Appendix to “Place-based Land Policy and Spatial Misallocation: Theory and Evidence from China”

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A Supplements to the Empirical Analysis

In this section, we implement nine groups of robustness checks for our empirical analysis. We also investigate the policy effect on some other outcome variables in the last subsection.

A.1 Robustness Checks for TFP Estimation Method

First, we implement the empirical analysis using firm-level TFP calculated with the methods proposed by Levinsohn and Petrin (2003). Table A1 shows the results of the primary regression. All results are very similar to the results when we calculate TFP using the OP method.

Table A1: RD-DID Results on TFP (LP)

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0580	-0.0948**
	(0.0478)	(0.0439)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	85,748	100,054
R-squared	0.1418	0.1495

Notes: The dependent variable is firm-level TFP measured by the Levinsohn and Petrin (2003) method. The regression specifications are identical to Table 2. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

A.2 Robustness Checks for Bandwidth Choices

Second, we adjust the bandwidth for the linear and quadratic smoothing functions. We present results for bandwidth choices ranging from 20 km to 70 km in Tables A2 and A3. The results remain qualitatively robust, although when we reduce the bandwidth, we lose observations, leading to decreased estimation precision.

Table A2: Robustness: TFP Regressions with Different Bandwidth Choices (OP)

bandwidth	(1) 20km	(2) 30km	(3) 40km	(4) 50km	(5) 60km	(6) 70km
Post2003×east	-0.0235	-0.0120	-0.0782*	-0.0830**	-0.0576*	-0.0272
	(0.0682)	(0.0512)	(0.0426)	(0.0363)	(0.0330)	(0.0298)
City Lagged Controls	Y	Y	Y	Y	Y	Y
Border FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	39,747	72,488	100,054	126,265	152,064	184,678
R-squared	0.1303	0.1114	0.1162	0.1196	0.1208	0.1161

Notes: The dependent variable is firm-level TFP measured by the Olley and Pakes (1992) method. The set of lagged city-level control variables includes the log of GDP, the log of population, the log of city area, and the scale of the service sector. We use a linear fit as the smoothing function. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A3: Robustness: TFP Regressions with Different Bandwidth Choices (LP)

bandwidth	(1) 20km	(2) 30km	(3) 40km	(4) 50km	(5) 60km	(6) 70km
Post2003×east	-0.0056	-0.0102	-0.0948**	-0.0953**	-0.0691**	-0.0377
	(0.0694)	(0.0526)	(0.0439)	(0.0374)	(0.0341)	(0.0310)
City Lagged Controls	Y	Y	Y	Y	Y	Y
Border FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Observations	39,747	72,488	100,054	126,265	152,064	184,678
R-squared	0.1644	0.1444	0.1495	0.1532	0.1547	0.1504

Notes: The dependent variable is firm-level TFP measured by the Levinsohn and Petrin (2003) method. The set of lagged city-level control variables includes the log of GDP, the log of population, the log of city area, and the scale of the service sector. We use a linear fit as the smoothing function. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

A.3 Robustness Checks for Without City-level Controls

Third, we run all main regressions without city-level lagged control variables for two reasons. First, although we use lagged city characteristics, there may still be a serial correlation with current period values, potentially leading to bad control issues. Second, this can also serve as a balance check. If dropping controls does not significantly change the point estimates and the R-squares, it suggests that the likelihood of omitted variable bias (in this case, location-period level unobserved variables) is low (Oster, 2019). Tables A4 and A5 demonstrate that the resulting estimates are similar to those in the regressions with control variables. The point estimates remain virtually unchanged. This implies that adding city characteristics does not affect the regression results, further validating the assumption that cities at the border have similar trends.

Table A4: Robustness: TFP Regressions without City-level Controls (OP)

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0844**	-0.0717*
	(0.0356)	(0.0426)
City Lagged Controls	N	N
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	131,250	100,054
R-squared	0.1157	0.1116

Notes: The dependent variable is firm-level TFP measured by the Olley and Pakes (1992) method. The regression specifications are identical to Table 2, except we drop all city-level lagged controls. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A5: Robustness: TFP Regressions without City-level Controls (LP)

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0530	-0.0884**
	(0.0479)	(0.0439)
City Lagged Controls	N	N
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	85,748	100,054
R-squared	0.1375	0.1446

Notes: The dependent variable is firm-level TFP measured by the Levinsohn and Petrin (2003) method. The regression specifications are identical to Table 2, except we drop all city-level lagged controls. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

A.4 Keeping Slopes Unchanged at the Boundary

Fourth, we change the regression specification to be more parsimonious by keeping slopes unchanged at the boundary. That is, we drop the fourth and the seventh terms in the main regression to have:

$$
\begin{aligned}
ln(y_{ibct}) = \alpha + \beta_1 East_{ibt} + \beta_2 f(Dist_{ibt}) + Post2003 \times [\delta_1 East_{ibt} + \delta_2 f(Dist_{ibt})] \\
+ \beta_4 X_{ct-1} + \phi_{bt} + \gamma_t + \psi_i + \epsilon_{ibct} \qquad (1)
\end{aligned}
$$

Table A6 shows that the results are not changed in this setting. Thus, our conclusion is not sensitive to the choice of the regression discontinuity functional form.

Table A6: **RD-DID Results with No Slope Change (OP)**

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0859**	-0.0777*
	(0.0346)	(0.0416)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	131,250	100,054
R-squared	0.1203	0.1162

Notes: We keep the slopes unchanged around the boundary in this setting. The dependent variable is firm-level TFP measured by the Olley and Pakes (1992) method. The set of lagged city-level control variables includes the log of GDP, the log of population, the log of city area, and the scale of the service sector. The sample in the Local Linear regression specification is restricted to be within an optimal bandwidth using a constant kernel. The sample in the Polynomial RD cases is restricted to be within a bandwidth of 40 km around the raw boundary. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

A.5 Thick Border

Fifth, following Michalopoulos and Papaioannou (2014)'s recommendation, we use a thick border in our regression analysis. Provincial borders are often formed by geographical features such as mountains or rivers, and firms at these boundaries may differ significantly from other firms. To address this, we exclude firms within 10 km on both sides of the original provincial borders and extend our bandwidth by 10 km as a compliment. This approach mitigates the potential impact of these unique geographic characteristics on our results. Table A7 presents the results using a thick border, and there are no significant changes compared with our baseline setting.

A.6 Moving Firms

Sixth, our empirical analysis is based on the National Industrial Enterprise Database, a panel dataset that tracks firm movements during the survey years. However, a potential concern is that these relocation decisions may not be exogenous and could be influenced by implementing the inland-favoring land policy. For instance, firms on the eastern side of the border may move to the other side of the boundary to take advantage of cheaper land rent. If the policy's effect on the local productivity gap is solely a result of these relocations, it may not have a meaningful impact on the economy as a whole.

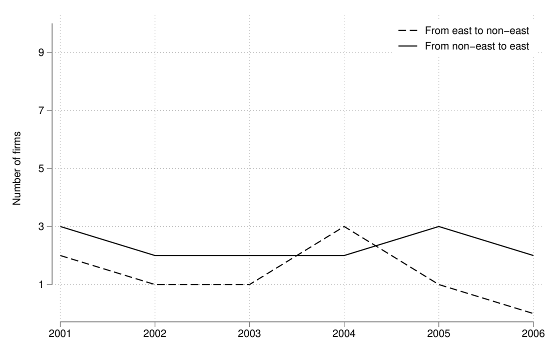
Table A7: **RD-DID Results with Thick Border (OP)**

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.1029	-0.0977*
	(0.0710)	(0.0510)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	79,668	111,595
R-squared	0.1077	0.1165

Notes: We drop all firms within 10 km of both sides of the boundaries and create a thick border. The dependent variable is firm-level TFP measured by the Olley and Pakes (1992) method. The set of lagged city-level control variables includes the log of GDP, the log of population, the log of city area, and the scale of the service sector. The sample in the Local Linear regression specification is restricted to be within an optimal bandwidth using a constant kernel. The sample in the Polynomial RD cases is restricted to be within a bandwidth of 40 km. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Figure A1 illustrates the yearly count of companies relocated from eastern to non-eastern regions and vice versa between 2001 and 2007. Generally, the number of relocating firms is minimal. For instance, only 3 out of 10,000 firms in our data moved from eastern to non-eastern regions in 2004. Additionally, we do not find any sudden change around the policy year 2003. Table A8 shows the main regression results when we drop all movers. There is no significant change.

Figure A1: **Number of Movers from 2001 to 2007**



Notes: This figure shows the number of firms relocating from eastern to non-eastern regions and from non-eastern to eastern regions in each year between 2001 and 2007.

Table A8: **RD-DID Results without Movers (OP)**

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0827**	-0.0754*
	(0.0356)	(0.0427)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	131,749	99,953
R-squared	0.1198	0.1161

Notes: We drop all firms moving their locations. The dependent variable is firm-level TFP measured by the Olley and Pakes (1992) method. The set of lagged city-level control variables includes the log of GDP, the log of population, the log of city area, and the scale of the service sector. The sample in the Local Linear regression specification is restricted to be within an optimal bandwidth using a constant kernel. The sample in the Polynomial RD cases is restricted to be within a bandwidth of 40 km. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

A.7 Placebo Test

In this section, we conduct a placebo test by shifting the boundary to the east and west and examining whether any discontinuities occur. We use a linear fit as the smoothing function, and the bandwidth is 40 km. Table A9 reveals that we do not observe any significant effects.

Table A9: Placebo Test on TFP (OP)

	(1) West 50km	(2) West 100km	(3) East 50km	(4) East 100km
Post2003×East	-0.0209	-0.0060	-0.0215	0.0139
	(0.0421)	(0.0316)	(0.0186)	(0.0142)
City Lagged Controls	Y	Y	Y	Y
Border FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Observations	51,068	67,420	192,250	272,117
R-squared	0.7411	0.7363	0.7153	0.6968

Notes: The dependent variable is firm-level TFP measured by the Levinsohn and Petrin (2003) method. In columns (1) and (2), we move the boundary to the west by 50 and 100 kilometers. In columns (3) and (4), we move the boundary to the east by 50 and 100 kilometers. We use a linear fit as the smoothing function, and the bandwidth is 40 km. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

A.8 Robustness Checks for The WTO Effect

Seventh, China joined the WTO at the end of 2001, leading to significant changes in the country's economic structure. Despite being around two years before the inland-favoring land supply policy, we remain concerned about potential confounding effects from the reduction in trade barriers, which may have influenced eastern and inland firms differently. To address this issue, we conduct the TFP regression using only firms with zero exports, as they should be the least affected by any WTO effects. Additionally, we run the main regression while controlling for firm-level exporting to eliminate any WTO-related influence. The regression results are displayed in Tables A10, A11, A12, and A13. Our main conclusions remain consistent. We also find that a firm's exporting activity positively relates to its productivity, which aligns with predictions in the trade literature (Bernard et al., 2007, 2018).

Table A10: Robustness: TFP Regressions without Exporting Firms (OP)

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0896**	-0.1082**
	(0.0406)	(0.0487)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	105,161	79,951
R-squared	0.1229	0.1204

Notes: The dependent variable is firm-level TFP measured by the Olley and Pakes (1992) method. The regression specifications are identical to Table 2. We drop all firms with positive exports. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A11: Robustness: TFP Regressions without Exporting Firms (LP)

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.1175**	-0.1399***
	(0.0550)	(0.0502)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	68,439	79,951
R-squared	0.1454	0.1533

Notes: The dependent variable is firm-level TFP measured by the Levinsohn and Petrin (2003) method. The regression specifications are identical to Table 2. We drop all firms with positive exports. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A12: Robustness: TFP Regressions Controlling for Exporting (OP)

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0725**	-0.0682
	(0.0356)	(0.0426)
log(Export)	0.0157***	0.0160***
	(0.0013)	(0.0015)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	131,250	100,054
R-squared	0.1222	0.1181

Notes: We additionally control for firm-level export in this regression. The dependent variable is firm-level TFP measured by the Olley and Pakes (1992) method. The regression specifications are otherwise identical to Table 2. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A13: Robustness: TFP Regressions Controlling for Exporting (LP)

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0431	-0.0787*
	(0.0476)	(0.0437)
log(Export)	0.0253***	0.0256***
	(0.0016)	(0.0015)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	85,748	100,054
R-squared	0.1467	0.1543

Notes: We additionally control for firm-level export in this regression. The dependent variable is firm-level TFP measured by the Levinsohn and Petrin (2003) method. The regression specifications are otherwise identical to Table 2. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

A.9 Robustness Checks for Subsidy and Tax Policies

Eighth, we attempt to rule out the effects of other concurrent subsidy and tax policies that may have been implemented alongside the land reform. Apart from the land supply policy, the Chinese government also enacted other inland-favoring measures to promote economic growth in those regions, such as manufacturing subsidies. We conduct the primary regression using firm-level government subsidies as the outcome variable to check whether relative subsidies changed for firms at the border during the same year the inland-favoring land policy was introduced. Table A14 indicates that firms on either side of the border received similar government subsidies before and after 2003. We then carry out the firm-level TFP regressions with additional controls, including city-level central government subsidies per capita, firm subsidies from the government, and firm-level taxes paid to the government. Tables A15 and A16 demonstrate that the main results remain consistent across all regression settings.

Table A14: RD-DID Results on Firm-level Subsidies

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0084	-0.0089
	(0.0164)	(0.0168)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	101,083	96,756
R-squared	0.0009	0.0010

Notes: The dependent variable is firm-level subsidies. The set of lagged city-level control variables includes the log of GDP, the log of population, the log of city area, and the value added to the service sector. The sample in the local linear regression specification is restricted to be within an optimal bandwidth using a constant kernel. The sample for the Polynomial RD cases is restricted to be within a bandwidth of 40 km around the raw boundary. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A15: RD-DID Results with Firm-level Subsidy and Tax Controls (OP)

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0914**	-0.0950**
	(0.0363)	(0.0434)
Tax	0.0014***	0.0015***
	(0.0002)	(0.0003)
Subsidy	-0.0051	-0.0168
	(0.0099)	(0.0112)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	126,897	96,756
R-squared	0.1221	0.1183

Notes: The dependent variable is firm-level TFP measured by the Olley and Pakes (1992) method. We additionally control for firm-level subsidies and firm-level taxes in these regressions. The regression specifications are identical to Table 2. We drop city-level lagged controls. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A16: RD-DID Results with Firm-level Subsidy and Tax Controls (LP)

	(1) Local Linear	(2) Poly RD (Poly=1)
Post2003×East	-0.0761	-0.1081**
	(0.0487)	(0.0445)
Tax	0.0017***	0.0017***
	(0.0003)	(0.0003)
Subsidy	-0.0103	-0.0037
	(0.0125)	(0.0113)
City Lagged Controls	Y	Y
Border FE	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	82,929	96,756
R-squared	0.1455	0.1535

Notes: The dependent variable is firm-level TFP measured by the Levinsohn and Petrin (2003) method. We additionally control for firm-level subsidies and firm-level taxes in these regressions. The regression specifications are identical to Table 2. We drop city-level lagged controls. The standard errors are clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

A.10 Additional Empirical Results on Other Outcome Variables

In this section, we investigate the inland-favoring land supply policy's effect on other outcome variables to validate our mechanism. First, we examine the direct effect on land prices using land transaction data. Second, we consider the effect on city-level wages and housing prices.

A.10.1 Policy Effect on Land Prices

To estimate the effect of the inland-favoring land policy on land prices, we utilize land transaction data from 2002 to 2018, collected from the China Land Market Website (`http://www.landchina.com/`). The dataset includes unique land IDs, parcel locations, land usage (industrial land, commercial/service sector land, housing land, and others), land area, and leasing prices. Prices are denominated in 10,000 Yuan per square meter.

Our primary empirical strategy for analyzing land prices is a simple DID. The RD-DID specification is not feasible due to insufficient data around the boundary. Local land administration departments were required to publish information on the transfer of state-owned land-use rights only after the passage of *The Regulations on the Disposition of State-Owned Land Use Rights for Auctions and Biddings* in 2007. Consequently, the sample size of data before 2007 is very limited.

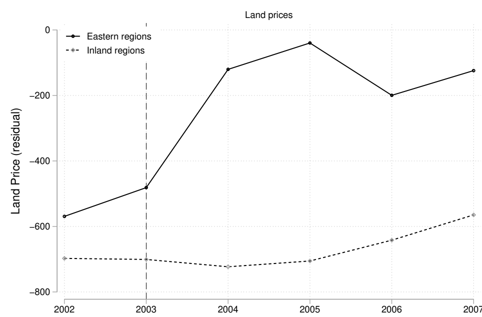
For land parcel i in city c and year t, we have the following regression:

$$ln(y_{ict}) = \alpha + Post2003 \times East_i + \beta_4 X_{ct-1} + \gamma_t + \psi_c + \epsilon_{ict} \tag{2}$$

where y_{ict} is the log price of land parcel i. $East_{it}$ is a dummy that equals one if the land parcel is located in the eastern region. X_{ct-1} is a set of lagged city-level control variables, including the log of GDP, the log of population, the log of city area, and the value added to the service sector. γ_t is the year fixed effect. ψ_c is the city fixed effect.

Figure A2 and A3 display the time trends and event study regression results for land prices. The pre-trend before 2003 is insignificant (although we have only one data point). Furthermore, we observe a notable increase in the land price gap between eastern and inland regions. Table A17 presents the DID regression results. Column (1) showcases the results when using the same sample years as in the TFP regression, while Column (2) includes the results when incorporating all available sample years. Our findings suggest that the inland-favoring land policy expanded the land price gap between eastern and non-eastern regions by 16 percentage points.

Figure A2: **Time Trends of Land Price**



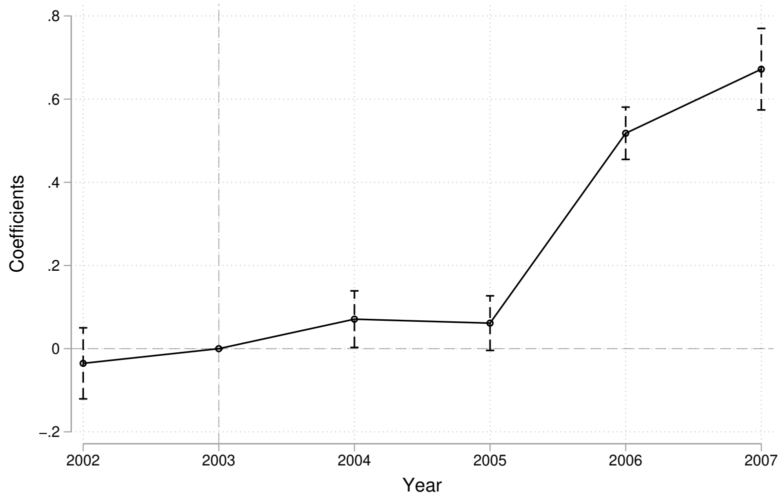
Notes: This figure shows the time trends of land parcel price. The black line is the average outcome value in the developed eastern region, and the grey line is the average outcome value in the inland region. The dashed vertical line indicates the implementation of the inland-favoring land policy.

Table A17: **DID Results on Land Prices**

	(1) Sample 02-07	(2) Sample 02-18
Post2003×East	0.155***	0.399***
	(0.0318)	(0.0307)
City Lagged Controls	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	201,436	1,415,302
R-squared	0.480	0.453

Notes: The dependent variable is land parcel prices. The set of lagged city-level control variables includes the log of GDP, the log of population, the log of city area, and the scale of the service sector. We also control for some land parcel level characteristics, including their leasing years, parcel quality rank, and distance to CBD. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Figure A3: **Event Study - Land Price**



Notes: The dependent variable is land price. The corresponding confidence interval is 95%.

A.10.2 Policy Effect on Wages and Housing Prices

Furthermore, we examine the impact of the inland-favoring policy on the wage and housing price disparities between eastern and non-eastern regions. We employ city-level data from City Statistical Yearbooks and conduct two simple DID regressions. The outcomes are presented in Table A18. Our findings indicate that the inland-favoring land policy led to a reduction in the average wage gap by 2 percentage points and an increase in the average housing price gap by 7 percentage points between eastern and non-eastern regions.

Table A18: **DID Results on Wages and Housing Prices**

	(1) Wages	(2) Housing Prices
Post2003×East	-0.0210*	0.0673**
	(0.0122)	(0.0269)
Province × Time Trend	Y	Y
GDP per capita × Time Trend	Y	Y
Industry Share × Time Trend	Y	Y
Year FE	Y	Y
Firm FE	Y	Y
Observations	1,792	1,789
R-squared	0.9385	0.7421

Notes: The dependent variables are city-level average wages and housing prices. We also control for province-specific time trends, GDP per capita by time trend, and industry share by time trend. Standard errors are clustered at the city level. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

B Supplements to the Equilibrium Quantitative Analysis

B.1 List of Cities by Productivity and Land Tightness

Table B1: List of Cities

City Name	GDP Per Capita (RMB)	Group	TFP 05	TFP 10	Land Abundance 2005	Land Abundance 2010
Beijing	38315	East, High	38.96	40.85	0.13	0.11
Tianjin	34170	East, Middle	38.95	41.63	0.03	0.14
Shijiazhuang	31850	East, Middle	36.53	39.25	0.12	0.04
Tangshan	27995	East, Middle	38.40	40.81	0.18	0.07
Qinhuangdao	39214	East, High	35.29	39.82	0.25	0.09
Handan	19687	East, Middle	36.95	40.24	0.14	0.05
Xingtai	18043	East, Middle	37.72	40.16	0.11	0.04
Baoding	23312	East, Middle	37.06	39.76	0.07	0.04
Zhangjiakou	24225	East, Middle	36.59	40.02	0.18	0.06
Chengde	20145	East, Middle	37.23	38.90	0.14	0.19
Taiyuan	20622	Non-east, Middle	37.54	40.04	0.10	0.12
Datong	16655	Non-east, Middle	37.03	40.82	0.08	0.12
Yangquan	16700	Non-east, Middle	38.45	40.95	0.06	0.10
Changzhi	20807	Non-east, Middle	37.74	40.84	0.04	0.07
Jincheng	20974	Non-east, Middle	38.14	40.37	0.03	0.06
Shuozhou	13665	Non-east, Low	36.58	40.20	0.07	0.08
Jinzhong	9873	Non-east, Low	36.57	39.42	0.02	0.04
Yuncheng	7584	Non-east, Low	36.67	38.36	0.03	0.06
Xinzhou	4795	Non-east, Low	36.13	37.49	0.02	0.05
Linfen	10588	Non-east, Low	37.72	39.22	0.03	0.03
Hohhot	31585	Non-east, Middle	35.87	38.45	0.27	0.17
Baotou	39561	Non-east, High	38.23	40.04	0.20	0.17
Wuhai	20081	Non-east, Middle	37.16	40.21	0.11	0.24
Chifeng	7547	Non-east, Low	36.56	39.00	0.19	0.09
Tongliao	13789	Non-east, Low	35.66	38.95	0.15	0.13
Ordos	35380	Non-east, Middle	38.46	42.13	0.05	0.13
Hulunbeir	13785	Non-east, Low	37.38	39.64	0.06	0.05
Shenyang	34345	East, Middle	37.80	39.89	0.18	0.12
Dalian	54183	East, High	38.29	41.01	0.18	0.15
Anshan	43816	East, High	38.41	39.73	0.21	0.13
Fushun	19635	East, Middle	37.73	39.89	0.24	0.18
Dandong	15440	East, Low	36.49	38.92	0.11	0.07
Fuxin	11242	East, Low	35.80	38.30	0.19	0.18
Tieling	11041	East, Low	36.14	39.66	0.12	0.08
Chaoyang	10781	East, Low	36.98	39.56	0.07	0.08
Changchun	37003	East, Middle	36.92	39.22	0.14	0.21
Jilin	23046	East, Middle	37.01	39.94	0.15	0.16
Siping	14560	East, Low	35.11	39.04	0.08	0.10
Liaoyuan	12097	East, Low	36.96	39.00	0.17	0.21
Tonghua	14717	East, Low	37.28	39.48	0.06	0.07
White City	9091	East, Low	33.83	37.96	0.06	0.11
Harbin	30534	East, Middle	37.11	39.33	0.19	0.13
Qiqihar	13431	East, Low	36.40	36.94	0.15	0.15
Jixi	8480	East, Low	36.59	37.15	0.18	0.16
Hegang	8432	East, Low	37.03	39.52	0.16	0.13
Shuangyashan	12678	East, Low	37.52	38.34	0.32	0.18
Yichun	8546	East, Low	35.63	39.11	0.66	0.53
Jiamusi	14080	East, Low	35.08	39.27	0.14	0.18
Shanghai	57423	East, High	40.22	41.11	0.04	0.06
Nanjing	35464	East, Middle	39.36	40.89	0.32	0.16
Wuxi	58976	East, High	39.07	41.34	0.12	0.06
Xuzhou	31592	East, Middle	37.94	40.37	0.13	0.10
Changzhou	36335	East, Middle	39.05	40.78	0.08	0.06

Table B2: List of Cities (Continued)

City Name	GDP Per Capita (RMB)	Group	TFP 05	TFP 10	Land Abundance 2005	Land Abundance 2010
Suzhou	60326	East, High	39.99	41.71	0.08	0.04
Nantong	35059	East, Middle	38.01	41.08	0.04	0.04
Lianyungang	29298	East, Middle	36.46	39.71	0.20	0.09
Huaian	11557	East, Low	36.99	41.05	0.17	0.08
Yancheng	15929	East, Middle	36.56	40.16	0.08	0.04
Zhenjiang	34988	East, Middle	39.62	40.62	0.13	0.08
Hangzhou	49055	East, High	39.86	41.30	0.16	0.07
Ningbo	60381	East, High	39.70	41.42	0.06	0.05
Wenzhou	45795	East, High	38.72	40.79	0.07	0.03
Jiaxing	30988	East, Middle	39.34	41.00	0.08	0.03
Huzhou	26260	East, Middle	39.55	40.52	0.14	0.05
Shaoxing	35753	East, Middle	39.24	40.82	0.08	0.04
Jinhua	19113	East, Middle	39.02	40.57	0.06	0.02
Zhoushan	21215	East, Middle	38.80	41.26	0.17	0.10
Taizhou	30647	East, Middle	39.47	40.88	0.09	0.04
Lishui	17653	East, Middle	37.03	40.59	0.07	0.05
Hefei	29058	Non-east, Middle	39.50	41.73	0.29	0.15
Wuhu	33544	Non-east, Middle	38.00	40.41	0.22	0.17
Bengbu	15456	Non-east, Low	35.64	39.48	0.29	0.20
Huainan	9784	Non-east, Low	37.74	40.82	0.23	0.18
Ma'anshan	29536	Non-east, Middle	38.84	41.11	0.24	0.17
Huaibei	15007	Non-east, Low	36.00	40.43	0.23	0.15
Anqing	19917	Non-east, Middle	35.27	39.24	0.11	0.08
Chuzhou	17353	Non-east, Middle	36.06	39.78	0.07	0.08
Fuyang	4229	Non-east, Low	35.92	38.71	0.26	0.07
Suzhou	4900	Non-east, Low	35.21	38.58	0.10	0.09
Lu'an	3039	Non-east, Low	36.15	39.55	0.18	0.08
Bozhou	6314	Non-east, Low	35.66	39.55	0.14	0.10
Chizhou	7290	Non-east, Low	37.11	39.74	0.10	0.12
Xuancheng	8989	Non-east, Low	37.80	40.78	0.11	0.07
Fuzhou	43600	East, High	38.27	40.70	0.12	0.07
Xiamen	40146	East, High	38.74	43.06	0.15	0.10
Sanming	25396	East, Middle	37.59	40.23	0.05	0.04
Quanzhou	28010	East, Middle	38.79	40.83	0.02	0.04
Zhangzhou	29056	East, Middle	38.24	40.88	0.05	0.04
Nanping	16169	East, Middle	37.09	39.83	0.04	0.03
Longyan	24690	East, Middle	38.21	40.37	0.07	0.04
Ningde	12408	East, Low	37.51	39.92	0.03	0.03
Nanchang	28388	Non-east, Middle	37.39	39.96	0.15	0.11
Jingdezhen	19486	Non-east, Middle	35.95	37.91	0.23	0.17
Pingxiang	13828	Non-east, Low	36.99	40.47	0.21	0.07
Jiujiang	29840	Non-east, Middle	35.78	39.43	0.07	0.07
Xinyu City	12046	Non-east, Low	36.69	39.94	0.24	0.15
Yingtan	11379	Non-east, Low	36.98	39.81	0.14	0.12
Ganzhou	12262	Non-east, Low	36.66	39.61	0.05	0.04
Ji'an	14198	Non-east, Low	35.89	38.41	0.06	0.04
Yichun	4600	Non-east, Low	36.68	39.29	0.05	0.04
Shangrao	12052	Non-east, Low	36.20	39.64	0.04	0.03
Jinan	36697	East, Middle	38.28	39.39	0.18	0.14
Qingdao	43327	East, High	39.24	41.10	0.10	0.07
Zibo	37104	East, Middle	38.15	39.66	0.19	0.14
Zaozhuang	13923	East, Low	36.38	38.87	0.18	0.12
Dongying	86523	East, High	39.20	41.20	0.26	0.15
Yantai	35583	East, Middle	38.74	40.47	0.13	0.13
Weifang	24267	East, Middle	37.26	40.44	0.09	0.06
Jining	18548	East, Middle	37.25	40.17	0.05	0.06
Tai'an	16938	East, Middle	37.15	39.71	0.14	0.08
Weihai	48100	East, High	38.20	39.94	0.15	0.14
Rizhao	16930	East, Middle	36.40	40.02	0.16	0.15
Laiwu	18042	East, Middle	37.55	40.45	0.32	0.14

Table B3: List of Cities (Continued)

City Name	GDP Per Capita (RMB)	Group	TFP 05	TFP 10	Land Abundance 2005	Land Abundance 2010
Linyi	17479	East, Middle	36.98	40.25	0.13	0.08
Dezhou	24777	East, Middle	36.27	39.71	0.09	0.08
Liaocheng	8844	East, Low	36.58	39.03	0.13	0.08
Binzhou	19158	East, Middle	37.30	40.27	0.11	0.12
Zhengzhou	27261	Non-east, Middle	36.71	39.77	0.26	0.10
Kaifeng	11976	Non-east, Low	35.44	38.85	0.39	0.17
Luoyang	26555	Non-east, Middle	36.73	39.93	0.22	0.12
Pingdingshan	18337	Non-east, Middle	37.15	39.82	0.17	0.08
Anyang	19362	Non-east, Middle	36.74	39.54	0.18	0.07
Hebi	14703	Non-east, Low	34.47	39.15	0.39	0.16
Xuchang	14306	Non-east, Low	36.63	39.65	0.16	0.11
Luohe	23156	Non-east, Middle	35.12	38.29	0.53	0.14
Sanmenxia	15414	Non-east, Low	36.35	39.21	0.17	0.08
Nanyang	25615	Non-east, Middle	35.64	38.19	0.23	0.08
Shangqiu	14764	Non-east, Low	35.49	38.86	0.16	0.07
Zhoukou	13144	Non-east, Low	33.75	38.60	0.15	0.39
Wuhan	24963	Non-east, Middle	37.38	40.19	0.12	0.11
Shiyan	35874	Non-east, Middle	36.70	38.93	0.14	0.08
Yichang	26548	Non-east, Middle	36.03	38.15	0.09	0.10
Xiangfan	12493	Non-east, Low	36.02	38.84	0.15	0.10
Ezhou	13519	Non-east, Low	35.45	41.07	0.23	0.18
Jingmen	19907	Non-east, Middle	35.62	38.24	0.12	0.08
Xiaogan	6977	Non-east, Low	35.99	38.80	0.08	0.03
Jingzhou	10007	Non-east, Low	35.58	39.36	0.09	0.06
Huanggang	10270	Non-east, Low	34.97	38.78	0.05	0.06
Xianning	8278	Non-east, Low	35.60	38.93	0.08	0.12
Suizhou	8350	Non-east, Low	35.30	38.61	0.54	0.11
Changsha	34131	Non-east, Middle	37.89	40.15	0.10	0.10
Zhuzhou	24835	Non-east, Middle	38.31	40.75	0.12	0.09
Xiangtan	26112	Non-east, Middle	37.51	40.77	0.12	0.10
Hengyang	15457	Non-east, Low	37.17	40.47	0.15	0.08
Shaoyang	8988	Non-east, Low	36.07	39.96	0.07	0.05
Yueyang	28512	Non-east, Middle	37.32	39.85	0.12	0.08
Changde	18270	Non-east, Middle	37.19	39.62	0.10	0.08
Zhangjiajie	6514	Non-east, Low	38.52	39.86	0.19	0.13
Yiyang	8840	Non-east, Low	37.23	39.30	0.11	0.08
Chenzhou	14959	Non-east, Low	37.54	40.34	0.06	0.07
Yongzhou	8503	Non-east, Low	37.52	40.30	0.13	0.09
Huaihua	15795	Non-east, Middle	37.24	40.29	0.09	0.07
Guangzhou	63819	East, High	40.36	42.60	0.08	0.10
Shaoguan	19590	East, Middle	37.25	40.38	0.03	0.12
Shenzhen	59271	East, High	40.35	42.69	0.08	0.07
Zhuhai	64960	East, High	39.74	40.72	0.06	0.10
Shantou	12456	East, Low	36.43	39.54	0.06	0.11
Foshan	47500	East, High	38.99	40.83	0.03	0.03
Jiangmen	30791	East, Middle	37.57	40.37	0.04	0.08
Zhanjiang	24248	East, Middle	37.68	39.15	0.04	0.09
Maoming	20541	East, Middle	38.26	40.15	0.03	0.10
Zhaoqing	25943	East, Middle	38.09	40.02	0.03	0.11
Huizhou	37681	East, Middle	38.73	40.72	0.04	0.11
Meizhou	10984	East, Low	37.54	40.23	0.02	0.07
Shanwei	10193	East, Low	36.76	39.91	0.01	0.03
Heyuan	11453	East, Low	37.76	39.24	0.01	0.07
Yangjiang	18778	East, Middle	37.01	38.88	0.04	0.09
Qingyuan	12004	East, Low	38.13	40.27	0.03	0.10
Dongguan	71997	East, High	40.34	42.03	0.01	0.01
Zhongshan	44005	East, High	39.29	41.76	0.02	0.02
Yunfu	12543	East, Low	36.84	39.14	0.02	0.06

Table B4: List of Cities (Continued)

City Name	GDP Per Capita (RMB)	Group	TFP 05	TFP 10	Land Abundance 2005	Land Abundance 2010
Nanning	24296	Non-east, Middle	35.60	39.23	0.19	0.11
Liuzhou	23042	Non-east, Middle	37.31	40.60	0.21	0.12
Guilin	22192	Non-east, Middle	37.60	39.84	0.10	0.06
Beihai	18530	Non-east, Middle	36.92	39.25	0.23	0.16
Yulin	8573	Non-east, Low	37.22	39.63	0.10	0.07
Baise	12227	Non-east, Low	36.71	39.63	0.08	0.07
Hechi	9114	Non-east, Low	35.60	38.46	0.07	0.04
Laibin	5947	Non-east, Low	36.90	39.37	0.15	0.11
Chongzuo	6633	Non-east, Low	35.84	39.38	0.04	0.09
Haikou	17928	East, Middle	36.89	38.89	0.08	0.14
Sanya	9538	East, Low	37.76	39.96	0.10	0.12
Chongqing	13342	Non-east, Low	37.80	40.73	0.10	0.12
Chengdu	29463	Non-east, Middle	37.89	39.83	0.24	0.07
Zigong	14452	Non-east, Low	35.83	39.34	0.22	0.18
Panzhihua	20725	Non-east, Middle	36.92	40.26	0.42	0.15
Luzhou	10166	Non-east, Low	37.04	38.94	0.25	0.13
Deyang	15421	Non-east, Low	38.23	40.87	0.07	0.06
Mianyang	18200	Non-east, Middle	36.08	39.87	0.16	0.10
Guangyuan	6323	Non-east, Low	35.79	39.71	0.34	0.08
Suining	5207	Non-east, Low	36.71	39.23	0.25	0.08
Leshan	9887	Non-east, Low	36.45	38.76	0.19	0.07
Nanchong	6373	Non-east, Low	35.98	39.17	0.19	0.07
Meishan	8575	Non-east, Low	37.34	39.89	0.20	0.09
Yibin	16042	Non-east, Middle	36.45	39.78	0.09	0.08
Guang'an	4584	Non-east, Low	36.55	38.33	0.24	0.07
Ziyang	7540	Non-east, Low	36.70	39.07	0.10	0.09
Guiyang	18874	Non-east, Middle	36.68	39.57	0.16	0.11
Liupanshui	13504	Non-east, Low	38.03	40.34	0.16	0.08
Zunyi City	15180	Non-east, Low	37.43	39.81	0.08	0.05
Anshun	4921	Non-east, Low	36.04	39.52	0.14	0.11
Kunming	31780	Non-east, Middle	38.12	40.26	0.11	0.09
Qujing	17659	Non-east, Middle	37.59	39.80	0.23	0.06
Yuxi	52230	Non-east, High	37.71	39.08	0.03	0.05
Baoshan	4656	Non-east, Low	36.94	39.18	0.05	0.07
Zhaotong	6819	Non-east, Low	37.94	40.12	0.04	0.05
Lijiang	11223	Non-east, Low	35.71	39.13	0.12	0.10
Xi'an	17528	Non-east, Middle	37.07	39.49	0.09	0.08
Tongchuan	8160	Non-east, Low	35.13	39.29	0.12	0.18
Baoji	24210	Non-east, Middle	36.38	40.01	0.06	0.13
Xianyang	18391	Non-east, Middle	36.25	38.96	0.42	0.07
Weinan	5411	Non-east, Low	36.16	39.83	0.05	0.06
Yan'an	10092	Non-east, Low	36.47	40.21	0.03	0.06
Yulin	5932	Non-east, Low	36.01	40.99	0.12	0.06
Lan'Zhou	22470	Non-east, Middle	36.60	39.09	0.14	0.13
Jiayuguan	25206	Non-east, Middle	38.51	40.05	0.31	0.44
Jinchang	31236	Non-east, Middle	36.19	40.31	0.12	0.28
Baiyin	17406	Non-east, Middle	36.26	38.96	0.13	0.22
Tianshui	6311	Non-east, Low	35.16	38.21	0.10	0.11
Wuwei	7307	Non-east, Low	34.78	37.24	0.10	0.14
Zhangye	8654	Non-east, Low	35.62	37.02	0.05	0.17
Pingliang	7591	Non-east, Low	36.20	38.99	0.11	0.08
Xining	11160	Non-east, Low	37.04	38.95	0.05	0.08
Yinchuan	13956	Non-east, Low	36.32	39.50	0.10	0.12
Shizuishan	15503	Non-east, Low	36.39	40.43	0.16	0.31

Notes: This table displays the complete list of cities used in the quantitative model. The second column gave GDP per capita in 2005. The third column shows the category of the city according to its location and GDP per capita. We divide cities into three levels of development by their GDP per capita. The fourth and fifth columns show TFP in 2005 and 2010, as calculated in the quantitative model. The sixth and the seventh columns show the land tightness in 2005 and 2010, as calculated in the quantitative model.

B.2 Computational Method of Solving the Model

Given the exogenous variables and parameters, we need to calculate the responses of endogenous variables resulting from model policy changes. As mentioned, we select the equilibrium that is the closest to the one observed in the real world. Thus, the initial values of the variables are set equal to the data in 2005 and 2010. Since we have a within-city land market between residential and production uses, we adopt a double-loop variation of the method in Fang and Huang (2022).

We first specify the exogenous variables and the model equation system. The exogenous variables are $\{H_i^s, \epsilon_j^s, \tau_{ij}^s, L_j, \phi_j, \eta_j\}$ where i indexes Hukou city, j indexes destination city, and s indexes skill. The equation system consists of three blocks: 1). Migration Block: worker income and gravity equations; 2). Production Block: production equations, wage equations, and production floor space price equations; 3). Housing Block: construction equations and market clearing equations.

To calculate the counterfactuals following policy changes, we start with the block where the changes happen and then iterate block by block to update the endogenous variables until all endogenous variables converge within certain small thresholds. We present the process of calculating a counterfactual following an increase in land supply as an example below.

Suppose a land reallocation policy is $\hat{L_j} = \Delta_j \times L_j$ for every city j. We have the following process of updating variables $\{\hat{x_{jk}}\}^{OI}$, which indicates the t^{th} iteration of variable x. Start with the housing block to initiate the process (there is no need to update $\{\hat{S_j}\}^*$ again):

Outer Loop: In the outer loop, we update the floor space distribution between residential and production uses according to the inner loop equilibrium unit prices of residential and production floor space. The outer loop converges when the prices satisfy the equilibrium price equation between both markets.

Step 1: Initiation (ensuring non-zero floor space supply)

$$\{\hat{S_{ju}}\}^* = \phi_j \hat{L_j} \tag{3}$$

$$\{\hat{S_{ju}^R}\}^1 = S_{ju}^R \times (\{\hat{S_{ju}}\}^* / S_{ju}) \tag{4}$$

$$\{\hat{S_{ju}^M}\}^1 = S_{ju}^M \times (\{\hat{S_{ju}}\}^* / S_{ju}) \tag{5}$$

Step 2: **Inner Loop** (feedback prices to Outer Loop, x^{1*} means Inner Loop for x converges)

$$\{\hat{Q_{ju}}\}^{\mathbf{1}^*} = \frac{1-\beta}{\beta} \frac{\{w_{ju}^l H_{ju}^l + w_{ju}^h H_{ju}^h\}^{\mathbf{1}^*}}{\{\hat{S_{ju}^R}\}^1} \tag{6}$$

$$\{\hat{q}_{ju}\}^{\mathbf{1}^*} = (1-\alpha)\left(\frac{\alpha}{\{\hat{W_{ju}}\}^{\mathbf{1}^*}}\right)^{\frac{\alpha}{1-\alpha}} \tag{7}$$

Step 3: Compare floor space prices and generate excess demand for residential space. The core idea is that if $\{\hat{Q_{ju}}\}^{\mathbf{1}^*} > \frac{\{\hat{q_{ju}}\}^{\mathbf{1}^*}}{\eta_j}$, residential floor space is smaller than equilibrium and production floor space is larger than equilibrium, so we need to redistribute more residential floor space to production floor space, until $\{\hat{Q_{ju}}\}^{\mathbf{1}^*} = \frac{\{\hat{q_{ju}}\}^{\mathbf{1}^*}}{\eta_j}$. We update partially with step size γ.

$$\{ED_j^R\}^1 = \gamma \left(\frac{\{\hat{Q_{ju}}\}^{\mathbf{1}^*} - \frac{\{\hat{q_{ju}}\}^{\mathbf{1}^*}}{\eta_j}}{\{\hat{Q_{ju}}\}^{\mathbf{1}^*} + \frac{\{\hat{q_{ju}}\}^{\mathbf{1}^*}}{\eta_j}} \right) \times \{\hat{S_{ju}^R}\}^1 \tag{8}$$

Step 4: Update floor space

$$\{\hat{S_{ju}^R}\}^2 = \{\hat{S_{ju}^R}\}^1 + \{ED_j^R\}^1 \tag{9}$$

$$\{\hat{S_{ju}^M}\}^2 = \{\hat{S_{ju}^M}\}^1 - \{ED_j^R\}^1 \tag{10}$$

Finally, we repeat Step 2 to Step 4 until the market clearing condition holds: $\{\hat{Q_{ju}}\}^{**} = \frac{\{\hat{q_{ju}}\}^{**}}{\eta_j}$.

Inner Loop: In the inner loop, we update the migration and production decisions given the residential and production floor space. This Inner Loop is almost identical to Fang and Huang (2022)'s method. Notation: for variable x^{OI}, O denotes the step in the Outer Loop, and I denotes the step in the Inner Loop. Here we demonstrate with $O = 1$.

Step 2-1: Update the housing block

$$\{\hat{Q_{ju}}\}^{11} = \frac{1-\beta}{\beta} \frac{w_{ju}^l H_{ju}^l + w_{ju}^h H_{ju}^h}{\{\hat{S_{ju}^R}\}^1} \tag{11}$$

$$\{\hat{Q_{jr}}\}^{11} = \tau \{\hat{Q_{ju}}\}^{11} \tag{12}$$

$$\{S_{jr}^R\}^{11} = \frac{1-\beta}{\beta} \frac{w_{jr} H_{jr}}{\{\hat{Q_{jr}}\}^{11}} \tag{13}$$

Step 2-2: Update the migration block

$$\{\hat{v_{in,jk}^s}\}^{11} = w_{jk}^s + \frac{\{\hat{Q_{in}}\}^{11}\{\hat{S_{in}^R}\}^{11}}{H_{in}^R} \quad \text{from eq.(4)} \tag{14}$$

$$\{\hat{\pi_{in,jk}^s}\}^{11} = \frac{(\tau_{in,jk}^s \{\hat{Q_{jk}}\}^{11^{1-\beta}})^{-\epsilon} (\{\hat{v_{in,jk}^s}\}^{11})^{\epsilon}}{\sum_{j'k'=11}^{JK} (\tau_{in,jk}^s \{\hat{Q_{j'k'}}\}^{11^{1-\beta}})^{-\epsilon} (\{\hat{v_{in,j'k'}^s}\}^{11})^{\epsilon}} \text{ from eq.(6)} \tag{15}$$

Then, combining $\{\hat{\pi_{in,jk}^s}\}^{11}$ with $\{H_{in}^s\}$, we are able to calculate $\{\hat{H_{jk}^s}\}^{11}$.

Step 2-3: Update the production block

$$\{\hat{X_{ju}}\}^{11} = [(\{A_{ju}^h\}^{11}\{\hat{H_{ju}^h}\}^{11})^{\frac{\sigma-1}{\sigma}} + (\{A_{ju}^l\}^{11}\{\hat{H_{ju}^l}\}^{11})^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}} \text{ from eq.(7)} \tag{16}$$

$$\{\hat{w^l_{ju}}\}^{11} = \alpha(\{\hat{X_{ju}}\}^{11})^{\alpha-1}(\{\hat{S^M_{ju}}\}^1)^{1-\alpha}(\{A^l_{ju}\}^{11})^{\frac{\sigma-1}{\sigma}}(\{\hat{X_{ju}}\}^{11})^{\frac{1}{\sigma}}(\{\hat{H^l_{ju}}\}^{11})^{-\frac{1}{\sigma}} \text{ from eq.(8)} \tag{17}$$

$$\{\hat{w^h_{ju}}\}^{11} = \alpha(\{\hat{X_{ju}}\}^{11})^{\alpha-1}(\{\hat{S^M_{ju}}\}^1)^{1-\alpha}(\{A^h_{ju}\}^{11})^{\frac{\sigma-1}{\sigma}}(\{\hat{X_{ju}}\}^{11})^{\frac{1}{\sigma}}(\{\hat{H^h_{ju}}\}^{11})^{-\frac{1}{\sigma}} \text{ from eq.(9)} \tag{18}$$

Step 2-4: Update prices

$$\{\hat{Q_{ju}}\}^{12} = \frac{1-\beta}{\beta}\frac{\{w^l_{ju}H^l_{ju} + w^h_{ju}H^h_{ju}\}^{11}}{\{\hat{S^R_{ju}}\}^1} \tag{19}$$

We repeat Step 2-1 to Step 2-4 until residential floor space prices $\{\hat{Q_{ju}}\}^{1t}$ converge to $\{\hat{Q_{ju}}\}^{1*}$. We then output $\{\hat{Q_{ju}}\}^{1*}$ and $\{\hat{q}_{ju}\}^{1*}$ for the use in outer loop.

$$\{\hat{Q_{ju}}\}^{1*} = \frac{1-\beta}{\beta}\frac{\{w^l_{ju}H^l_{ju} + w^h_{ju}H^h_{ju}\}^{1*}}{\{\hat{S^R_{ju}}\}^1} \tag{20}$$

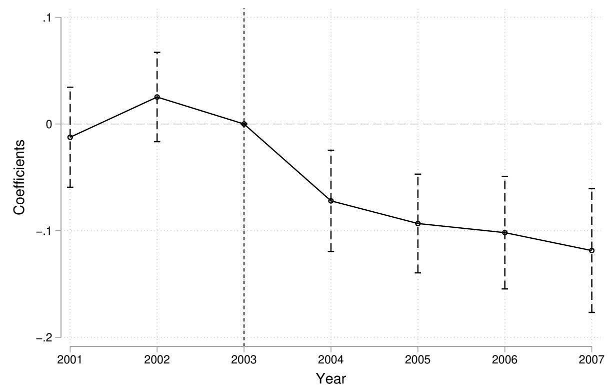
$$\{\hat{W_{ju}}\}^{11} = \frac{\{\hat{w^h_{ju}}\}^{11}\{\hat{H^h_{ju}}\}^{11} + \{\hat{w^l_{ju}}\}^{11}\{\hat{H^l_{ju}}\}^{11}}{\{\hat{X_{ju}}\}^{11}} \tag{21}$$

$$\{\hat{q}_{ju}\}^{1*} = (1-\alpha)\left(\frac{\alpha}{\{\hat{W_{ju}}\}^{1*}}\right)^{\frac{\alpha}{1-\alpha}} \tag{22}$$

B.3 Estimation of the Agglomeration Parameters: Event Study

Figure B1 provides city-level event study plots for our city-level regression (20) in the main paper. The dependent variable is TFP measured using the Olley and Pakes (1992) method. The result shows no difference in the pre-trend before 2003. City-level average TFP consequently fell in the eastern region after implementing the policy.

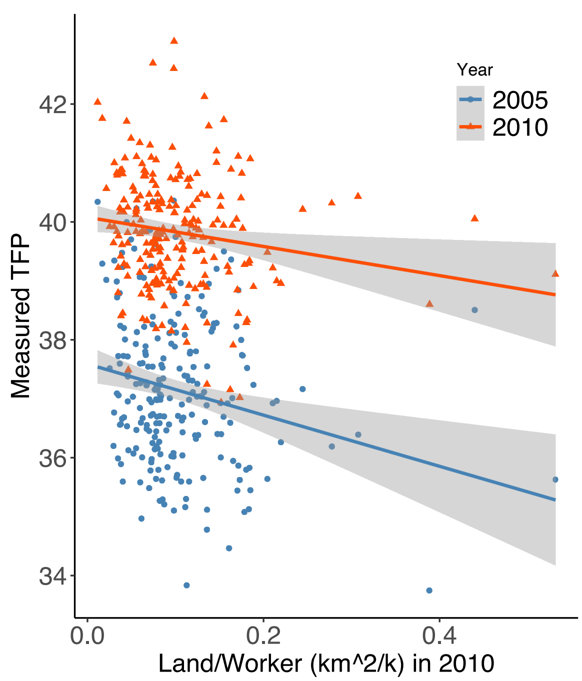
Figure B1: City-level Event Study Results (OP)



Notes: This is the event study plot from the city-level regression. TFP is measured using the Olley and Pakes (1992) method. All the specifications are the same as for the city-level DID regression.

B.4 Correlation between Productivity and Land Abundance

Figure B2: Correlation between Productivity and Land Abundance By Individual City Including Extreme Values



Notes: This figure plots the correlation between productivity and land abundance in the model at the individual city level, including the extreme values omitted in the main paper.

Figure B2 plots the correlation between productivity and land tightness in the model at the individual city level, including the extreme values omitted in the main paper. We still observe a strong negative correlation between productivity and land tightness with the extreme values included.

B.5 Additional Results of the Quantitative Analysis

In this section, we show additional results of the quantitative analysis of the spatial distribution of economic development and income. Table B5 shows the spatial distributions of total output, urban output, rural output, and urban population in 2005. Table B6 shows the spatial distributions of urban and rural workers by skill and the floor space price in 2005. Table B7 and B8 show the above contents in 2010. Table B9 shows the spatial distribution of total income, wage income, and non-wage income for Hukou workers.

Across these five tables, we have three observations that are consistent with our findings above. First, more developed eastern cities have much higher output, especially urban output. Second, these cities are much more populated with higher floor space prices. Third, workers in these cities earn higher incomes (higher wages for all workers and higher non-wage incomes for Hukou workers). These findings supplement our main findings on the spatial misallocation created by China's place-based land policy.

Table B5: **Quantitative Analysis: Year 2005 Spatial Distribution of Economic Development I**

Regions (loc., dev.)	No. of Cities	Total Output	Urban Output	Rural Output	Urban Pop.
		Units are Chinese Yuan and Person			
National	225	7.28E+12	5.08E+12	2.20E+12	2.38E+08
(east, high)	21	2.38E+12	2.23E+12	1.52E+11	7.59E+07
(east, mid)	51	1.95E+12	1.38E+12	5.67E+11	6.97E+07
(east, low)	25	4.62E+11	2.51E+11	2.11E+11	1.76E+07
(inland, high)	2	6.01E+10	2.67E+10	3.34E+10	1.33E+06
(inland, mid)	50	1.13E+12	6.55E+11	4.72E+11	3.68E+07
(inland, low)	76	1.31E+12	5.39E+11	7.68E+11	3.70E+07

Notes: This table displays a summary of economic development variables by city group (weighted by population) in 2005. Regions are classified by the location of the city (east or inland) and level of development (GDP per capita) in 2005, as in Table 5.

Table B6: **Quantitative Analysis: Year 2005 Spatial Distribution of Economic Development II**

Regions (loc., dev.)	No. of Cities	Urban Pop. High-skill	Urban Pop. Low-skill	Rural Pop. High-skill	Rural Pop. Low-skill	Floor Space Price
National	225	4.24E+07	1.96E+08	5.85E+05	2.19E+08	6.24E+01
(east, high)	21	1.41E+07	6.18E+07	6.38E+04	8.83E+06	1.21E+02
(east, mid)	51	1.07E+07	5.90E+07	1.35E+05	5.32E+07	4.78E+01
(east, low)	25	2.54E+06	1.51E+07	8.77E+04	2.40E+07	4.37E+01
(inland, high)	2	2.56E+05	1.07E+06	6.24E+03	1.96E+06	5.21E+01
(inland, mid)	50	8.06E+06	2.87E+07	1.25E+05	4.65E+07	4.71E+01
(inland, low)	76	6.71E+06	3.03E+07	1.67E+05	8.48E+07	3.83E+01

Notes: This table displays a summary of economic development variables by group (weighted by population) in 2005. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table B7: **Quantitative Analysis: Year 2010 Spatial Distribution of Economic Development I**

Regions (loc., dev.)	No. of Cities	Total Output	Urban Output	Rural Output	Urban Pop.
		Units are Chinese Yuan and Person			
National	225	1.64E+13	1.28E+13	3.62E+12	3.40E+08
(east, high)	21	5.33E+12	5.08E+12	2.47E+11	1.07E+08
(east, mid)	51	4.50E+12	3.41E+12	1.09E+12	9.53E+07
(east, low)	25	6.44E+11	4.14E+11	2.30E+11	1.55E+07
(inland, high)	2	8.24E+10	5.84E+10	2.39E+10	1.59E+06
(inland, mid)	50	2.99E+12	2.20E+12	7.82E+11	6.51E+07
(inland, low)	76	2.89E+12	1.63E+12	1.25E+12	5.53E+07

Notes: This table displays a summary of economic development variables by city group (weighted by population) in 2005. Regions are classified by the location of the city (east or inland) and level of development (GDP per capita) in 2005, as in 5.

Table B8: **Quantitative Analysis: Year 2010 Spatial Distribution of Economic Development II**

Regions (loc., dev.)	No. of Cities	Urban Pop. High-skill	Urban Pop. Low-skill	Rural Pop. High-skill	Rural Pop. Low-skill	Floor Space Price
National	225	6.20E+07	2.78E+08	1.45E+06	1.83E+08	1.15E+02
(east, high)	21	1.96E+07	8.78E+07	1.32E+05	8.05E+06	1.75E+02
(east, mid)	51	1.62E+07	7.91E+07	4.44E+05	5.26E+07	9.64E+01
(east, low)	25	2.29E+06	1.33E+07	1.01E+05	1.36E+07	7.37E+01
(inland, high)	2	3.60E+05	1.23E+06	9.31E+03	9.25E+05	1.03E+02
(inland, mid)	50	1.42E+07	5.10E+07	3.47E+05	3.91E+07	1.08E+02
(inland, low)	76	9.29E+06	4.60E+07	4.17E+05	6.85E+07	7.88E+01

Notes: This table displays a summary of economic development variables by group (weighted by population) in 2010. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table B9: **Quantitative Analysis: Spatial Distribution of Hukou-based Income**

Regions	No. of	Total Income		Wage Income		Non-Wage Income	
(loc., dev.)	Cities	2005	2010	2005	2010	2005	2010
National	225	1.90E+04	3.69E+04	1.46E+04	2.85E+04	4.35E+03	8.48E+03
(east, high)	21	3.73E+04	7.00E+04	2.46E+04	4.10E+04	1.27E+04	2.90E+04
(east, mid)	51	1.94E+04	3.71E+04	1.51E+04	2.89E+04	4.30E+03	8.26E+03
(east, low)	25	1.47E+04	2.93E+04	1.18E+04	2.42E+04	2.86E+03	5.07E+03
(inland, high)	2	2.26E+04	4.01E+04	1.74E+04	3.04E+04	5.21E+03	9.71E+03
(inland, mid)	50	1.72E+04	3.49E+04	1.37E+04	2.76E+04	3.45E+03	7.34E+03
(inland, low)	76	1.47E+04	3.05E+04	1.22E+04	2.60E+04	2.55E+03	4.46E+03

Notes: This table displays a summary of income variables by group (weighted by population) in 2005 and 2010. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

C Supplements to the Counterfactual Analysis

C.1 Constructing the Counterfactual Policy

Table C1, C2, and C3 provide additional summary statistics of the counterfactual land allocation policy when we redistribute the land quota according to equation (23). In general, we find that if we maintain the pre-2003 land policy instead of adopting the inland-favoring policy, we would distribute more urban land to more developed cities and increase their land per worker, compared with the data. This lowers the land tightness in more developed cities.

Table C1: **Removing the Inland-favoring Policy: Spatial Distribution of Land Tightness**

Regions (loc., dev.)	No. of Cities	Reality 2005	Reality 2010	Counterfactual $\widehat{2005}$	Counterfactual $\widehat{2010}$
National	225	0.093	0.083	0.092	0.082
(east, high)	21	0.077	0.068	0.082	0.090
(east, mid)	51	0.084	0.082	0.083	0.071
(east, low)	25	0.080	0.108	0.084	0.106
(inland, high)	2	0.127	0.130	0.127	0.107
(inland, mid)	50	0.140	0.101	0.126	0.079
(inland, low)	76	0.104	0.086	0.103	0.080

Notes: This table displays a summary of urban land supply relative to workers by city group (weighted by urban population) as well as the counterfactual migration-based land supply in 2005 and 2010 (unit: km^2/k). Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table C2: **Removing the Inland-favoring Policy: Changes in Total Land Supply**

Regions (loc., dev.)	No. of Cities	Changes 2005	Changes 2010
National	225	0%	0%
(east, high)	21	13%	51%
(east, mid)	51	-2%	-16%
(east, low)	25	4%	-5%
(inland, high)	2	0%	-18%
(inland, mid)	50	-12%	-27%
(inland, low)	76	-2%	-11%

Notes: This table displays changes in counterfactual total urban land supply by group (summations within the group) in 2005 and 2010. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table C3: **Removing the Inland-favoring Policy: Changes in Land Tightness**

Regions (loc., dev.)	No. of Cities	Changes 2005	2010
National	225	0%	0%
(east, high)	21	6%	34%
(east, mid)	51	-2%	-14%
(east, low)	25	4%	-2%
(inland, high)	2	0%	-17%
(inland, mid)	50	-10%	-21%
(inland, low)	76	-1%	-7%

Notes: This table displays changes in counterfactual urban land per thousand workers by group (summations within the group) in 2005 and 2010. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

C.2 Calculation of Welfare

In this section, we briefly discuss the welfare (utility) calculation of workers. We can calculate the ex-ante expected utility of workers based on the properties of the Fréchet distribution. The cumulative distribution function of the utility of workers originating from city i sector n with skill s is

$$G^s_{in}(u) = e^{-\Phi^s_{in} u^{-\epsilon}}, \ \Phi^s_{in} = \sum_{j'k'=11}^{JK} (\tau^s_{in,j'k'} Q^{1-\beta}_{j'k'})^{-\epsilon} (v^s_{in,j'k'})^{\epsilon}$$

with their expected utility as:

$$\mathbf{E}^s_{in}[u] = \Gamma\left(1 - \frac{1}{\epsilon}\right) \times (\Phi^s_{in})^{\frac{1}{\epsilon}}$$

where the Gamma function $\Gamma\left(1 - \frac{1}{\epsilon}\right)$ is a constant number and Φ^s_{in} reflects the expected utility from accesses to all alternative cities and sectors. This choice set value is positively correlated with potential income $v^s_{in,j'k'}$ and is negatively correlated with migration and housing costs. We then calculate the changes in ex-ante expected utility as:

$$\Delta\mathbf{E}^s_{in}[u] = \frac{\hat{\mathbf{E}^s_{in}[u]}}{\mathbf{E}^s_{in}[u]} - 1 \quad (23)$$

To aggregate national or regional welfare, we assign equal weights to each worker and sum across all groups.

C.3 Additional Results on Spatial Economic Development

Measured TFP Table C4 shows the effects of changing the land supply policy on the spatial distribution of measured TFP. By maintaining the pre-2003 land allocation rule and allocating more land to developed regions, we can substantially increase national TFP by 4.8% in 2005 and 6.4% in 2010. The decomposition further reveals that most of the national TFP gains are driven by increased fundamental productivity. The reform encourages more workers to migrate to developed regions with higher TFP, raising the weighted national TFP. The influx of migrant workers also amplifies the agglomeration effect on local productivity in developed regions.

The changes in TFP are uneven across regions. In 2005, TFP in eastern cities with high productivity increased by 2.9%, while there was almost no change in TFP in other cities. In 2010, although we observed a larger TFP increase of 6.4% in developed cities, there was also a significant TFP decrease in underdeveloped cities due to land losses. For instance, TFP in inland cities with medium and low productivity declines by 5.2% and 3.2%, respectively. This result demonstrates that although national TFP and output would be higher with the pre-2003 land allocation policy, regional productivity gaps would also increase.

Table C4: **Removing the Inland-Favoring Policy: Spatial Effects on Measured TFP**

Regions	No. of	2005				2010			
(location, development)	Cities	Total	Fund	SP	LSP	Total	Fund	SP	LSP
National	225	4.8%	4.7%	-0.8%	0.8%	6.4%	6.6%	-0.6%	0.3%
(east, high)	21	2.9%	3.2%	-2.9%	2.8%	6.7%	4.9%	-2.7%	4.5%
(east, mid)	51	0.0%	0.2%	0.1%	-0.3%	-1.2%	0.5%	0.4%	-2.1%
(east, low)	25	-0.3%	-0.8%	0.1%	0.4%	-1.7%	-0.6%	-0.1%	-1.0%
(inland, high)	2	-0.2%	0.0%	0.0%	-0.2%	-2.2%	0.2%	0.0%	-2.4%
(inland, mid)	50	0.0%	0.9%	0.0%	-1.0%	-5.2%	-1.4%	-0.3%	-3.6%
(inland, low)	76	0.2%	0.4%	0.1%	-0.3%	-3.2%	-1.4%	0.2%	-2.1%

Notes: This table displays a summary of changes in measured TFP $ln(\widetilde{TFP}_{ju})$ by group (weighted by population) in 2005 and 2010 as well as its decomposition: Fund stands for fundamental, SP stands for skill premium, and LSP stands for land scale premium. Regions are classified by the location of the city (east or inland) and level of development (GDP per capita) in 2005, according to the data. For the level of development, we divide all cities into three categories {high, mid, and low} to capture {10%, 45%, 45%} of the distribution of GDP per capita. Each region consists of the same cities in both 2005 and 2010 for consistent comparisons over time.

Migration Tables C5 and C6 illustrate the counterfactual changes in migration compared with the real world. More workers migrate to urban areas in developed cities when more land is allocated to developed regions. Specifically, the urban low-skill (high-skill) population in eastern cities with high productivity increased by 7.1% (2.1%) in 2005 and by 13.9% (8.7%) in 2010. Conversely, less developed cities lose population. The urban low-skill (high-skill) population in inland cities with low productivity declined by 1.7% (1.0%) in 2005 and by 4.6% (2.8%) in 2010.

Table C5: **Removing the Inland-Favoring Policy: Spatial Effects on Migration in 2005**

Regions (loc., dev.)	No. of Cities	Urban Pop. High-skill	Urban Pop. Low-skill	Rural Pop. High-skill	Rural Pop. Low-skill
National	225	0.0%	1.5%	-1.3%	-1.4%
(east, high)	21	2.1%	7.1%	-0.3%	0.0%
(east, mid)	51	-0.9%	-0.5%	-1.5%	-0.6%
(east, low)	25	-0.5%	-0.7%	-2.3%	-1.3%
(inland, high)	2	-0.1%	0.1%	-0.2%	0.1%
(inland, mid)	50	-1.5%	-1.7%	-1.4%	-1.7%
(inland, low)	76	-1.0%	-1.7%	-0.8%	-1.9%

Notes: This table displays a summary of economic development variables by city group (weighted by population) in 2005. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table C6: **Removing the Inland-Favoring Policy: Spatial Effects on Migration in 2010**

Regions (loc., dev.)	No. of Cities	Urban Pop. High-skill	Urban Pop. Low-skill	Rural Pop. High-skill	Rural Pop. Low-skill
National	225	0.0%	1.4%	-1.4%	-2.2%
(east, high)	21	8.7%	13.9%	5.8%	3.2%
(east, mid)	51	-2.5%	-2.7%	-1.9%	-0.8%
(east, low)	25	-3.3%	-3.0%	-0.7%	-2.2%
(inland, high)	2	-1.0%	-0.9%	3.2%	1.8%
(inland, mid)	50	-6.3%	-6.9%	-2.5%	-3.1%
(inland, low)	76	-2.8%	-4.6%	-2.4%	-3.5%

Notes: This table displays a summary of economic development variables by city group (weighted by population) in 2005. Regions are classified by the location of the city (east or inland) and level of development (GDP per capita) in 2005, as in Table 5.

C.4 A Sophisticated Rule of Regional Transfer

Without loss of generality, we design a direct regional transfer rule instead of the place-based land allocation policy. We need first to figure out who gains and who loses from removing the inland-favoring land policy and then design a direct regional transfer rule to reduce the income gap between workers from developed and underdeveloped regions.

Who Gains and Who Losses We first discuss workers in four subgroups without considering cross-city migration. Firstly, developed regions experience direct gains. Urban workers in developed cities benefit from three components: higher local wages, lower local housing prices, and increased land income. Rural workers in developed cities benefit from two components: higher wages and lower housing prices in the nearby urban sector. Secondly, underdeveloped regions face direct losses. Urban workers in underdeveloped cities suffer from three components: lower local wages, higher local housing prices, and decreased land income. Rural workers in underdeveloped cities suffer from two components: lower wages and higher housing prices in the nearby urban sector.

We then discuss workers in four subgroups, taking into account cross-city migration. All workers in underdeveloped cities enjoy more indirect gains from higher wages and lower housing prices in developed cities, especially rural workers in underdeveloped cities. Meanwhile, rural workers in developed cities also experience indirect gains, although they may not be as significant as those for workers in underdeveloped cities. Urban workers in developed cities have minimal indirect gains. Lastly, the government directly benefits from higher production floor space returns.

The Regional Transfer Rule Based on the above qualitative analysis, we could design a regional transfer rule to replace the place-based land policy. The rule is not targeting on optimal policy design but demonstrates that there could be a better policy design. The rule could directly aim at transferring the direct gains. First, define the national gains in land income as follows:

$$\Delta\Pi_L^R = \sum_i \left(\hat{Q}_{iu}\hat{S}_{iu}^R - Q_{iu}S_{iu}^R\right) \tag{24}$$

$$\Delta\Pi_L^M = \sum_i \left(\hat{q}_{iu}\hat{S}_{iu}^M - q_{iu}S_{iu}^M\right) \tag{25}$$

where $\hat{Q}_{iu}\hat{S}_{iu}^R$ and $\hat{q}_{iu}\hat{S}_{iu}^M$ are regional land income in the counterfactual and $Q_{iu}S_{iu}^R$ and $q_{iu}S_{iu}^M$ are regional land income in the original equilibrium. The regional transfers $\{\widehat{DT_{iu}}, \widehat{DT_{ir}}\}$ must satisfy the following balance of budgets:

$$\sum_i \left(\widehat{DT_{iu}} + \widehat{DT_{ir}}\right) = \Delta\Pi_L^R + \Delta\Pi_L^M \tag{26}$$

We assume the following rule for each city i:

$$\widehat{DT_{iu}} = \underbrace{-\left(\hat{Q}_{iu}\hat{S}_{iu}^R - Q_{iu}S_{iu}^R\right)}_{\text{restore urban land income}} + \underbrace{\left.\frac{\frac{\hat{Q}_{iu}-Q_{iu}}{Q_{iu}}Q_{iu}S_{iu}^R}{\sum_i \frac{|\hat{Q}_{iu}-Q_{iu}|}{Q_{iu}}Q_{iu}S_{iu}^R} \times \gamma_u^1 \times \Delta\Pi_L^R\right|_{\hat{Q}_{iu}-Q_{iu}>0}}_{\text{adjust for housing price }\uparrow} + \underbrace{\left.\frac{\frac{\hat{Q}_{iu}-Q_{iu}}{Q_{iu}}Q_{iu}S_{iu}^R}{\sum_i \frac{|\hat{Q}_{iu}-Q_{iu}|}{Q_{iu}}Q_{iu}S_{iu}^R} \times \gamma_u^2 \times \Delta\Pi_L^R\right|_{\hat{Q}_{iu}-Q_{iu}<0}}_{\text{adjust for housing price }\downarrow} \tag{27}$$

$$\widehat{DT_{ir}} = \underbrace{\frac{\Delta\Pi_L^M H_{ir}}{\sum_i H_{ir}}}_{\text{urban-rural transfer}} + \underbrace{\left.\frac{\frac{\hat{Q}_{ir}-Q_{ir}}{Q_{ir}}Q_{ir}S_{ir}^R}{\sum_i \frac{|\hat{Q}_{ir}-Q_{ir}|}{Q_{ir}}Q_{ir}S_{ir}^R} \times \gamma_r^1 \times \Delta\Pi_L^R\right|_{\hat{Q}_{ir}-Q_{ir}>0}}_{\text{adjust for housing price }\uparrow} + \underbrace{\left.\frac{\frac{\hat{Q}_{ir}-Q_{ir}}{Q_{ir}}Q_{ir}S_{ir}^R}{\sum_i \frac{|\hat{Q}_{ir}-Q_{ir}|}{Q_{ir}}Q_{ir}S_{ir}^R} \times \gamma_r^2 \times \Delta\Pi_L^R\right|_{\hat{Q}_{ir}-Q_{ir}<0}}_{\text{adjust for housing price }\downarrow} \tag{28}$$

where $\{\gamma_u^1, \gamma_u^2, \gamma_r^1, \gamma_r^2\}$ are tunning parameters for housing price transfer adjustments. The weights reflect the importance of the local housing market in the country in terms of housing prices. To satisfy the balanced budget condition (26), the following equation $\gamma_u^1 + \gamma_r^1 = \gamma_u^2 + \gamma_r^2 + 2$ must hold. The first part of $\widehat{DT_{iu}}$ is to restore gains and losses in direct land income, and the second and third parts adjust for gains and losses in floor space prices. The first part of $\widehat{DT_{ir}}$ is to redistribute additional urban production land income to rural households, and the second and third parts adjust for gains and losses in floor space prices.

This counterfactual is feasible to implement and still fulfills the central government's goal of balancing regional development. This mechanism mimics a policy called the "land quota market," which has been recommended by previous literature such as Lu and Xiang (2016). The basic idea is that the central government can balance the development of different regions by transferring revenues from developed cities to underdeveloped cities rather than allocating the land supply directly. Since land and wage incomes in land-gaining cities are higher than in land-losing cities, and the total land supply is unchanged, this redistribution is feasible, and the central government generates an additional financial surplus.

Turning the Redistribution Parameters Since the distribution of gains is mainly between housing price dropping in developed urban regions and housing price increases in underdeveloped rural regions because it is more costly to move to nearby urban regions. We could mainly focus on γ_r^1 and γ_u^2. Currently, we choose $\gamma_r^1 = 20$ and $\gamma_u^2 = 18$ to satisfy significant redistribution. We choose $\gamma_u^1 = 0.2$ and $\gamma_r^2 = 0.2$ to make non-zero adjustments in the other directions.

C.5 Additional Results with the Sophisticated Rule

C.5.1 Spatial Effects on Income and Welfare

Spatial Effects on Income Table C7 shows the decomposition of the spatial effects on income into wage and non-wage incomes (including housing asset income and potential regional transfers). We show that the changes in non-wage income play an essential role in shaping the spatial distribution of total income.

Table C7: **Removing the Inland-Favoring Policy with the Sophisticated Rule of Regional Transfer: Decomposition of Spatial Effects on Income:**

Regions	No. of	Without Transfer				Regional Transfer			
		Δ Wage Income		Δ Non-wage Income		Δ Wage Income		Δ Non-wage Income	
(loc., dev.)	Cities	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$
National	225	1.1%	1.0%	1.1%	1.1%	0.8%	0.7%	7.1%	4.4%
(east, high)	21	0.1%	0.0%	6.0%	13.7%	0.2%	0.4%	-27.9%	-28.5%
(east, mid)	51	0.4%	0.4%	-0.5%	-2.9%	0.3%	0.0%	0.8%	15.4%
(east, low)	25	1.3%	2.1%	-1.1%	-3.8%	1.4%	1.8%	-4.5%	16.5%
(inland, high)	2	0.0%	-1.6%	0.0%	-1.6%	0.0%	-1.7%	7.8%	19.4%
(inland, mid)	50	1.3%	0.7%	-1.9%	-8.1%	0.8%	0.2%	76.2%	22.3%
(inland, low)	76	2.4%	2.1%	-1.6%	-4.6%	1.7%	1.6%	21.3%	23.9%

Notes: This table displays a summary of income by city group (summations within the group) in 2005 and 2010. Regions are classified by the location of the city (east or inland) and level of development (GDP per capita) in 2005, as in Table 5.

Spatial Effects on Welfare Tables C8, C9, C10, and C11 show the decomposition of the spatial effects on welfare into four sector-skill groups: (urban, high), (urban, low), (rural, high), (rural, low). We first show that without a regional transfer, workers in developed eastern cities benefit more from removing the inland-favoring policy. When the regional transfer is implemented on top of removing the inland-favoring policy, workers in underdeveloped cities, especially in the rural sector, benefit significantly from the counterfactual policy.

Table C8: **Removing the Inland-Favoring Policy without Regional Transfer: Decomposition of Spatial Effects on Welfare**

Regions	No. of	Without Transfer (Year 2005)				
(loc., dev.)	Cities	Welfare	(Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	3.7%	1.9%	1.4%	4.7%	1.2%
(east, high)	21	9.8%	6.3%	5.8%	14.3%	3.0%
(east, mid)	51	-0.2%	-0.7%	-0.7%	-0.2%	-0.4%
(east, low)	25	-1.7%	0.8%	0.8%	-2.5%	1.6%
(inland, high)	2	-0.5%	-0.3%	-0.3%	0.3%	-1.0%
(inland, mid)	50	-0.3%	-2.2%	-1.3%	0.4%	-2.5%
(inland, low)	76	2.3%	0.0%	0.0%	3.1%	0.5%

Notes: This table displays a summary of welfare by city group (summations within the group) in 2005. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table C9: **Removing the Inland-Favoring Policy without Regional Transfer: Decomposition of Spatial Effects on Welfare**

Regions (loc., dev.)	No. of Cities	Without Transfer (Year 2010) Welfare	(Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	10.6%	2.8%	-0.6%	9.2%	12.4%
(east, high)	21	17.9%	16.1%	13.6%	19.3%	17.5%
(east, mid)	51	-3.9%	-4.5%	-5.4%	-3.3%	-3.5%
(east, low)	25	0.8%	-2.5%	-2.9%	6.3%	0.8%
(inland, high)	2	-5.1%	-5.7%	-6.7%	-4.9%	-4.9%
(inland, mid)	50	-5.5%	-9.4%	-8.7%	-4.5%	-3.3%
(inland, low)	76	-3.7%	-4.7%	-3.8%	-9.2%	-0.9%

Notes: This table displays a summary of welfare by city group (summations within the group) in 2010. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table C10: **Removing the Inland-Favoring Policy with the Sophisticated Rule of Regional Transfer: Decomposition of Spatial Effects on Welfare**

Regions (loc., dev.)	No. of Cities	Regional Transfer (Year 2005) Welfare	(Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	4.4%	-9.2%	-7.7%	5.5%	4.3%
(east, high)	21	7.1%	-16.3%	-14.8%	13.5%	0.9%
(east, mid)	51	1.0%	-3.8%	-3.5%	1.1%	2.5%
(east, low)	25	1.2%	-6.8%	-8.5%	1.4%	5.5%
(inland, high)	2	1.4%	-0.5%	-0.4%	1.6%	1.8%
(inland, mid)	50	4.6%	-4.1%	-4.5%	2.8%	18.2%
(inland, low)	76	4.4%	-5.4%	-6.7%	4.4%	7.0%

Notes: This table displays a summary of welfare by city group (summations within the group) in 2005. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table C11: **Removing the Inland-Favoring Policy with the Sophisticated Rule of Regional Transfer: Decomposition of Spatial Effects on Welfare**

Regions (loc., dev.)	No. of Cities	Welfare	Regional Transfer (Year 2010) (Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	5.7%	-13.5%	-10.8%	7.4%	8.0%
(east, high)	21	8.0%	-25.2%	-22.7%	12.7%	9.0%
(east, mid)	51	0.3%	-6.3%	-6.3%	-0.2%	3.2%
(east, low)	25	4.4%	-5.0%	-6.1%	6.6%	7.6%
(inland, high)	2	0.5%	-4.6%	-5.4%	0.7%	3.8%
(inland, mid)	50	1.5%	-7.6%	-7.3%	2.1%	6.1%
(inland, low)	76	1.7%	-6.2%	-5.9%	-2.0%	5.3%

Notes: This table displays a summary of welfare by city group (summations within the group) in 2010. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

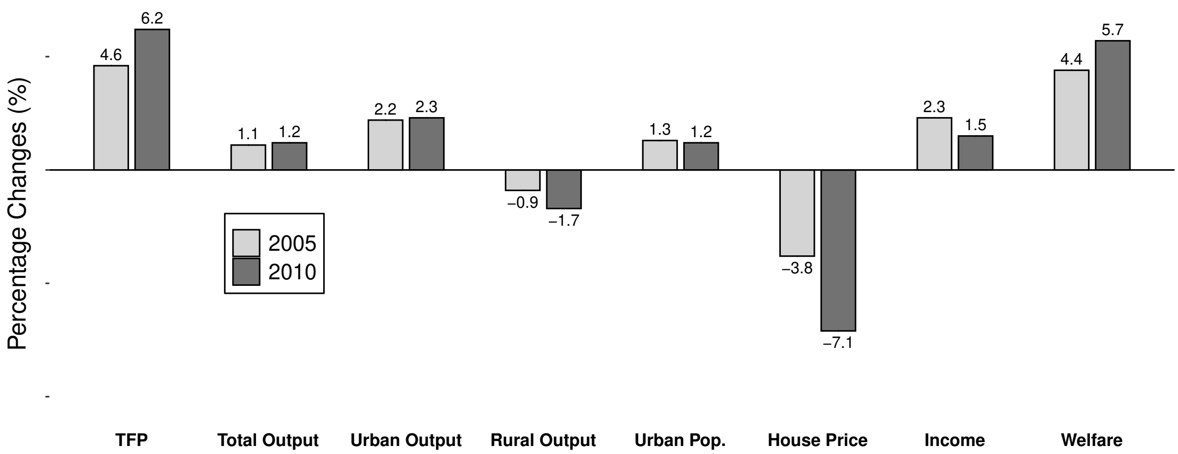
C.5.2 Aggregate and Spatial Effects on Economic Development

We also show additional results on the counterfactual analysis with the regional transfer.

Aggregate Effects of the Regional Transfer with the Sophisticated Rule We show the aggregate effects of replacing the inland-favoring land policy with the regional transfer on national TFP, output, urban output, rural output, urban population, and national average income and welfare. The results are plotted in Figure C1. We find that removing the place-based land policy and adding the regional transfer leads to significant gains in TFP, urban output, income, and welfare in both 2005 and 2010. It also helps to increase the urban population due to lower residential floor space prices in more developed cities. Rural output falls due to worker emigration.

Spatial Effects on Economic Development We show the spatial effects on economic development in Table C12 on changes in TFP, urban output, rural output, urban population, and house price, and Table C13 on changes in the decomposition of TFP.

Figure C1: **Aggregate Effects of Replacing the Inland-Favoring Policy with the Sophisticated Rule of Regional Transfer**



Notes: This figure shows the aggregate effects of replacing the inland-favoring policy with the regional transfer on the Chinese economy in 2005 and 2010. We find substantial national gains in TFP, total output, urban output, urban population, income, and welfare.

Table C12: **Replacing the Inland-Favoring Policy with the Sophisticated Rule of Regional Transfer: Spatial Effects on Economic Development:**

Regions (loc., dev.)	No. of Cities	Δ TFP $\widehat{2005}$	Δ TFP $\widehat{2010}$	Δ Urban Output $\widehat{2005}$	Δ Urban Output $\widehat{2010}$	Δ Rural Output $\widehat{2005}$	Δ Rural Output $\widehat{2010}$	Δ Urban Pop. $\widehat{2005}$	Δ Urban Pop. $\widehat{2010}$	Δ House Price $\widehat{2005}$	Δ House Price $\widehat{2010}$
National	225	1.1%	2.2%	-0.9%	1.3%	0.9%	0.0%	1.5%	-0.8%	-1.4%	-3.8%
(east, high)	21	5.9%	6.3%	0.0%	5.9%	0.3%	1.4%	7.0%	-0.2%	0.1%	-18.9%
(east, mid)	51	-1.0%	-0.7%	-0.5%	-0.6%	-0.1%	-0.9%	-0.5%	-1.4%	-0.6%	1.4%
(east, low)	25	-0.9%	-0.4%	-1.4%	-0.6%	0.1%	-0.4%	-0.7%	-2.2%	-1.3%	-3.1%
(inland, high)	2	0.0%	0.0%	0.0%	0.1%	-0.2%	-0.1%	0.1%	-0.2%	0.1%	1.6%
(inland, mid)	50	-1.8%	-2.1%	-1.5%	-1.6%	-0.6%	-1.3%	-1.7%	-0.7%	-1.5%	1.9%
(inland, low)	76	-1.5%	-1.3%	-1.7%	-1.4%	0.1%	-0.9%	-1.3%	0.0%	-1.9%	-3.4%

Notes: This table displays a summary of changes in core economic development variables by group (weighted by population) in 2005 and 2010. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table C13: **Replacing the Inland-Favoring Policy with the Sophisticated Rule of Regional Transfer: Spatial Effects on Measured TFP**

Regions	No. of	2005				2010			
(location, development)	Cities	Total	Fund	SP	LSP	Total	Fund	SP	LSP
National	225	4.6%	4.6%	-0.8%	0.8%	6.2%	6.6%	-0.6%	0.3%
(east, high)	21	2.9%	3.2%	-2.9%	2.7%	6.7%	5.0%	-2.8%	4.5%
(east, mid)	51	0.0%	0.2%	0.1%	-0.3%	-1.3%	0.5%	0.4%	-2.1%
(east, low)	25	-0.4%	-0.8%	0.1%	0.4%	-1.7%	-0.6%	-0.1%	-1.0%
(inland, high)	2	-0.2%	0.0%	0.0%	-0.2%	-2.2%	0.1%	0.0%	-2.4%
(inland, mid)	50	-0.2%	0.8%	0.0%	-1.1%	-5.3%	-1.4%	-0.3%	-3.6%
(inland, low)	76	0.2%	0.3%	0.1%	-0.3%	-3.3%	-1.4%	0.2%	-2.1%

Notes: This table displays a summary of changes in measured TFP $ln(\widetilde{TFP}_{ju})$ by city group (weighted by population) in 2005 and 2010 as well as its decomposition: Fund stands for fundamental, SP stands for skill premium, and LSP stands for land scale premium. Regions are classified by the location of the city (east or inland) and level of development (GDP per capita) in 2005, according to the data. For the level of development, we divide all cities into three categories {high, mid, and low} to capture {10%, 45%, 45%} of the distribution of GDP per capita. Each region consists of the same cities in both 2005 and 2010 for consistent comparisons over time.

C.6 A Simple Rule of Regional Transfer

We could also design a very simple direct regional transfer rule without considering the changes from the new equilibrium to the original equilibrium. There are certainly more efficient regional transfer rules. The simple rule is as follows for each city i:

$$\widehat{DT}_{iu} = \underbrace{\hat{Q}_{iu}\hat{S}^R_{iu} \times \gamma^l_u \times \frac{-\Delta L_i}{L_i}}_{\text{urban land income transfer}} + \underbrace{(\hat{w}^l_{iu}H^l_{iu} + \hat{w}^h_{iu}H^h_{iu}) \times \gamma^w_u \times \frac{-\Delta L_j}{L_j}}_{\text{urban wage income transfer}}$$

$$\widehat{DT}_{ir} = \underbrace{(\hat{w}_{ir}H_{ir}) \times \gamma_r \times \frac{-\Delta L_j}{L_j}}_{\text{rural wage income transfer}}$$

where $\widehat{DT}_{iu}$ stands for direct transfer to urban workers and $\widehat{DT}_{ir}$ stands for direct transfer to rural workers. For a city losing $\frac{\Delta L_i}{L_i}$ (<0) of its land, urban workers will be compensated with a fraction γ^l_u of their floor space income $\hat{Q}_{iu}\hat{S}^R_{iu}$, and a fraction γ^w_u of their wage income $(\hat{w}^l_{iu}H^l_{iu} + \hat{w}^h_{iu}H^h_{iu})$. Since rural workers also face losses in their wage for losing access to their closest urban sector (the urban sector in their own city), they will be compensated with a fraction γ_r of their indirect wage income $\hat{w}_{ir}H_{ir}$. These direct transfers are feasible to implement because land-gaining cities ($\frac{\Delta L_i}{L_i} > 0$) have much higher floor space prices and wages.

The transfer scale depends on the tuning parameters $\{\gamma^l_u, \gamma^w_u, \gamma_r\}$. As we mentioned, we cannot discuss the design of optimal redistribution policy in this paper. We show the results from one set of tuning parameters $\{\gamma_u^l, \gamma_u^w, \gamma_r\} = \{0.5, 0.1, 0.5\}$ for 2010 and $\{\gamma_u^l, \gamma_u^w, \gamma_r\} = \{0.75, 0.1, 0.5\}$ for 2005 which are sufficient to generate substantial redistribution and clarify the key mechanisms of the transfer results. We tested other sets of parameters, and the results were similar.

C.7 Additional Results with the Simple Rule

C.7.1 Spatial Effects on Income and Welfare

Spatial Effects on Income Table C14 shows the decomposition of the spatial effects on income into wage and non-wage incomes (including housing asset income and potential regional transfers). We show that the changes in non-wage income play an essential role in shaping the spatial distribution of total income.

Table C14: **Removing the Inland-Favoring Policy with the Simple Rule of Regional Transfer: Decomposition of Spatial Effects on Income:**

Regions	No. of	Without Transfer				Regional Transfer			
		Δ Wage Income		Δ Non-wage Income		Δ Wage Income		Δ Non-wage Income	
(loc., dev.)	Cities	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$
National	225	1.1%	1.0%	1.1%	1.1%	1.0%	0.5%	-1.1%	3.1%
(east, high)	21	0.1%	0.0%	6.0%	13.7%	0.2%	0.2%	-21.1%	-35.3%
(east, mid)	51	0.4%	0.4%	-0.5%	-2.9%	0.4%	-0.1%	-11.3%	6.1%
(east, low)	25	1.3%	2.1%	-1.1%	-3.8%	1.5%	1.8%	-11.7%	21.4%
(inland, high)	2	0.0%	-1.6%	0.0%	-1.6%	0.0%	-1.6%	-5.9%	-4.2%
(inland, mid)	50	1.3%	0.7%	-1.9%	-8.1%	0.9%	-0.1%	52.0%	31.9%
(inland, low)	76	2.4%	2.1%	-1.6%	-4.6%	2.0%	1.4%	6.7%	33.1%

Notes: This table displays a summary of income by city group (summations within the group) in 2005 and 2010. Regions are classified by the location of the city (east or inland) and level of development (GDP per capita) in 2005, as in Table 5.

Spatial Effects on Welfare Tables C8, C9, C15, and C16 show the decomposition of the spatial effects on welfare into four sector-skill groups: (urban, high), (urban, low), (rural, high), (rural, low). We first show that workers in developed eastern cities benefit more from removing the inland-favoring policy without a regional transfer. When the regional transfer is implemented on top of removing the inland-favoring policy, workers in underdeveloped cities benefit significantly from the counterfactual policy, especially in the rural sector.

Table C15: **Removing the Inland-Favoring Policy with the Simple Rule of Regional Transfer: Decomposition of Spatial Effects on Welfare**

Regions	No. of	Regional Transfer (Year 2005)				
(loc., dev.)	Cities	Welfare	(Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	2.8%	-8.8%	-8.9%	4.0%	1.0%
(east, high)	21	3.9%	-12.1%	-12.3%	9.7%	-2.6%
(east, mid)	51	0.5%	-8.0%	-8.6%	1.4%	1.7%
(east, low)	25	0.8%	-5.6%	-6.9%	1.6%	1.6%
(inland, high)	2	-1.2%	-7.4%	-7.9%	1.0%	0.7%
(inland, mid)	50	3.1%	-5.4%	-6.0%	2.2%	11.9%
(inland, low)	76	2.6%	-5.6%	-6.6%	2.8%	3.4%

Notes: This table displays a summary of welfare by city group (summations within the group) in 2005. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table C16: **Removing the Inland-Favoring Policy with the Simple Rule of Regional Transfer: Decomposition of Spatial Effects on Welfare**

Regions	No. of	Regional Transfer (Year 2010)				
(loc., dev.)	Cities	Welfare	(Urban, High)	(Urban, Low)	(Rural, High)	(Rural, Low)
National	225	4.1%	-20.4%	-20.7%	9.6%	6.9%
(east, high)	21	4.1%	-28.7%	-30.6%	9.1%	5.0%
(east, mid)	51	0.3%	-17.8%	-19.8%	2.5%	8.6%
(east, low)	25	6.6%	-11.9%	-14.5%	6.1%	14.2%
(inland, high)	2	-3.6%	-16.1%	-18.6%	1.8%	4.5%
(inland, mid)	50	5.0%	-14.7%	-15.5%	6.0%	14.8%
(inland, low)	76	7.6%	-14.2%	-14.7%	13.9%	10.0%

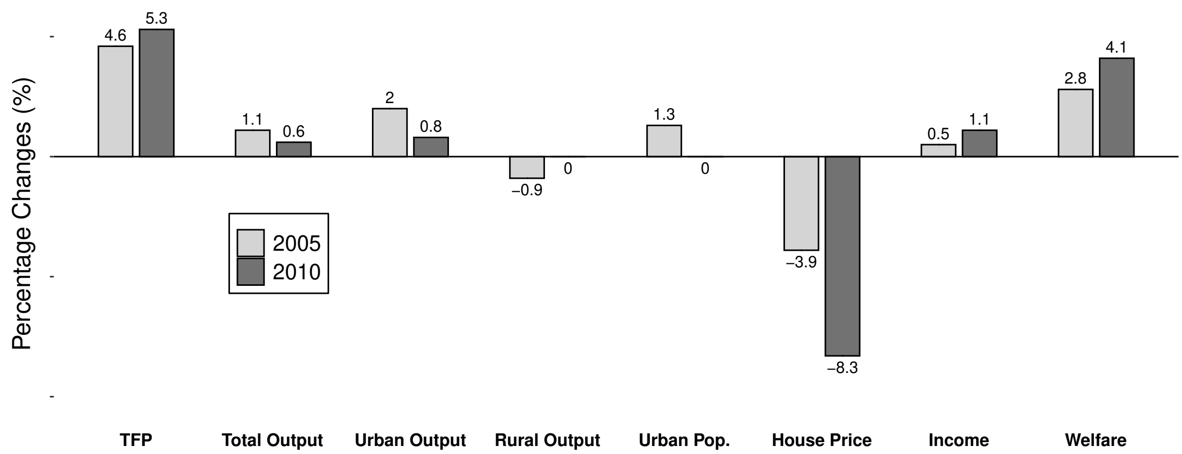
Notes: This table displays a summary of welfare by city group (summations within the group) in 2010. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

C.7.2 Aggregate and Spatial Effects on Economic Development

We also show additional results on the counterfactual analysis with the regional transfer.

Aggregate Effects of the Regional Transfer with the Simple Rule We show the aggregate effects of replacing the inland-favoring land policy with the regional transfer on national TFP, urban output, rural output, urban population, and national average income and welfare. The results are plotted in Figure C2. Removing the place-based land policy leads to significant gains in TFP, urban output, income, and welfare in 2005 and 2010. It also helps to increase the urban population due to lower residential floor space prices in more developed cities. Rural output falls due to worker emigration.

Figure C2: **Aggregate Effects of Replacing the Inland-Favoring Policy with the Simple Rule of Regional Transfer**



Notes: This figure shows the aggregate effects of replacing the inland-favoring policy with the regional transfer on the Chinese economy in 2005 and 2010. We find substantial national gains in TFP, total output, urban output, urban population, income, and welfare.

Spatial Effects on Economic Development We show the spatial effects on economic development in Table C17 on changes in TFP, urban output, rural output, urban population, and house price and Table C18 on changes in the decomposition of TFP.

Table C17: **Replacing the Inland-Favoring Policy with the Simple Rule of Regional Transfer: Spatial Effects on Economic Development**

Regions	No. of	Δ TFP		Δ Urban Output		Δ Rural Output		Δ Urban Pop.		Δ House Price	
(loc., dev.)	Cities	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$	$\widehat{2005}$	$\widehat{2010}$
National	225	4.6%	5.3%	2.0%	0.8%	-0.9%	0.0%	1.3%	0.0%	-3.9%	-8.3%
(east, high)	21	2.9%	6.0%	5.8%	12.2%	-0.7%	0.4%	5.7%	10.3%	-18.9%	-35.7%
(east, mid)	51	0.0%	-1.3%	-0.7%	-4.7%	-0.5%	0.9%	-0.7%	-3.5%	1.2%	11.5%
(east, low)	25	-0.4%	-1.8%	-0.8%	-4.3%	-1.4%	-2.2%	-0.6%	-2.6%	-3.5%	3.3%
(inland, high)	2	-0.2%	-2.4%	0.0%	-3.3%	0.0%	2.1%	0.0%	-1.2%	1.6%	18.4%
(inland, mid)	50	-0.2%	-5.6%	-2.4%	-10.9%	-1.1%	0.0%	-1.9%	-7.5%	1.7%	10.2%
(inland, low)	76	0.2%	-3.4%	-1.3%	-6.1%	-1.3%	-0.8%	-1.4%	-4.7%	-3.5%	-1.1%

Notes: This table displays a summary of changes in core economic development variables by group (weighted by population) in 2005 and 2010. Regions are classified by the location of the city (east or inland) and the level of development (GDP per capita) in 2005, consistently as in Table 5.

Table C18: **Replacing the Inland-Favoring Policy with the Simple Rule of Regional Transfer: Spatial Effects on Measured TFP**

Regions	No. of	2005				2010			
(location, development)	Cities	Total	Fund	SP	LSP	Total	Fund	SP	LSP
National	225	4.6%	4.5%	-0.7%	0.8%	5.3%	5.6%	-0.5%	0.2%
(east, high)	21	2.9%	3.0%	-2.8%	2.8%	6.0%	3.8%	-2.2%	4.5%
(east, mid)	51	0.0%	0.2%	0.1%	-0.3%	-1.3%	0.5%	0.4%	-2.2%
(east, low)	25	-0.4%	-0.8%	0.1%	0.3%	-1.8%	-0.6%	-0.1%	-1.0%
(inland, high)	2	-0.2%	0.0%	0.0%	-0.2%	-2.4%	0.0%	0.0%	-2.4%
(inland, mid)	50	-0.2%	0.9%	-0.1%	-1.1%	-5.6%	-1.7%	-0.3%	-3.7%
(inland, low)	76	0.2%	0.4%	0.1%	-0.3%	-3.4%	-1.5%	0.2%	-2.1%

Notes: This table displays a summary of changes in measured TFP $ln(\widetilde{TFP}_{ju})$ by city group (weighted by population) in 2005 and 2010 as well as its decomposition: Fund stands for fundamental, SP stands for skill premium, and LSP stands for land scale premium. Regions are classified by the location of the city (east or inland) and level of development (GDP per capita) in 2005. For the level of development, we divide all cities into three categories {high, mid, and low} to capture $\{10\%, 45\%, 45\%\}$ of the distribution of GDP per capita. Each region consists of the same cities in 2005 and 2010 for consistent comparisons.

References

Bernard, Andrew B, J Bradford Jensen, Stephen J Redding, and Peter K Schott. 2007. "Firms in International Trade." *Journal of Economic Perspectives* 21 (3):105–130.

———. 2018. "Global Firms." *Journal of Economic Literature* 56 (2):565–619.

Fang, Min and Zibin Huang. 2022. "Migration, Housing Constraints, and Inequality: A Quantitative Analysis of China." *Labour Economics* 78:102200.

Levinsohn, James and Amil Petrin. 2003. "Estimating Production Functions Using Inputs to Control for Unobservables." *The Review of Economic Studies* 70 (2):317–341.

Lu, Ming and Kuanhu Xiang. 2016. "Great Turning: How Has the Chinese Economy Been Trapped in an Efficiency-and-Balance Tradeoff?" *Asian Economic Papers* 15 (1):25–50.

Michalopoulos, Stelios and Elias Papaioannou. 2014. "National Institutions and Subnational Development in Africa." *The Quarterly Journal of Economics* 129 (1):151–213.

Olley, G Steven and Ariel Pakes. 1992. "The Dynamics of Productivity in the Telecommunications Equipment Industry." Tech. rep., National Bureau of Economic Research.

Oster, Emily. 2019. "Unobservable Selection and Coefficient Stability: Theory and Evidence." *Journal of Business & Economic Statistics* 37 (2):187–204.