children (Tao and Xu 2007).
[5] Land thus emerged as a key policy issue (Wong 2014) with multiple institutional challenges (Pan *et al.* 2015).

Chengdu prefecture includes 20 counties/districts with a total area of 12,000 km^2 and a population of 11 million, of which 5 million are rural residents. In 2008, it was named as pilot area for the comprehensive reform under a Commission for Balanced Urban-Rural Growth (CBRUG). Three key changes were introduced (Li 2012). First, a participatory effort to title all land -including agricultural, construction, forest, and wasteland- and to establish a registration system was implemented under the authority of administrative villages. The purpose was to establish clear and secure property rights as a basis for long-term contracts for agricultural or construction land.[6] Second, the Chengdu Rural Property Rights Exchange was established as a platform for transactions of all types of rural property rights, including construction land quotas to allow more market-oriented and transparent mechanisms for price discovery. It also aimed to allow farmers and collectives to take the initiative in auctioning construction land quotas through competitive bidding and the role of Government to shift to that of a regulator and supervisor. Introduction of tradable development rights allows voluntary market-driven access to land for non-agricultural purposes in ways that can benefit local communities.[7] Third, to encourage migration, *hukou* restrictions were eliminated and regulations to allow easier transfers of rural construction land were passed. At least in principle, this would allow migration without the fear of losing an essential social safety net,[8] or the sale of part of a migrant's land in her place of origin to finance start-up of small enterprises in urban areas.

The experiment attracted interest from policy makers, scholars and the media. Case studies point towards positive reform effects in terms of (i) higher levels of investment in high-value perennials and vegetables due to a reduced threat of expropriations and reallocations and confidence in the stability of land ownership triggered by award of formal documents; (ii) increased volume of land transactions for agricultural and construction land that are likely to enhance efficiency and an incipient markets for secondary transactions and land conversion; and (iii) job creation in agriculture and other industries and higher wages or incomes as gains from reforms are shared more broadly throughout the local economy. Although potentially very valuable to identify underlying mechanisms, such anecdotal evidence if often based on non-representative samples and lacks a clear counterfactual, and does not allow quantification of benefits in a way that can be compared to the cost of the intervention. To provide these and, in doing so, draw out the implications of the experiment in a more systematic manner, more systematic survey evidence is needed.

2.3 Analytical approach

To analyze village level impacts of Chengdu's reforms, we use data from a 2014 survey that collected data, largely based on administrative records, in neighboring villages on both sides of the administrative border

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[6] Titles to homesteads were given on occupied land although the size of plots frequently exceeded legal norms or what was documented on past certificates. Use rights to collectively owned construction land, e.g. for rural enterprises, public interest, and other purposes, were also documented.
[7] A fund to strengthen protection of farmland, replenished from fees from transfers of land use rights and charges on newly developed construction land, is used to cover farmers' contribution to old-age pension insurance and to provide subsidies for land protection.
[8] This allows households to participate in rental without sending a signal that they do not need the land and make them subject to reallocation.

of Chengdu prefecture (see fig. 1 for a map). We use these to implement a regression discontinuity design that relies on a triple-difference approach whereby differences between pre- and post-reform periods in the same village are compared between villages located just inside Chengdu prefecture -and thus affected by reforms- and those located just outside -and thus unaffected. Although villages may have been different from each other already before the reform, use of village fixed effects implies that our strategy is valid as long as pre-reform trends of relevant outcome variables in treatment and control are parallel, a condition that will be tested empirically. We also use spatial fixed effects to control for time-varying changes in unobservables (e.g. local property booms) that will affect treatment and control located in close proximity from each other and include data on public services and programs administered by local governments as independent variables. Our basic regression is of the form

$$Y_{ijt} = \alpha + \beta_1 R_{ijt} + \beta_2 C_{ij} R_{ijt} + \beta_3 X_{ijt} + \beta_4 \rho_{ijt} + \delta_{ij} + \varepsilon_{ijt} \quad (1)$$

where Y_{ijt} is the outcome of interest for village i in neighborhood j in year t, R_{ijt} is an indicator variable for the post-reform period (2010-2013), C_{ij} is an indicator variable for villages inside Chengdu, X_{ijt} is a vector of time-variant village characteristics that includes total land area, population, number of households with access to agricultural subsidies, new rural pension, or new medial scheme, distance to the nearest county road, surface of the village road, and indicator variables for village-level infrastructure (primary schools and medical stations) in the village, ρ_{ijt} a vector of time-variant unobservables, δ_{ij} is a village fixed effect, ε_{ijt} is an error term and βs are parameters to be estimated. The parameter of main interest is β_2, our estimate of the impact of certification on village-level outcomes. To eliminate correlation between $C_{ij}R_{ijt}$ and ε_{ijt} that may be due to time-invariant village characteristics, we demean to obtain

$$\tilde{Y}_{ijt} = \beta_1 \tilde{R}_{ijt} + \beta_2 \tilde{C}_{ij} \tilde{R}_{ijt} + \beta_3 \tilde{X}_{ijt} + \beta_4 \tilde{\rho}_{ijt} + \tilde{\varepsilon}_{ijt} \quad (2)$$

where variables with tilde are demeaned. To control for location-specific unobservables that affect villages on both sides of the border equally and thus introduce correlation between ρ_{ijt} and $C_{ij}R_{ijt}$, we introduce spatial fixed effects as follows:

$$\tilde{Y}_{ijt} - \frac{1}{n_j}\sum_{i' \in j} \tilde{Y}_{i'jt} = \beta_1 (\tilde{R}_{ijt} - \frac{1}{n_j}\sum_{i' \in j} \tilde{R}_{i'jt}) + \beta_2 (\tilde{C}_{ij}\tilde{R}_{ijt} - \frac{1}{n_j}\sum_{i' \in j} \tilde{C}_{i'j}\tilde{R}_{i'jt}) + \beta_3 \left(\tilde{X}_{ijt} - \right.$$

$$\left. \frac{1}{n_j}\sum_{i' \in j} \tilde{X}_{i'jt} \right) + \beta_4 \left(\tilde{\rho}_{ijt} - \frac{1}{n_j}\sum_{i' \in j} \tilde{\rho}_{i'jt} \right) + (\tilde{\varepsilon}_{ijt} - \frac{1}{n_j}\sum_{i' \in j} \tilde{\varepsilon}_{i'jt}) \quad (3)$$

where n_j represents the number of villages within a critical distance of village i. Standard errors are corrected to deal with possible spatial correlation and serial correlation of error terms (Conley 2008).[9] To ensure we have at least one control for each treated village and vice versa, we set the critical distance at 11km.

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[9] To implement this in practice, we use stata code suggested in the literature (Hsiang 2010).

To check if our results might be due to structural differences other than the rural-urban integration reform, we perform a placebo test where equation (3) is estimated using a R_{ijt} corresponding to a putative reform in 2006/07. Estimates of β_2 from this regression are reported throughout. Also, as studies found evidence of large potential agglomeration effects that are not always fully utilized (Au and Henderson 2006a), we test for heterogeneity of effects with economic distance to Chengdu city center, measured by either road travel time or the Euclidean distance between the village center to downtown Chengdu.[10]

3. Data, descriptive statistics, and analytical approach

Although agriculture was the main source of livelihood in our sample villages, strong diversification trends are visible over the 2004-13 period covered by our data. While villages just outside and inside the prefecture boundary differed from each other in terms of average land endowments, public sector interventions in the land sector, and the level of diversification, we cannot reject the hypothesis of parallel trends in all of these variables prior to reform except two, justifying a discontinuity design. Inside Chengdu, land certification was swift and participatory, making it of interest to explore whether it triggered changes in outcomes.

3.1 Data and descriptive statistics

To analyze reform effects, we use data from a survey of villages along comparable stretches of the Chengdu prefecture border conducted by Development Research Center of the State Council (DRC) in May 2014. The sample comprises 529 villages; 288 inside and 241 outside the border. To illustrate the location of sample villages relative to the border and to Chengdu city, figure 1 plots coordinates of the centers for treatment and control villages. We note that, even after excluding the Western part of the prefecture that lacks comparability,[11] our sample includes a high level of variability: villages in two pockets in the Northeast and South are located along expressways and thus easily accessed from the city center in less than 30 minutes. Sample villages towards the East and the West are in mountainous settings that are, with road distances of some 150 km to Chengdu city center and a travel time of 3-4 hours, economically more remote. With a mean distance of 1.9 km between the village center and the prefecture boundary, treatment and control villages are, however, very close to each other.

Information on village characteristics, incidence of land reallocations and expropriations, land transfers, and existence of enterprises for every year between 2004 and 2013 was obtained from formal village records. It is complemented with recall data on informal land transfers from current and previous village leaders. For Chengdu villages, administrative data collected in the course of land registration were added.

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[10] Empirically, we use the z-score of both variables and obtained road travel time from google maps. Results for both are substantively very similar. We report the one using travel time which is more intuitive. Results using the straight line distance are available upon request.
[11] The Western part of Chengdu prefecture consists of a of a rapidly ascending mountain range that contains two large national parks and borders Qiang and Aba Tibetan autonomous prefectures. As this would compromise comparability, we decided not to survey any villages in these areas.

Table 1 provides information on key characteristics separately for sample villages in the 2004-07 'before' reform period (col. 2 and 3 for villages outside and inside the Chengdu prefecture boundary, respectively) and the 2010-13 'after' reform period (col. 5 and 6 for villages outside and inside the boundary). To test for pre-reform trends in outcome variable Y_{it}, we use the 2004-07 sample to estimate $Y_{it} = \alpha + \beta_1 C_i + \beta_2 T_{it} + \beta_3 C_i T_{it} + \varepsilon_{it}$ where C_i is an indicator variable for location in Chengdu prefecture and T_{it} is a time trend while β_2 and $\beta_2 + \beta_3$ are estimates of the pre-reform trend for villages outside and inside Chengdu, respectively. As significance of β_3 implies rejection of the parallel trend assumption, we report the level of significance of β_3 in table 1 col. 7.

Although they were rather close to Chengdu city, villages predominantly depended on agriculture as a source of livelihood. Before the reform (i.e. in 2004-07), about 58% of the labor force (61% and 55% outside and inside the prefecture boundary) had their main occupation in agriculture, complemented by 23% (21% and 24%) in the secondary and 20% (18% and 21%) in the tertiary sector. The fact that, of the latter, some 16% and 25% worked temporarily outside the village or the county, respectively, suggests that most secondary and tertiary sector was accessed through migration with village enterprises having very limited employment effects. Labor allocation across sectors changed over time: agriculture's share declined to 52% (56% and 49% inside and outside the boundary, respectively) in the 2010-13 period, accompanied by an increase of work in secondary and tertiary sectors to 26% (23% and 28%) and 22% (20% and 23%), respectively. The share of workers working outside the county increased from 25% to 29% and that of those who left their village for a period of less than 6 months from 16% to 19%.

Of villages' total land endowment, some 47% (44% vs. 50% outside and inside the border, respectively) was used for arable agriculture, 32% (38% vs. 28%) for 'other' agriculture, mostly pastures, 10% (8% vs. 11%) for residential or commercial purposes, and 11% (10% vs. 12%) remained unutilized. At 1.4 mu per capita, arable land endowments did not differ significantly between villages in- and outside the border. Residential land per capita was, with about 109 m^2 (101 m^2 outside and 115 m^2 inside). well above the 20-30 m^2 norm for Sichuan (Han and Li 2009). Although more rigorous econometric analysis will be needed to assess whether these are true reform effects, we note that, in the post-reform period, the share of arable land increased inside but decreased outside the border while the opposite was observed for residential land. This is supported by an increase of almost 10 percentage points (from 1.40 to 1.53) in per capita arable land and an equivalent decrease (from 115 to 103 m^2) inside Chengdu prefecture, compared to unchanged levels of arable land and significant increases in residential land endowments outside the boundary.

The incidence of land reallocation and expropriation was low: they were observed in 5% and 2% of villages overall, with higher rates inside (7.3% and 2.4%, respectively) vs. outside (2.5% and 0.7%) the boundary although reallocations in control villages involved larger areas and numbers of households. Interestingly,

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post-reform, the incidence of both reallocations and expropriations was higher outside as compared to inside the prefecture boundary (4.7% vs. 3.4% for reallocations and 6.3% vs. 5.6% for expropriations).

Informal land transactions were observed in 22% of villages (23% outside and 20% inside) and, where they occurred, transferred some 11% of arable village land (10% and 13% outside and inside), in 25% and 33% involving outsiders or contracts longer than 5 years, respectively, and contributing to some consolidation. Formal transfers were observed in 4% of villages (1.3% and 6.9% outside and inside, respectively) mostly with one partner only and in about 30% of cases (8% outside and 33% inside) mediated by local government. If they took place, they affected 7% of arable area, involved longer contract periods (77% between 6 and 30 years and 23% above 30 years) and involved a larger share of households (16% outside and 14% inside Chengdu prefecture) than informal transfers. The incidence of both types of transfers increased over time; informal transfers to 31.2% after the reforms although the area affected changed much less (12% vs. 16% for informal and 6% vs. 10% for formal transactions).

Before the reform, transfers of construction were observed only in 1.4% of villages; 1.8% and 1.0% outside and inside the prefecture boundary, respectively. Where observed, they involved some 7% of construction land (2.3% outside and 10% inside). After reform, the incidence of transfers increased to 3.2% of villages (2.6% and 3.6% outside and inside the boundary), affecting 12.8% of construction land (7.8% and 15.3% outside and inside). Presence of a formal enterprise is observed only in about 4.4% of villages (4% outside and 5% inside the boundary). With most villages having one enterprise only, 48%, 29%, and 24% of these were in the secondary, tertiary, and primary sector, respectively. After reform, the incidence of enterprises increased to 5% and 8%, respectively, with a significant increase in the share of agricultural ones, especially inside the Chengdu prefecture boundary.

Results from tests for parallel trends pre-reform (table 1 col. 7) suggest that this hypothesis can be rejected at 10% or above for only 2 variables -incidence of expropriations and formal land transfers- out of 45. In both cases, trends for villages inside Chengdu are higher than for those outside. However, for the latter, the significance disappears if we consider only formal transfers that were not initiated by local government. Data on other time varying variables controlled for in our regressions is in appendix table 1.

3.2 Evidence on the certification process

A detailed description of the size of different types of land and the certification process for each of the 529 sample villages is provided in table 2. The average village area is 12,790 mu (8 km^2). Certificates for collective construction land were issued to the village whereas those for contracted arable and forest land and residential land and actual structures were awarded to households.

Regarding implementation, we note that in more than 80% of cases, rules were made at the village level, either by the assembly (44%), economic organizations (23%), representatives (13%) or leaders (2%). Organization came more often from above (44% of township or above; 27% village leaders), and actual measurement was done by village representatives in 44% of cases.

In about 50% of villages, land registration gave rise to disputes and, where this was the case, an average of 11.1 disputes per village emerged. Disputes was most pervasive for arable and forest land (which attracted disputes in 45% and 31% of villages with 9.4 and 8.9 disputes, respectively) and least frequent with regard to collective and construction land (18.5% and 19.6% of villages with a mean of some 6 disputes). Even where disputes emerged, most of the cases encountered were resolved by village institutions: in villages with conflict, a total of 0.9 cases required intervention by institutions above the village.

After certification, contracts longer than 30 years were issued for all construction land and more than 95% of all other land use types with the exception of arable land (87%). Permanent land use contracts were given in close to 80% of cases overall, from 91% of residential and construction land to 84% of collective land, and some 58% and 59% of arable and forest land. Survey data point toward total cash cost of about Y 16 per mu of which close to half (43%) was contributed by the village and the remainder from outside. Villagers contributed close to 2,000 man-days of labor (about 3 days per household) and, with somewhat more than 10 person-months of labor by outsiders, contributions from above the village remained limited.

4. Econometric results

Our estimates point towards significant reform-effects on land and labor markets. Reform-induced increases of tenure security: significant reductions of land reallocations and, to a lesser extent, expropriations seem to be a key driver. While reforms did not affect the amount of unused land, they triggered land transfers from 'other' to agricultural use and from residential to non-residential construction land with reform effects estimated to have been larger closer to Chengdu city center. Large part of observed land use changes was mediated through land markets, suggesting that reform efforts to improve transferability of land and reduce the transaction costs of land markets operation did have an impact. Beyond this, a significant increase in new enterprise startups may point towards independent impacts from labor market reforms.

In terms of presentation, tables 3-6 assess reform effects on land and labor markets by reporting estimated reform effects on three sets of outcomes, namely (i) tenure security and changes in land use (tables 3 and 4); (ii) market-mediated land transfers through a range of channels (table 5); and (iii) new enterprise startups (table 6). Throughout, village fixed effects, a host of other controls, and spatial fixed effects are included and panel A reports estimated mean reform impacts, panel B provides results from a putative placebo reform in 2006/7 to the test robustness of our estimates,[12] and panel C includes results from regression where reform effects are allowed to vary with the travel distance to the city center of Chengdu.

4.1 Tenure security

We estimate that reforms led to a 5 point-reduction in the incidence of land reallocations (col. 1 and 2 with and without spatial fixed effects), thus contributing to stability of property rights that is likely to be a pre-condition for higher levels of land-related investment. Compared to a pre-reform average of 5.1% of villages being affected by reallocation, this is a quantitatively large effect. Equivalent regression for the incidence of land expropriation point towards a negative reform effect on the likelihood of any expropriation taking place with point estimates of -0.024, contrasting to a positive but insignificant coefficients in the placebo test (panel B). Again, in light of a pre-reform average of 1.6%, this effect is quantitatively large. Placebo tests suggest that, if anything, estimated reform impacts run counter to or even reverse strongly positive pre-reform trends in reallocation or insignificant ones for expropriation.

A key goal of China's land policy has been to create incentives for bringing unused residential land to more productive use although implementing this has not always been easy or uncontroversial (Huang *et al.* 2014). Our results suggest that reforms, by leading to a significant increase of 1.2 percentage points (table 4, panel A, column 4) compared to a pre-reform mean of 3.9% in the share of non-residential construction land (table 1), helped to move closer towards this goal. This is matched by a near-equivalent decrease (a point estimate of 0.9%) in the share of residential construction land,[13] supporting the interpretation that it was creation of a more conducive environment for operation of land and labor markets that allowed land freed up in this way to be formalized to allow its effective use in ways sanctioned by the law. We explore below the extent to which construction land conversion to non-residential use created employment opportunities.

To interpret estimated heterogeneous effects, note that the relevant right-hand side variable is the z-score of the travel distance to Chengdu. The reform's reallocation-reducing effect is attenuated for villages farther from the city center: at a distance of 1.83 hours (i.e., one standard deviation above the mean), we cannot

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[12] We define two years to keep balanced samples before and after the placebo reform. For modules we have data between 2004 and 2013, the placebo reform is defined as 2006. For modules we have data in 2004, 2007, 2010 and 2013, the placebo reform is defined as 2007. to see if the parallel trends assumption holds if other factors are controlled for, we perform a placebo where equation (1) is estimated for the pre-reform sample, replacing R_{ijt} with an indicator variable for a putative reform in 2006 or 2007.

[13] While placebo tests point towards some reduction of residential land in Chengdu even before the reform -though of much smaller magnitude than after the reform, no such trend is evident for non-residential construction land.

reject the hypothesis of zero reform effects on the likelihood of a land reallocation. At the same time, the reallocation-reducing effect of reforms is much higher for those closer to Chengdu; for those within the boundary, a travel distance of one hour would imply a point estimate of reform effects of 11%.

4.2 Changes in land use

Beyond encouraging higher levels of land-attached investment, tenure security is also a pre-condition for decentralized land transfers that can increase overall efficiency by better aligning land use with economic incentives (Besley and Ghatak 2010). To check if Chengdu's reforms may have triggered such change, table 4presents results from regressions of the share of land in a village under different uses, in particular (i) arable agriculture vs. other less directly productive uses; (ii) non-residential compared to residential construction land; and (iii) unutilized or so-called wasteland. Results point towards no appreciable impact on the share of unutilized or 'waste' land, allaying fears that reforms may have led to unsustainable land expansion or deforestation but considerable changes within the agricultural and construction land categories.

For agricultural land, we find evidence of intensification of agricultural land use with a highly significant reform-induced increase of 2.5% in the share of land used for agriculture that is matched by a reform-induced decrease of almost equal magnitude (-2.2%) in the share of 'other' agricultural land. The placebo test illustrates that estimated reform impacts contrast with pre-reform trends (i.e. insignificant trend or a significant increase for arable and 'other' rural land, respectively), suggesting that, if anything, reforms reversed an earlier increase in 'other' agricultural land, helping to bring such land to more productive use.

A key goal of China's land policy has been to create incentives for bringing unused residential land to more productive use although implementing this has not always been easy or uncontroversial (Huang *et al.* 2014). Our results suggest that reforms led to a significant increase of 1.2 percentage points compared to a pre-reform mean of 3.9% in the share of non-residential construction land (table 4, panel A, column 4). This is matched by an almost equivalent decrease (a point estimate of 0.9%) in the share of residential construction land,[14] supporting the interpretation that it was creation of a more conducive environment for operation of land as well as labor markets that allowed the land freed up in this way to be formalized to allow its effective use in a way that is sanctioned by the law. We will explore below the extent to which construction land conversion to non-residential use created employment opportunities.

One of the advantages of village level data is the presence of considerable variation in terms of distances to the city that can be exploited by allowing the size of reform effects to vary with this variable. Estimates that do so suggest that reform-related increases in the share of arable agricultural land compared to the

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[14] While placebo tests point towards some reduction of residential land in Chengdu even before the reform -though of much smaller magnitude than after the reform, no such trend is evident for non-residential construction land.

'other' category are more pronounced at greater distances to Chengdu. At the same time, reform-induced increases of non-residential construction land are much larger as one moves closer to the city center and quickly disappear as one moves away from it.

4.3 Land market operation and enterprise start-ups

Although official records on actual land use are preferable to evidence on market-based transactions that may, for a range of reasons, not be formalized, data on transactions allow us to cross-check findings based on land use and ascertain if such changes are driven by market-based transactions. Results from doing so (table 5) suggest that, indeed, a significant part of the land use change observed earlier can be attributed to land market activity, in three respects. First, we note a significant increase in market-mediated transfers of construction land, albeit from a very low level, with point estimate of 1.8 percentage points suggesting that reform helped to almost double the pre-existing level of such transfers. The contrast with insignificantly negative point estimates in placebo regressions (panel B) suggests that estimates are unlikely to pick up pre-existing trends in Chengdu prefecture. Second, we find evidence of a significant reform-induced increase in formal transfers of agricultural land, with a point estimate of 7.1% or 4.9% with and without government-supported transfers, respectively, compared to a pre-reform level of 3.5% or 2.6%.[15]

Finally, we find a significant reform effect for shorter-term land transfers in informal markets with an estimated increase in the incidence of land market activity of 6.8%, compared to a pre-reform mean of 21%, contrasting with an insignificant pre-reform trend according to the placebo (panel B). We can also run regressions for the share of households participating in land markets. Results from doing so in table 5, col. 2-4 suggest that reform led to a significant increase in the share of households who either rented in or out, with point estimates of 1.0% and 0.8%, respectively, but did not affect mean shares of land transferred.[16] There is no evidence of significant pre-reform trends if other variables are controlled for, consistent with the notion of a reform-induced increase in the incidence of land market transactions.

Although suggestive of reform-induced increases in land market activity, the above results provide little detail on the extent to which reforms in land markets interacted with labor market outcomes. In the absence of household level information on time allocation or wages received, we use village-level data on enterprise start-ups to test for such effects. Results (table 6 col. 1 and 2) point towards significant reform-induced increases in the likelihood of overall enterprise start-ups, with point estimates of 2.7% and 3.1% with and without spatial fixed effects that are large compared to a pre-reform mean of 4.4% and contrast to insignificant pre-reform trends. For villages where new enterprise formation was observed, estimates of the

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[15] The placebo test suggests that, while we cannot reject the hypothesis of parallel trends in a linear model (table 1), the growth rate of formal land market transactions may already have been higher for villages inside as compared to outside the Chengdu prefecture boundary, before the reforms.
[16] While the fact that figures are based on recall by village leaders implies that all of effects reported in table 5 should be treated with greater caution than the others that are based on information taken from administrative records, we think they are still of interest and worth reporting.

distribution of such enterprises by sector suggest that reforms led to a significant increase in the incidence of agricultural enterprises and a corresponding decrease of those in the tertiary sector.

5. Conclusion and policy implication

Use of village-level data, mostly from administrative records, allows us to assess the impact of far-reaching factor market reforms that were implemented in Chengdu prefecture through a 'rural-urban integration' experiment in 2008. We find that reforms significantly reduced the threat of reallocation or expropriation, thus facilitating more efficient land use, either through investment or by transferring land form less to more efficient uses and users. This resulted in higher shares of agricultural and construction land being used for arable and economic purposes. Many of the reform-induced land use changes were mediated through land markets, suggesting that reform efforts to improve transferability of land and reduce the transaction costs of land markets operation were not without impact. Beyond this, a significant increase in new enterprise startups may point towards independent impacts from labor market reforms. Most reform effects are estimated to have been larger closer to Chengdu city center. Given the evidence in support of reform-effects at village level, analysis of the productivity of land use, distributional effects, and more rigorous cost-benefit analysis of the reform using household level data could provide a promising area for future research.
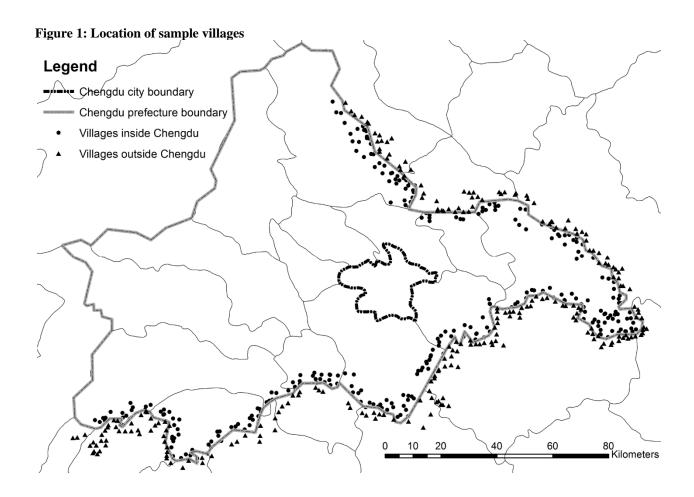
Figure 1: Location of sample villages

Table 1: Key parameters for villages inside and outside the Chengdu prefecture boundary

	Total	Before Outside	Inside	Total	After Outside	Inside	T test
Labor shares							
Agriculture	0.576	0.607	0.551	0.521	0.561	0.487	
Secondary industry	0.228	0.214	0.239	0.259	0.234	0.280	
Tertiary industry	0.195	0.177	0.210	0.220	0.204	0.234	
Labor working out of village <6 months	0.158	0.154	0.162	0.185	0.181	0.189	
Labor working out of county	0.248	0.270	0.230	0.288	0.311	0.269	
Land endowments							
Area of arable land per capita (mu)	1.410	1.425	1.400	1.485	1.420	1.532	
Area of residential land per capita (m^2)	109	101	115	105	109	103	
Share of arable land in total area	0.472	0.440	0.496	0.476	0.435	0.506	
Share of other agricultural land in total area	0.318	0.375	0.276	0.312	0.376	0.266	
Share of residential land in total area	0.057	0.049	0.063	0.054	0.052	0.055	
Share of other construction land in total area	0.039	0.033	0.044	0.049	0.037	0.057	
Share of unutilized land in total area	0.113	0.103	0.121	0.109	0.100	0.115	
Threats to tenure security							
Any reallocation	0.051	0.024	0.073	0.040	0.047	0.034	
… if yes, number of reallocations	1.140	1.261	1.107	1.369	1.311	1.436	
… if yes, area involved	0.083	0.184	0.061	0.134	0.063	0.199	
… if yes, share of households involved	0.176	0.324	0.133	0.181	0.126	0.248	
Any expropriation	0.017	0.007	0.025	0.059	0.063	0.056	**
… if yes, number of expropriations	1.222	1.286	1.207	1.560	1.984	1.156	
… if yes, area involved	0.080	0.020	0.085	0.065	0.058	0.071	
… if yes, share of households involved	0.145	0.085	0.158	0.145	0.176	0.117	
Informal transfers of arable land							
Any informal transfer of arable land	0.215	0.230	0.201	0.312	0.290	0.330	
… if yes, share of areas transferred	0.111	0.095	0.128	0.140	0.121	0.156	
… if yes, share of households renting out	0.100	0.081	0.120	0.144	0.118	0.163	
… if yes, share of household renting in	0.069	0.059	0.083	0.090	0.066	0.112	
… if yes, share of transfer period <=5 years	0.667	0.606	0.724	0.555	0.513	0.583	
….if yes, share with close kin	0.537	0.521	0.554	0.550	0.534	0.565	
… if yes, share with outsiders	0.254	0.249	0.264	0.325	0.331	0.314	
… if yes, share without rental	0.568	0.543	0.593	0.601	0.606	0.597	
Formal transfers of arable land							
Dummy: Any formal transfer	0.043	0.013	0.069	0.124	0.058	0.180	**
… if yes, # of formal transfers	1.391	1.077	1.444	1.441	1.232	1.498	
… if yes, share of area transferred	0.071	0.073	0.071	0.095	0.063	0.102	
… if yes, share of households involved	0.147	0.161	0.144	0.140	0.109	0.149	
… if yes, share not mediated by local government	0.707	0.923	0.671	0.677	0.732	0.662	
… if yes, share of transfer period <=5 years	0.000	0.000	0.000	0.066	0.154	0.042	
… if yes, share of transfer period 6-30 years	0.769	0.750	0.772	0.786	0.642	0.825	
… if yes, share of transfer period >30 years	0.231	0.250	0.228	0.148	0.204	0.133	
Formal transfers of construction land							
Dummy: Any transfer of construction land	0.014	0.018	0.010	0.032	0.026	0.036	
… if yes, # of construction land transfers	1.103	1.059	1.167	1.493	1.200	1.667	
… if yes, area transferred/constr. land area	0.062	0.023	0.098	0.128	0.078	0.153	
… if yes, share of transfer period>=30 years	0.586	0.647	0.500	0.644	0.660	0.634	
Enterprises							
Dummy: Any enterprise	0.044	0.039	0.048	0.068	0.049	0.084	
… if yes, # of enterprises	1.108	1.053	1.145	1.431	1.617	1.340	
… if yes, share in agriculture	0.236	0.235	0.236	0.446	0.278	0.525	
… if yes, share in secondary sector	0.478	0.529	0.445	0.308	0.487	0.224	
… if yes, share in tertiary sector	0.287	0.235	0.318	0.246	0.235	0.251	
Geo variables							
Travelling time to Chengdu (hour)				1.43	1.56	1.32	
Euclidean distance to Chengdu (km)	52.67	55.75	50.09	52.67	55.75	50.09	

Source: Own computation from 2014 Chengdu village survey based on 529 villages. As explained in the text, the t-test is for the hypothesis of parallel trends pre-reform; stars indicate the confidence level with which this hypothesis can be rejected as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Characteristics of the land certification process

	Total	Collect.	Arable	Forest	Constr.	Residential	Houses
				Land type			
Main characteristics							
Total area	12,790	7,052	3,295	1,859	343	316	237
Titling complete	0.938	0.974	0.979	0.964	0.900	0.911	0.911
…if yes, months taken	5.011	4.157	4.455	5.961	5.080	5.330	5.711
No. of certificates issued	2,852	95	781	633	393	717	719
Area titled (mu)	9,033	5,861	3,159	1,695	306	267	219
Organization and implementation							
Rules made by village leaders	0.015	0.019	0.018	0.011	0.017	0.017	0.015
Rules made by village representatives	0.127	0.133	0.135	0.121	0.131	0.117	0.124
Rules made by village assembly	0.444	0.437	0.465	0.447	0.383	0.438	0.458
Rules made by village econ. Organizations	0.225	0.211	0.223	0.232	0.257	0.229	0.215
Rules made by township or above	0.188	0.200	0.160	0.189	0.211	0.200	0.189
Organization done by village leaders	0.271	0.264	0.276	0.220	0.176	0.270	0.278
Organization done by village representatives	0.047	0.048	0.046	0.079	0.049	0.045	0.043
Organization done by village assembly	0.129	0.117	0.141	0.126	0.126	0.139	0.141
Organization done by village econ. organizations	0.113	0.095	0.131	0.105	0.082	0.127	0.123
Organization done by township or above	0.439	0.476	0.406	0.471	0.566	0.418	0.415
Actual measurement done by village leaders	0.075	0.074	0.078	0.079	0.088	0.070	0.073
Actual measurement by village representatives	0.436	0.415	0.468	0.497	0.337	0.434	0.462
Actual measurement done by village assembly	0.041	0.029	0.039	0.026	0.050	0.029	0.047
Actual measurement by village econ. organizations	0.289	0.265	0.309	0.330	0.337	0.307	0.298
Actual measurement done by township or above	0.159	0.217	0.106	0.068	0.188	0.160	0.120
Disputes							
Any disputes encountered	0.502	0.185	0.452	0.314	0.196	0.244	0.243
… if yes, no. of disputes	11.102	6.860	9.367	8.883	5.600	7.695	6.652
… disputes could not be resolved at village level	0.877	0.104	0.772	0.746	0.029	1.000	0.677
Results							
Contract now longer than 30 years	0.959	0.974	0.869	0.968	1.000	0.984	0.989
Contract now permanent	0.793	0.844	0.578	0.590	0.910	0.914	0.899
Resources required and costs							
Total labor from village (man-days)	1,918						
Total labor from outside (man-days)	269						
Total cost (Y/mu)	16.15						
Share of cost borne by village	0.431						

Source: Own computation from 2014 Chengdu village survey based on 529 villages.

Table 3: Impact of reform on threats to tenure security

	Any reallocation		Any expropriation	
Panel A: Basis				
Chengdu*After	-0.047**	-0.053***	-0.024*	-0.024**
	(0.023)	(0.012)	(0.014)	(0.010)
Observations	4,186	4,186	4,186	4,186
R-squared	0.010	0.272	0.004	0.220
Panel B: Placebo				
Chengdu*After	0.048*	0.047***	0.007	0.015
	(0.026)	(0.017)	(0.008)	(0.012)
Observations	2,095	2,095	2,095	2,095
R-squared	0.011	0.557	0.010	0.294
Panel C Het. effects				
Chengdu*After	-0.044*	-0.047***	-0.030**	-0.044***
	(0.026)	(0.011)	(0.015)	(0.012)
Chengdu*After*Time	0.061***	0.057***	0.021	0.029**
	(0.010)	(0.011)	(0.016)	(0.013)
Observations	4,186	4,186	4,186	4,186
R-squared	0.016	0.277	0.005	0.226
Spatial fixed effects	Yes	No	Yes	No

Notes: Village fixed effects are included. Village time-variant characteristics are controlled for throughout but not reported. These include total area and population, share of the households with access to pension and health schemes as well as the amount of agricultural subsidy, distance to the nearest county road, surface of the village road, and indicator variables for primary schools and medical stations within the village. Time is z score of google travelling time from a village to the center of Chengdu (μ=1.43h, σ=0.40h). Standard errors adjusted for spatial correlation and serial correlation are in parentheses. If spatial fixed effects are included, otherwise they are adjusted for serial correlation within the village. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Impact of reform on shares of land used for different purposes

	Agricultural land		Construction land		Unutilized
	arable	'other'	non-residential	residential	land
Panel A					
Chengdu*After	0.025***	-0.022***	0.012**	-0.009***	-0.006
	(0.006)	(0.005)	(0.005)	(0.002)	(0.004)
Observations	1,842	1,842	1,842	1,842	1,842
R-squared	0.110	0.025	0.039	0.082	0.207
Panel B					
Chengdu*After	0.003	0.009*	0.001	-0.002**	-0.010**
	(0.003)	(0.005)	(0.002)	(0.001)	(0.004)
Observations	912	912	912	912	912
R-squared	0.266	0.092	0.037	0.137	0.183
Panel C					
Chengdu*After	0.032***	-0.028***	0.010*	-0.009***	-0.005
	(0.006)	(0.005)	(0.005)	(0.002)	(0.005)
Chengdu*After*Time	0.027***	-0.006	-0.014**	0.004***	-0.011***
	(0.006)	(0.005)	(0.005)	(0.001)	(0.004)
Observations	1,842	1,842	1,842	1,842	1,842
R-squared	0.130	0.031	0.050	0.088	0.210
Spatial fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Village fixed effects are included. Village time-variant characteristics are controlled for throughout but not reported. These include total area and population, share of the households with access to pension and health schemes as well as the amount of agricultural subsidy, distance to the nearest county road, surface of the village road, and indicator variables for primary schools and medical stations within the village. Time is z score of google travelling time from a village to the center of Chengdu (μ=1.43h, σ=0.40h). Standard errors adjusted for spatial correlation and serial correlation are in parentheses. If spatial fixed effects are included, otherwise they are adjusted for serial correlation within the village. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Impact of reform on land transfers

| | Construction | Agricultural | | | | | |
| | | Formal | | Informal | | | |
	any rent	any rent	any rent	any rent	area %	rent out %	rent in %
Panel A							
Chengdu*After	0.018**	0.071***	0.049***	0.068***	0.007	0.010**	0.008**
	(0.009)	(0.019)	(0.015)	(0.022)	(0.005)	(0.005)	(0.003)
Observations	4,186	4,186	4,186	2,094	2,040	2,080	1,944
R-squared	0.004	0.010	0.010	0.020	0.016	0.026	0.022
Panel B							
Chengdu*After	-0.006	0.035***	0.026**	0.006	-0.000	-0.003	0.001
	(0.007)	(0.010)	(0.010)	(0.015)	(0.003)	(0.003)	(0.001)
Observations	2,095	2,095	2,095	1,049	1,031	1,042	991
R-squared	0.006	0.015	0.023	0.020	0.015	0.051	0.049
Panel C							
Chengdu*After	0.013	0.067***	0.052***	0.061***	0.008	0.010*	0.007**
	(0.010)	(0.021)	(0.017)	(0.023)	(0.006)	(0.005)	(0.003)
Chengdu*After	-0.000	0.004	-0.001	-0.011	0.006	0.005	0.005**
*Time	(0.009)	(0.018)	(0.015)	(0.017)	(0.005)	(0.004)	(0.002)
Observations	4,186	4,186	4,186	2,094	2,040	2,080	1,944
R-squared	0.004	0.010	0.010	0.020	0.017	0.026	0.024
Spatial fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Spatial fixed effects and village fixed effects are included throughout. Village time-variant characteristics are controlled for throughout but not reported. These include total area and population, share of the population with access to pension and health schemes as well as agricultural subsidy, distance to the nearest county road, surface of the village road, and indicator variables for primary schools and medical stations within the village. Time is z score of google travelling time from a village to the center of Chengdu (μ=1.43h, σ=0.40h). Standard errors adjusted for spatial correlation and serial correlation are in parentheses. If spatial fixed effects are included, otherwise they are adjusted for serial correlation within the village. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Impact of reform on new enterprise startups

	Any startup in village		… if yes, share of		
			agriculture	industry	services
Panel A					
Chengdu*After	0.027*	0.031**	0.580***	-0.220	-0.360*
	(0.016)	(0.013)	(0.166)	(0.149)	(0.206)
Observations	4,186	4,186	223	223	223
R-squared	0.004	0.262	0.822	0.809	0.803
Panel B					
Chengdu*After	0.006	0.008	-0.100	0.313	-0.213
	(0.013)	(0.019)	(0.323)	(0.603)	(0.584)
Observations	2,095	2,095	87	87	87
R-squared	0.004	0.419	0.914	0.910	0.951
Panel C					
Chengdu*After	0.025	0.031**	0.742***	-0.250	-0.492**
	(0.019)	(0.013)	(0.203)	(0.190)	(0.208)
Chengdu*After*Time	0.011	0.003	-0.189	-0.170	0.359*
	(0.013)	(0.011)	(0.167)	(0.177)	(0.182)
Observations	4,186	4,186	223	223	223
R-squared	0.004	0.262	0.827	0.810	0.811
SFE	Yes	No	No	No	No

Notes: Village fixed effects are included. Village time-variant characteristics are controlled for throughout but not reported. These include total area and population, share of the households with access to pension and health schemes as well as the amount of agricultural subsidy, distance to the nearest county road, surface of the village road, and indicator variables for primary schools and medical stations within the village. Time is z score of google travelling time from a village to the center of Chengdu (μ=1.43h, σ=0.40h). Standard errors adjusted for spatial correlation and serial correlation are in parentheses. If spatial fixed effects are included, otherwise they are adjusted for serial correlation within the village. *** p<0.01, ** p<0.05, * p<0.1.

Appendix table 1: Village characteristics used in the regressions

	Before		After	
	Outside	**Inside**	**Outside**	**Inside**
Total population	1,433	2,199	1,554	2,323
Share of households with access to rural pension	0.000	0.000	0.493	0.657
Share of households with access to cooperative health scheme	0.529	0.567	0.865	0.892
Amount of agricultural subsidy (yuan/mu)	68,491	90,275	201,608	268,608
Distance to the nearest county road (km)	8.382	6.375	8.231	6.141
Share of asphalt village road	0.046	0.127	0.054	0.123
Share of cement village road	0.463	0.651	0.757	0.786
Share of villages with primary school	0.448	0.307	0.272	0.175
Share of villages with medical stations	0.728	0.806	0.820	0.852

Source: Own computation from 2014 Chengdu village survey based on 529 villages.

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