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Urbanization, Regional Development, and Economic Inequality: Contemporary Policy Perspectives

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Abstract

While urbanization is reconfiguring income distribution patterns, it can increase or decrease economic inequality depending on local conditions, infrastructure availability, and the stage of urban transition. The paper explores the interaction between urbanization, regional development, and economic inequality using a stylized balanced panel of 160 regions observed in 2005, 2010, 2015, and 2021, grouped into five regional types. The region and year fixed-effects models are applied along with the region-clustered standard errors, Theil decomposition, and a type-by-year heat map of the urban–rural income ratio. The results indicate that the Gini coefficient and the urban–rural income ratio have an inverted-U relationship with urbanization, with the turning points for the Gini coefficient and the urban–rural income ratio occurring at 57 percent and 61 percent, respectively, of urbanization, after accounting for infrastructure access. Urbanization reduces poverty very strongly, and urbanization in neighboring regions has a similar (negative) effect on poverty as urbanization in the own region. However, the magnitude of regional differences increases from 80.2 to 87.5 percent of the overall Theil index of inequality, with the gap between the coast and frontier regions increasing, while that between urban and rural areas in the industrial regions widens. The paper finds that urbanization is equalizing incomes only through a threshold in infrastructure and institutional development and provides policy suggestions on the issue of infrastructure, housing, connectivity, and place-sensitive governance.

Keywords: Urbanization, Regional Development, Economic Inequality, Spatial Spillovers, Urban–Rural Gap, Policy Perspectives.

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Introduction

Along with population growth, urbanization is one of the most salient economic changes of our times. Cities become sources of prosperity as people, firms, and public investments focus on them, and this spatialization of sources of prosperity is paralleled by a corresponding spatialization of sources of inequality. Urbanization means that the effects on the distribution of people are not even. Theoretically and empirically, urbanization has been shown to affect the income distribution by labor reallocation, land and housing markets, and provision of public services He & Zhang, (2022), and the housing dimension in particular to be related to spatial inequality (Fischer, 2023). Another channel is infrastructure. Infrastructure inequality is not something that occurs in isolation, but instead is part of urbanization itself, and can be incorporated into the fabric of the city even during periods of rapid urbanization, as average incomes go up (Pandey et al., 2022). The regional dimension is used to broaden the problem beyond the city level. A regional development trap where the stagnation of regional economies makes it difficult to overcome low growth has been identified in Europe (Diemer et al., 2022), and spatial studies of income inequality in EU countries suggest that the geographical pattern of inequality has not been changing (Niknam Khajepasha & Gkartzios, 2024). Nor is there certainty of convergence. Research on regional convergence in the European Union investigates the drivers of regional convergence between the European Union's two major crises, the Great Recession and the COVID crisis, when several shocks challenged the equalizing effect of the standard growth models (Pintera, 2024). Large cities can also out-compete their surroundings, and there is evidence that expansion shadows exist that can cast upon nearby places (Cuberes et al., 2021).

A third strand has to do with the urban–rural divide. There has been a study of the spatial pattern of urban–rural integration in China Pan et al., (2023), and the urban–rural polarisation of social values and economic development has been documented around the world, impacting both politically and economically (Luca et al., 2023). The role of cities in driving prosperity is also now being rethought, and the new issues of cities in a post-COVID world and location preferences have been taken into account as it relates to remote work and location assumptions (Florida et al., 2023). There is still a wealth of work, but three gaps that are yet to be filled. First, the urbanization–inequality nexus or regional convergence are the most common choices in the studies, often without a common empirical base. Second, access to infrastructure is typically handled as a control variable and not as a variable that could change the turning point of the relationship between the two. Third, the relative importance of between-regional and within-regional sources of inequality is rarely published in conjunction with the regression results. In this paper, these gaps are filled by (i) estimating non-linear fixed-effects models relating urbanization to inequality, while including infrastructure access as a control, (ii) testing for spatial spillovers from urbanization to poverty, (iii) mapping the urban–rural income gap in terms of regional type and period, and (iv) decomposing total inequality using the Theil index.

The paper is based on a different order than the standard theoretical formulation and methodological analysis followed by a brief empirical examination. The book follows a results-driven format, in which literature is integrated with testable propositions, the analytical design is contained within a limited space, and the bulk of the book is devoted to the results and their interpretation and the subsequent policy implications. The paper's literature review is presented in Section 2, which also includes four hypotheses; Section 3 lays out the framework, data, and estimation strategy; Section 4 discusses the results; Section 5 presents perspectives on policy implications and limitations; and Section 6 concludes.

Literature Review and Propositions

The phenomenon of rising and falling inequality in China has been the focus of some studies that look at the possibility of a Kuznets curve; these studies show that results can be sensitive to measurement and specification (Ravallion & Chen, 2022). This also encourages the method adopted in this study: the turning point is explicitly estimated, then compared for the two measurements of inequality and is tested for infrastructure dependence. A more positive interpretation of urbanization is that it can be expected to decrease income inequality in the city, as the gap can also be reduced due to migration and structural change in the city when it reaches a mature stage (Wan et al., 2022). This is also reflected in the research that was conducted on tourism, urbanization, and income inequality in China, where the distributive impact of urbanization is seen to be dependent on the nature of activities that generate urbanization (Zhang, 2023). All these studies suggest that the urbanization–inequality relationship is not always positive. A second body of work explores the idea of places instead of individuals. In fact, research pinpoints two types of left-behind places: unequal places and places in economic decline, and shows that the two are analytically and politically different, and that the rise of populism in the USA and Europe is linked to economic decline, but not to interpersonal inequality (Rodríguez-Pose et al., 2023). This argument of territorial discontent has also been expanded to the green transition,

which can result in new "geographies of winners and losers" (Rodríguez-Pose & Bartalucci, 2024). History and institutions do matter, too; in China, the long shadow of history has been correlated with regions experiencing changes in governance and inequality in territory (Wang et al., 2021). These contributions will indicate that lagging areas are not as strongly disadvantaged as is often assumed because of their urbanization.

Whether catch-up can be achieved in lagging places will depend on their capabilities. Comparative evidence on innovation in lagging cities in China suggests that the term "lagging" is not a homogeneous term, but rather depends on local circumstances (Rodríguez-Pose et al., 2021). Access to infrastructure is not just a control—innovation and productive capacity rely on it, and access to it will generate broad or narrow income gains. The third strand is a relation of urban change to poverty and to the urban–rural gap in space. The spatial spillover effect on poverty reduction and urbanization has also been studied for rural China (Wang et al., 2023); rural financial development and the spatial spillover and poverty reduction have also been studied (Zhu et al., 2021). The urban–rural income gap has been approached as a relationship between urban expansion and the urban income gap, where urban expansion can change it instead of closing it. The urban–rural income gap has been examined as a relationship between urban expansion and the urban income gap, and that the urban income gap can be changed by urban expansion (Zhong et al., 2022). These studies share a common theme, which is that the benefits and expenses of urbanization are not confined to administrative boundaries; that neighboring regions should be included in the regional model.

Four hypotheses are motivated by the literature. H1: The relationship between urbanization and income inequality (Gini coefficient and urban–rural income ratio) is U-shaped. Better infrastructure access will reduce inequality and shift the turning point to a higher level of urbanization. Urbanization decreases poverty, and urbanization in adjacent regions provides a spillover benefit. H4: Within-region inequality is decreasing, but the inequality between types of regions is increasing due to unequal distribution of benefits from urbanization by region type.

Analytical Framework, Data and Estimation

The analytic logic is summarized in fig. 1. Urbanization impacts on the inequality directly through agglomeration, migration and land conversion, and indirectly through mediating factors like access to infrastructure, housing and labour market. Both the speed of urbanization and the robustness of the channels are shaped by regional context conditions, and across-regional spatial spillovers carry effects over to other regions, linking urbanization to welfare outcomes, here proxied by poverty incidence.

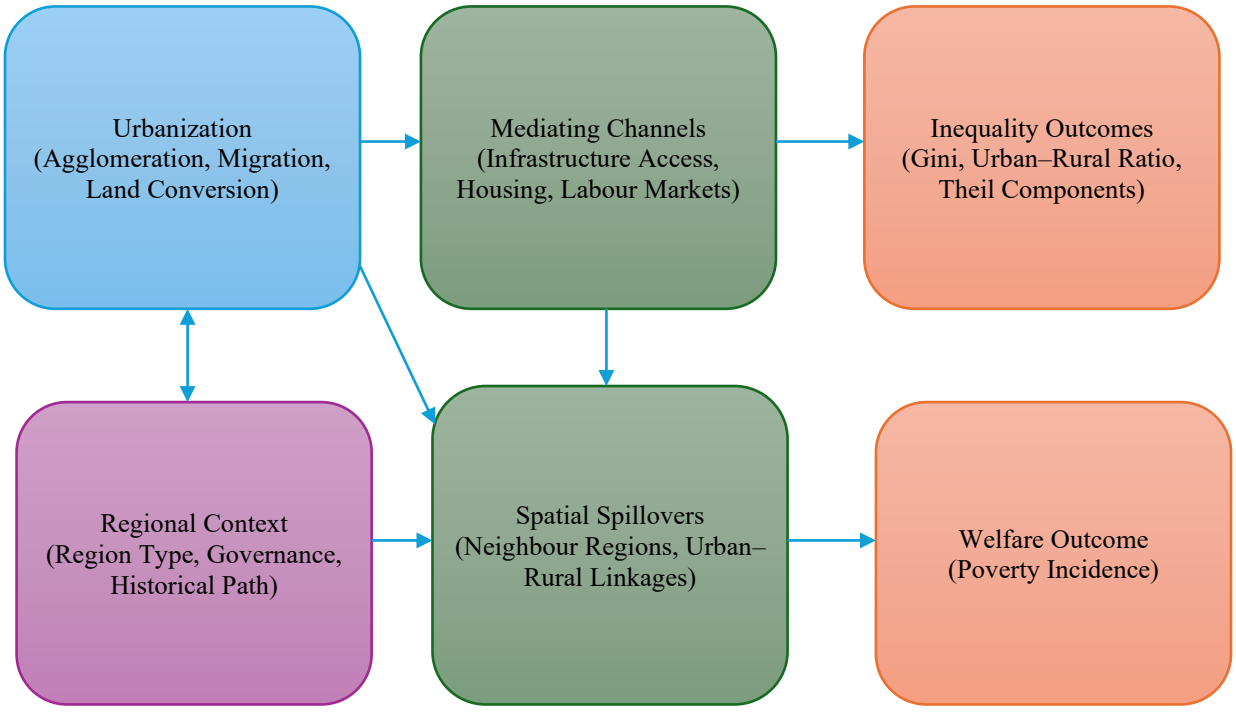


Fig. 1: Analytical Framework Linking Urbanization, Regional Context, Mediating Channels, Spillovers and Outcomes

The empirical analysis uses a stylized balanced panel of 160 regions (640 region-year observations) observed in 2005, 2010, 2015 and 2021. There are five types of regions: coastal metropolitan, inland industrial, interior services, rural-agrarian, and frontier or peripheral. The panel is made of synthetic material. It is produced using a fixed random seed to create stylized facts which are substantiated in the literature reviewed above, namely: the hump-shaped relationship between urbanization and inequality, negative effect of infrastructure, poverty reduction due to both own and neighboring urbanization, and higher income growth in advanced regions. The data are thus to be considered as examples of the analytical process rather than as estimates of the situation in any given country. The factors are: urbanization rate (percentage of population living in urban areas), an infrastructure access index (0–100), the regional Gini coefficient, the urban–rural income ratio, poverty incidence (% of population) and neighboring-region urbanization, which is the mean urbanization level of other regions of the same type in the same year.

Inequality is modeled with region and year fixed effects and standard errors clustered by region, shown in equation (1):

$$\mathrm{INEQ}_{it} = \alpha_i + \lambda_t + \beta_1 \mathrm{URB}_{it} + \beta_2 \mathrm{URB}_{it}^2 + \beta_3 \mathrm{INFRA}_{it} + \varepsilon_{it} \qquad (1)$$

where INEQ is either the Gini coefficient or the urban–rural income ratio, URB is urbanization in tens of percentage points, and INFRA is infrastructure access in tens of index points. The turning point is $\mathrm{URB}^* = -\beta_1/(2\beta_2)$. Poverty is modeled as defined in equation (2):

$$\mathrm{POV}_{it} = \alpha_i + \lambda_t + \gamma_1 \mathrm{URB}_{it} + \gamma_2 \mathrm{NBR}_{it} + \gamma_3 \mathrm{INFRA}_{it} + u_{it} \qquad (2)$$

where NBR is neighboring-region urbanization, so that γ_2 captures the spatial spillover. Finally, total inequality in each year is measured with the Theil index over 320 urban and rural population segments and decomposed additively into three parts: the component between regional types, the component between regions within types, and the urban–rural component within regions.

Results

Descriptive Patterns Across Regional Types

The period-pooled means by regional type are reported in table 1. The regional hierarchy is almost perfectly matched by urbanization and poverty: coastal metropolitan regions have an average urbanization rate of 68.1 percent, and an average poverty rate of 8.0 percent; frontier regions have an average urbanization rate of 26.5 percent, and an average poverty rate of 23.2 percent. As a result of this, the correlation between urbanization and poverty is −0.91, while the correlation between urbanization and infrastructure is 0.88, so the following econometric models split the two. The average Gini is, by contrast, highest in the interior services regions (0.312) and lowest in the frontier regions (0.298), a first indication of a hump-shaped pattern with middle-stage regions being the most unequal.

Table 1: Descriptive Statistics by Regional Type

Regional type	Regions	Urbanization (%)	Infrastructure index	Gini	Urban–rural ratio	Poverty (%)
Coastal metropolitan	30	68.1 (7.4)	69.0	0.303	1.70	8.0
Inland industrial	35	57.6 (8.7)	60.6	0.308	1.75	11.6
Interior services	30	48.7 (9.4)	56.0	0.312	1.73	14.7
Rural-agrarian	35	34.3 (10.4)	46.6	0.302	1.68	19.7
Frontier/peripheral	30	26.5 (8.8)	36.7	0.298	1.64	23.2
All regions (pooled)	160	47.0 (17.4)	53.8	0.305	1.70	15.5

Note: 640 region-year observations. The urban–rural ratio is urban divided by rural per capita income.

The aggregated image that emerges over time is of a very rapid urban transition together with a declining average inequality. By 2021, mean urbanization increases from 37.1 percent in 2005 to 57.4 percent; and access to infrastructure increases from 40.0 to 68.2 percent, while poverty decreases from 23.4 to 7.1 percent. The average Gini coefficient drops from 0.315 to 0.290, as does the average urban–rural ratio, which falls from 1.74 to 1.65. Averages conceal divergence, however, as the next two subsections show.

4.2 The urban–rural gap by regional type and period

Fig. 2 is a heat map of the mean income ratio between urban and rural areas, by regional type and survey year, showing the scale of color to the right of the figure and the values of the cells to be read exactly. The darkest cells in 2005 are for the inland industrial (1.82), coastal metropolitan (1.80) and interior services (1.79) regions, where the urban income

premium is highest. Coastal metropolitan is the lowest-scoring cell in 2021 (1.59). Those in coastal regions, therefore, experience the largest decrease in the gap (−0.22), followed by those in inland industrial (−0.16) and interior services (−0.13) regions. The rural-agrarian regions' change is minimal, falling by only 0.03 from 1.69 to 1.66. Frontier regions trend towards an increase in the ratio from 1.61 to 1.67 and, as such, have the highest ratio of any kind in 2021. The heat map then illustrates the convergence of the urban income premium among advanced and middle stage regions, and its emergence in the least urbanized regions.

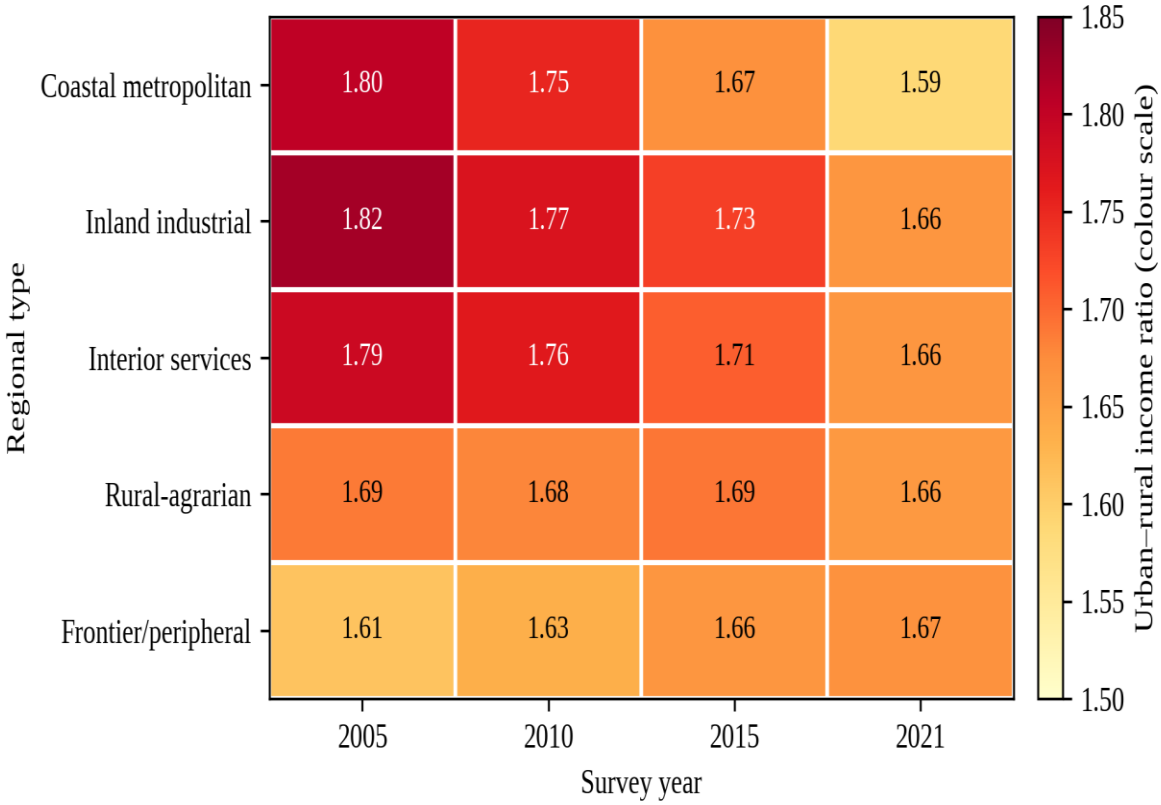


Fig. 2: Mean Urban–Rural Income Ratio by Regional Type and Survey Year

Urbanization and Inequality: Nonlinear Fixed-Effects Estimates

Central estimates are included in table 2. H1 is supported by the urbanization having positive linear coefficient and negative quadratic coefficient in the model of both are significant at 1 % level in column (1). With infrastructure added in column (2), the hump remains but there is a change in the estimated turning point from 46.7 to 56.7 %, as part of what the simple model explains as urbanization is actually infrastructure access; the infrastructure coefficient is −0.0077 per 10 index points, which implies, for example, that a 10-point increase in access would be accompanied by an 0.008 decrease in the Gini coefficient. This pattern is referred to in the first part of H2. At 70 % urbanisation, the marginal effect of a change of 10 % urbanisation becomes −0.008, meaning that the urbanisation effect is disequalising in early stages and equalising in late stages.

Table 2: Fixed-Effects Estimates of Urbanization and Inequality (Standard Errors Clustered by Region in Parentheses)

Variable	(1) Gini	(2) Gini	(3) Gini	(4) Urban–rural ratio
Urbanization (per 10 pp)	0.0309***	0.0353***	0.0386***	0.195***
	(0.0031)	(0.0029)	(0.0070)	(0.015)
Urbanization squared	-0.0033***	-0.0031***	-0.0034***	-0.0158***
	(0.0003)	(0.0002)	(0.0008)	(0.0011)
Infrastructure (per 10 pts)		-0.0077***	-0.0077***	-0.042***
		(0.0013)	(0.0013)	(0.006)
Urbanization × infrastructure			0.0003	
			(0.0007)	
Turning point (% urbanized)	46.7	56.7	56.0	61.4
Within R^2	0.627	0.663	0.664	0.606
Observations / regions	640 / 160	640 / 160	640 / 160	640 / 160
Region and year effects	Yes	Yes	Yes	Yes

Note: * p<0.10, ** p<0.05, *** p<0.01. Urbanization is in tens of percentage points. Turning point is $-\beta_1/(2\beta_2)$ expressed in % urbanized. Within R^2 excludes absorbed region effects.

In column (3), it is determined if infrastructure alters the curve by an interaction. The interaction term is small but statistically insignificant (0.0003, 0.0007) and the turning point is near unchanged at 56.0 %, lending support for an additive, rather than multiplicative, effect of infrastructure on inequality; it reduces inequality at all levels but does not change the shape of the hump. The level effect is thus shown to be supported, while the shift in turning-point is only partially supported, and is not significantly different from zero. The exercise is repeated in column (4) for the urban–rural ratio. The hump again is important and the turning point is 61.4 %, which is some five points higher than the Gini coefficient. The urban-rural premium is thus continuing to widen beyond just the level of inequality at the overall regional level, consistent with a labour market in which the urban-rural wage gap is only felt once a certain size of the urban region is achieved.

The turning point is relevant because there are different times that the regions cross the turning point. The number of observations in the region outside the turning point, in 2005, showed 14.4 % of observations, which increased to 54.4 % in 2021, using the threshold of 56.7 % in column (2). Most of the regions are in the falling part of the curve, but the minority in the rising part of the curve is concentrated in the least urbanized types, in turn creating the heterogeneity results below.

Poverty Reduction and Spatial Spillovers

The poverty models are provided in table 3. The poverty incidence drops by 10 percentage points for every 10 percentage points increase in urbanization in the region, by 0.64 point for every 10 points increase in infrastructure in the region. Adding neighbouring urbanization to column (2). Its coefficient is −2.17 with a significance level of 1 %, some way short of that of the own-region coefficient (which is −2.31). The own-region effect in column (1) is in part captured by the neighbourhood effect, as suggested by H3 and in line with the logic of spillovers as suggested in Section 2.4. Policy, in turn, implies that the benefits of urban investment run also in the region's surroundings; a region investing in urban development gives its neighbours part of the benefits, and vice versa, a region surrounded by slowly urbanizing neighbours takes part of the urban benefits.

Table 3: Fixed-Effects Estimates for Poverty Incidence with Spatial Spillover (Standard Errors Clustered By Region)

Variable	(1) Own-region	(2) With spillover
Urbanization (per 10 pp)	-3.244***	-2.306***
	(0.433)	(0.582)
Neighbouring urbanization (per 10 pp)		-2.170***
		(0.828)
Infrastructure (per 10 pts)	-0.644***	-0.607***
	(0.182)	(0.178)
Within R^2	0.954	0.955
Observations / regions	640 / 160	640 / 160

Note: * p<0.10, ** p<0.05, *** p<0.01. Dependent variable is poverty incidence (%). Neighbouring urbanization is the mean urbanization of the other regions of the same type in the same year. Region and year effects included.

Heterogeneity by Regional Type

Table 4 estimates the within-type slope of each outcome on urbanization, again with region and year effects. The figures are consistent: there are significant variations behind the overall hump. Disequalisation also persists in rural-agrarian areas, with a change of 10 points in the Gini coefficient being followed by a change of 0.023 ($p<0.01$), and a change of 10 points in the urban–rural ratio by a change of 0.096 ($p<0.10$). In frontier areas, the ratio increases by 0.121 per 10 points ($p<0.05$); and the Gini slope is statistically equal to zero, meaning that premiums in frontier areas are opening up but are not yet influential in overall inequality. Contrary to coastal metropolitan areas, an increase in urbanization in rural areas decreases the urban–rural ratio by 0.098 ($p<0.05$). In interior services (−3.17), rural-agrarian (−4.17) and inland industrial (−2.64) regions, poverty was negatively affected, most strongly in the rural-agrarian regions where poverty is already high, while in coastal and frontier regions, where poverty is already low, or the urban base is thin, there was no significant effect.

Table 4: Within-Type Association Between Urbanization (Per 10 Pp) And Inequality and Poverty Outcomes (Region-Clustered Standard Errors in Parentheses)

Regional type	Gini slope	Ratio slope	Poverty slope
Coastal metropolitan	-0.0016 (0.0084)	-0.098** (0.036)	-0.97 (1.23)
Inland industrial	-0.0108 (0.0084)	-0.046 (0.034)	-2.64** (1.02)
Interior services	-0.0010 (0.0110)	0.034 (0.048)	-3.17** (1.45)
Rural-agrarian	0.0233*** (0.0070)	0.096* (0.048)	-4.17*** (1.26)
Frontier/peripheral	0.0025 (0.0122)	0.121** (0.047)	-1.69 (1.40)

Note: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Each cell is a separate regression of the outcome on urbanization with region and year effects, estimated within the stated regional type. Infrastructure is not controlled, so slopes are total associations.

Decomposing Total Inequality

The results of Theil decomposition are presented in the form of stacked bars in fig. 3 and the exact values are presented in table 5. Despite a decreasing mean regional Gini coefficient, total inequality among the 320 urban and rural segments increases by 59 % (×100) from 5.71 in 2005 to 9.09 in 2021. This is because it can be seen in the stack. The between type component ranges from 4.57 to 7.95 and is 80.2 % in 2005 and 87.5 % in 2021. The urban–rural component within regions remains consistent around 1.0, decreasing from 17.2 % to 10.7 %, as for between-region component within types which remains close to zero (about 0.16). The urban–rural gradient within a region, not the type of region, is becoming more important in terms of inequality.What matters is more the urban–rural gradient within a region than the type of region, supporting H4.

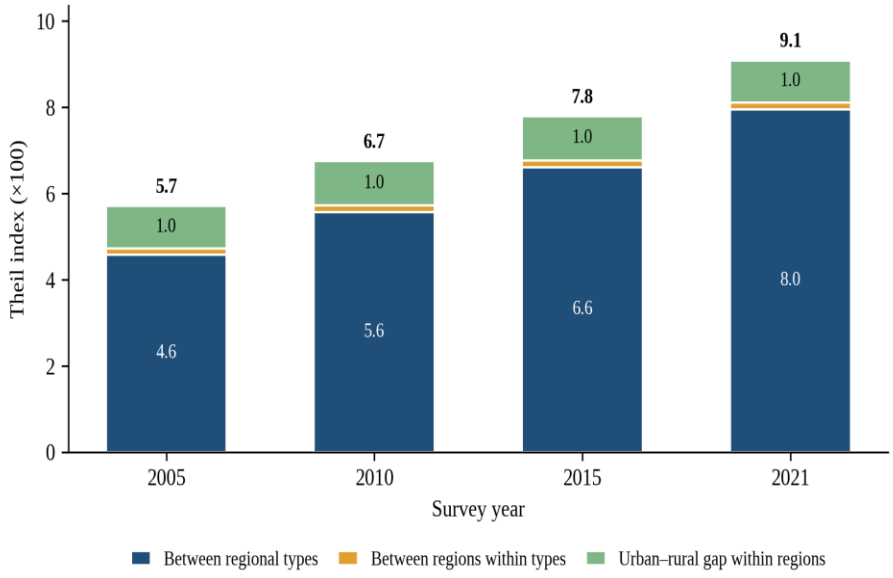


Fig. 3: Stacked Decomposition of The Theil Index (×100) By Survey Year

Table 5: Theil Index Decomposition by Year (Index Values ×100)

Year	Total Theil (×100)	Between types	Between regions within types	Urban–rural within regions	Between-type share (%)
2005	5.71	4.57	0.15	0.98	80.2
2010	6.75	5.57	0.16	1.02	82.5
2015	7.79	6.61	0.16	1.02	84.8
2021	9.09	7.95	0.16	0.97	87.5

Note: Computed over 320 urban and rural population segments (160 regions × 2). Components sum to the total.

Robustness Checks

Table 6 re-estimates the Gini model of table 2 (column (2)) for four alternative samples and controls. The linear term is stable, between 0.034 and 0.038, at the 1 % level, as is the quadratic term between −0.0028 and −0.0034, also at 1 % level, while the infrastructure coefficient is found to be between −0.0061 and −0.0077. When the coastal metropolitan regions are not included, the turning point is 52.3 % and when the frontier regions are not included, the turning point is 60.5 %. It is intuitive as coastal areas have already reached the peak and frontier areas have yet to reach it. The 2021 wave is out and the turning point is virtually unaffected (56.3 %). The turning point is increased by only a small amount (58.2 %) when absorbing the region-type-by-year effect, removing all common shocks to a region-type, without losing significance of the coefficients, which means that the result is not affected by the differences in the trends within the types.

Table 6: Robustness of the Gini Model to Sample and Fixed-Effects Choices

Specification	Urbanization	Urbanization²	Infrastructure	Turning point (%)	Within R^2	N / regions
Baseline (Table 2, col. 2)	0.0353***	-0.0031***	-0.0077***	56.7	0.663	640 / 160
Excluding coastal metropolitan	0.0337***	-0.0032***	-0.0074***	52.3	0.592	520 / 130
Excluding frontier/peripheral	0.0344***	-0.0028***	-0.0061***	60.5	0.701	520 / 130
Excluding 2021 wave	0.0380***	-0.0034***	-0.0075***	56.3	0.489	480 / 160
Region-type × year effects	0.0359***	-0.0031***	-0.0070***	58.2	0.147	640 / 160

Note: * p<0.10, ** p<0.05, *** p<0.01. Dependent variable is the Gini coefficient; all models include region effects and year effects, with standard errors clustered by region.

Summary of Hypothesis Tests

Table 7 collects the verdicts. Three of the four hypotheses are supported in full and H2 in part.

Table 7: Summary of Hypothesis Tests

Hypothesis	Key evidence	Verdict
H1: inverted-U in Gini and ratio	Significant $\beta_1>0$, $\beta_2<0$; turning points 56.7% (Gini), 61.4% (ratio)	Supported
H2: infrastructure lowers inequality, shifts turning point	Infrastructure −0.0077 (p<0.01); interaction 0.0003 (p=0.62)	Partly supported
H3: urbanization reduces poverty, with spillover	Own −2.31, neighbour −2.17 per 10 pp (p<0.01)	Supported
H4: between-type inequality rises as within-region gaps shrink	Between-type share 80.2% → 87.5%; urban–rural share 17.2% → 10.7%	Supported

Discussion and Policy Perspectives

The results convey a single message with multiple layers: Urbanisation is not a uniformly equalising or disequalising process and its distributive impact will vary depending on the stage of the urban transition faced by a region, as well as on the conditions for sharing the urban gains. The inverted-U reinforces the general idea of the Kuznets tradition while also taking into account the warning that turning points are fragile and that here the turning point is at 56–57 % for the Gini coefficient, shifting by 10 points if infrastructure is not included. The addition of evidence of the urban–

rural ratio peaking later than the Gini coefficient provides a policy-relevant nuance, as inequality increases in less-urban areas may occur well after aggregate inequality is declining. The magnitudes behind this message are quantified in tables 9 and 10 and fig. 4, which follow table 8.

Infrastructure and housing. When inequality in infrastructure is reduced at all stages, it is in line with the argument that unequal infrastructure is a component of how cities grow. Basic services should be provided in rapidly expanding peripheral urban zones, as should housing supply, not to exacerbate the spatial sorting of housing markets, and public transport that links urban and rural labour markets.

Linkage to outlying areas. The heat map and table 4 reveal new urban–rural premiums are emerging in frontier and rural-agrarian areas. Good urban job quality, through targeted connectivity (roads, digital access, market connections) and urban policies that increase the quality of urban jobs, would help limit the further premiumization.

Spatial coordination. Urbanization in neighbouring regions can significantly lower poverty, as well as urbanization in the region itself, so regional policy needs to coordinate with neighbouring regions. There should be joint planning, common infrastructure, and fiscal transfers that incentivize the provision of external benefits across borders. However, the potential for secondary cities to encroach on the shadow of growth calls for prudence: Support for secondary cities must be developed in such a way that large metropolitan centres do not compete with them.

Place-sensitive governance. The increasing between-type inequality makes it hard to use national averages. Place-based strategies need to be combined with monitoring of regional dispersion in addition to the national Gini coefficients, and consideration of the territorial implications of the green transition, as promoted by regions at risk of development traps and for 'left-behind places'.

Connections to previous findings. The results are useful to explain two conflicting interpretations from the literature. The argument of urbanization reducing inequality is consistent with the descending branch of the curve, which most of the regions in the panel are at the present day, while research on urban expansion and the urban–rural income gap speaks to the ascending branch, which is still evident in rural–agrarian and frontier regions. The sectoral dependence suggested in the literature on tourism, urbanisation and urban income inequality and the heterogeneity of innovation in lagging cities provide plausible explanations as to why the turning points vary across region types, but cannot be directly tested by the present design. The spillover effect is similar to the spatial dynamics of urban studies on urbanization and poverty reduction and rural studies on financial development, spatial spillover and poverty reduction, while the differences in types are similar to the left-behind places literature and the institutional legacies emphasised by regional governance reform studies and territorial inequality.

Table 8 translates the type-specific findings into policy priorities, so that the discussion above can be read type by type.

Table 8: Policy Priorities Implied by The Results, By Regional Type

Regional type	Main result	Policy priority
Coastal metropolitan	Largest fall in urban–rural ratio (1.80 to 1.59); poverty near zero	Housing affordability and spillover links to neighbouring regions
Inland industrial	Steady convergence; strong poverty response (−2.64)	Infrastructure upgrading and job quality in urban industry
Interior services	Highest mean Gini (0.312); poverty response −3.17	Public transport and services in fast-growing urban areas
Rural-agrarian	Urbanization still raises Gini (+0.023); gap not closing	Rural–urban market links, finance and skills
Frontier/peripheral	Urban–rural ratio rising (1.61 to 1.67)	Basic connectivity and place-based investment

Implied Magnitudes and Temporal Dynamics

The following subsections derive the implied magnitude and dynamic profile for each estimate. Each of the following tables and figures is calculated straight from coefficients and summary statistics presented in tables 1, 2 and 3 above, without conducting any additional estimation. Since the panel data are artificial, the figures are intended to demonstrate the logic of the analysis rather than the real-world situation.

Table 9 shows the marginal effect of a 10-percentage point increase in the urbanization rate on the Gini coefficient and the urban-rural ratio for some selected levels of urbanization, based on the coefficients from table 2 (marginal effect = $\beta_1 + 2\beta_2 \cdot \text{URB}$, with URB in tens of percentage points). In the absence of infrastructure (column 1), the effect

becomes negative when urbanization reaches 40-50 %, while in its presence (column 2) the effect remains positive up to 57 %.

A rise of ten points when urbanization is 30 % results in a change in Gini coefficient by 0.017 in column (2) of the regression, while an increase of ten points at 70 % decreases the Gini coefficient by 0.008, which is the value that is stated alongside table 2. With respect to the urban–rural ratio, the impact is positive until about 60 % and negative from 70 % onwards.

Table 9: Implied Marginal Effect of a 10-Percentage-Point Rise in Urbanization at Selected Urbanization Levels

Urbanization level (%)	Gini, Table 2 col. (1)	Gini, Table 2 col. (2)	Ratio, Table 2 col. (4)	Phase (col. 2 and col. 4)
20	0.0177	0.0229	0.1318	Rising
30	0.0111	0.0167	0.1002	Rising
40	0.0045	0.0105	0.0686	Rising
50	−0.0021	0.0043	0.0370	Rising
60	−0.0087	−0.0019	0.0054	Falling (Gini)
70	−0.0153	−0.0081	−0.0262	Falling
80	−0.0219	−0.0143	−0.0578	Falling

Note: Marginal effect = $\beta_1 + 2\beta_2 \cdot URB$ evaluated at the stated level (URB in tens of percentage points). Values are computed from the rounded coefficients in table 2, so implied zero crossings can differ from the reported turning points by a few tenths of a percentage point.

Fig. 4 shows the same graph on a continuous basis. The reason for the near-parallelism of the two graphs is that the coefficients in the quadratic terms are almost identical (−0.0033 and −0.0031); the distance between them represents that part of the urbanization effect that is really an infrastructure effect. Infrastructure raises the threshold at which the crossing occurs from around 47% to around 57%, so not controlling for it leads to underestimation of urbanization by about ten percentage points.

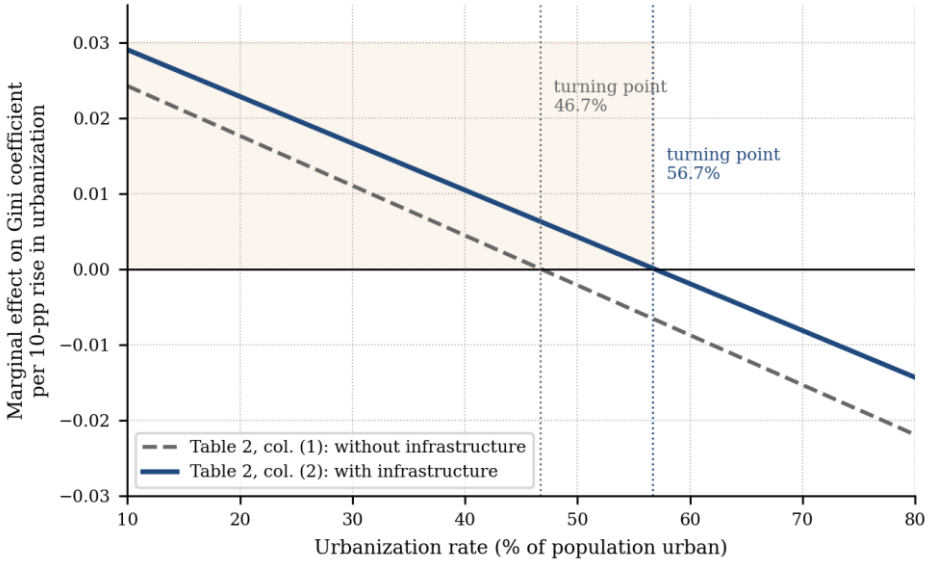


Fig. 4: Implied Marginal Effect of Urbanization on the Gini Coefficient by Urbanization Rate

Table 10 illustrates the poverty estimates presented in table 3 (column 2) by using some scenarios. An increase in the urbanization rate in one's region by 10 points leads to a decrease in poverty incidence by 2.31 points while an increase in neighbouring regions' urbanization rate by 10 points will lead to an additional decrease of 2.17 points in poverty incidence; thus a region's gain from being in sync with neighbouring regions in terms of urbanization is about twice as much as if it were to urbanize on its own (4.48 points, which is 29% of the pooled average poverty rate of 15.5%). If one includes 10 points increase in infrastructure access, the total gain increases to 5.08 points.

Table 10: Implied Change in Poverty Incidence under Stylised Scenarios (Based on Table 3, Column 2)

Scenario	Change in poverty incidence (pp)	As share of pooled mean poverty (%)
(a) +10 pp urbanization in own region	−2.31	14.9
(b) +10 pp urbanization in neighbouring regions	−2.17	14.0
(c) Own and neighbouring regions together, (a) + (b)	−4.48	28.9
(d) +10 points of infrastructure access	−0.61	3.9
(e) Scenarios (c) and (d) combined	−5.08	32.8

Limitations. The panel is synthetic, and was created to demonstrate the process and cannot be used for transferring magnitudes to any particular country. Neighbouring urbanization is not a measure of geographical contiguity, but rather is defined within the context of region types, and the fixed-effects design only reveals associations, not causal effects. Extensions such as the application of the framework to official regional statistics, the inclusion of spatial weights matrices and the testing of instrumental-variable strategies are natural extensions.

Conclusion

This paper analyzed the linkages between urbanization, regional development and economic inequality and established interesting variations in terms of the impact of urbanization on inequality across regions. Specifically, this study has found that there is an inverted-U shape between urbanization and Gini coefficients as well as urban-rural income ratio, with turning points at around 57% and 61% of urbanization, respectively. This suggests that urbanization may increase inequality in the early stage but become more egalitarian once regions move past the urban transition phase. Access to infrastructure reduces inequality regardless of the level of urbanization, but has no impact on turning points. Also, urbanization not only decreases poverty but creates important positive spill-over effects in neighboring regions to the extent that such spillovers are of the same magnitude as those in the own-region effect. On the other hand, inequality is increasingly differentiated among types of regions. The between-types component of Theil inequality becomes higher from 80.2% to 87.5%. At the same time, the proportion of within-region inequality due to urban-rural gap gets relatively lower. Thus, it can be concluded that urbanization does not necessarily imply equalizing effects. It requires certain infrastructural provision, housing and institution building as well as regional coordination. Hence, national policy approaches may neglect regional differentiations because they are built upon equal treatment of all regions. It is important to have place-based policy which will improve infrastructure and connectivity as well as help frontier and rural-agrarian regions not to stay at the rising part of the inequality curve. Implications of magnitude calculations based on the estimates (Tables 9 and 10, fig. 4) back up these results: after controlling for infrastructure, the point where change occurs shifts up about ten percent in terms of urbanization, and an area that urbanizes along with its neighbors reduces its poverty by nearly twice as much as one that does not.

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