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The spatial dynamics of America's debt-driven growth model

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ABSTRACT

The United States is considered the exemplar of a consumption-driven growth model supported by household debt and rising house prices. Yet this categorisation assumes that debt and growth occur in the same places. Using Common Correlated Effects Mean Group (CCEMG) estimation to control for cross-sectional interdependence across 321 US Metropolitan Statistical Areas (2001–2023), combined with corporate and sectoral network mapping, this analysis demonstrates that household debt growth effects disappear when spatial connections between metropolitan areas are properly controlled for, whilst positive house price effects remain locally bounded. The network analysis of CCEMG residuals identifies 29,784 systematic relationships between metropolitan areas operating at continental scale. Service-providing regions systematically outperform manufacturing areas, demonstrating sectoral hierarchies embedded in post-industrial capitalism. These findings demonstrate that debt-driven growth operates through connections between places, particularly national value chains, thereby challenging the ability of place-based development policies to support left-behind regions.

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1. Introduction

The rise of Donald Trump and other anti-establishment political movements focused attention on 'left-behind' regions across the American Rust Belt and rural areas that have experienced sustained economic decline due to de-industrialisation, whilst metropolitan centres captured most of the benefits of the shift towards a knowledge-based economy (Rodríguez-Pose, 2018). For decades, US policymakers expanded access to private credit and homeownership to address such income and wealth disparities (e.g., Prasad, 2012; Rajan, 2010), leading the growth models literature to classify the US as a consumption-driven economy supported by rising house prices and household debt (Hay, 2024 Reisenbichler & Wiedemann, 2022; Stockhammer & Gouzoulis, 2023;). However, this perspective has been criticised for insufficiently appreciating sub-national regional dynamics (Regan & Blyth, 2025), raising fundamental questions about whether spatially fixed household borrowing generates economic benefits through increased local consumption. When households in Detroit take out credit to purchase goods from Amazon, headquartered in Seattle with a national distribution network, or borrow against their homes to purchase vehicles manufactured in Kentucky and Texas, which area benefits from the resulting debt-driven growth? Formally assessing these regional dynamics of debt-driven growth in the US is where this paper makes an empirical contribution.

This paper evaluates three hypotheses that move systematically from testing territorial relationships to identifying spatial redistribution patterns and examining institutional mechanisms. The first tests whether household debt and house prices drive sub-national gross domestic product (GDP) growth as the growth models perspective suggests. The second tests whether spatial economic relationships operate through systematic redistribution patterns rather than random spillovers. The final hypothesis tests whether corporate and sectoral networks constitute the primary institutional mechanisms for systematic spatial redistribution. These hypotheses are assessed using error correction models with a Common Correlated Effects Mean

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Group (CCEMG) estimator applied to 321 US Metropolitan Statistical Areas over 2001–2023, combined with comprehensive Fortune 500 corporate network and sectoral mapping.

The results suggest that America's debt-driven growth model operates by systematically redistributing growth benefits between different places rather than driving local development. When connections between metropolitan areas are controlled for through methods that account for cross-sectional interdependence, household debt effects on local GDP become statistically insignificant, whilst positive house price effects remain robust and spatially localised. The network analysis of CCEMG residuals identifies 29,784 systematic relationships between metropolitan areas, with the majority crossing regional boundaries and operating at continental scale. Service-providing regions systematically outperform manufacturing areas, with Fortune 500 corporate networks amplifying these sectoral hierarchies.

These findings do not challenge the growth models perspective's argument that the US is a consumption-driven economy supported by rising house prices and household debt. Rather, by integrating insights from the economic geography and global production networks literatures, the analysis demonstrates how debt-financed consumption drives aggregate demand through geographically distributed corporate supply chains that systematically redistribute growth benefits from manufacturing areas to service centres. This highlights the challenges of using place-based policies to address regional economic decline in 'left behind' areas (Rodríguez-Pose et al., 2024).

The analysis proceeds through six further sections. Section 2, the literature review develops the theoretical framework and generates three hypotheses testing territorial assumptions in debt-driven growth. Section 3 explains the three-stage empirical design. The next three empirical sections (Sections 4–6) present the results: the first tests territorial debt-driven growth relationships (H1), the second identifies the systematic spatial relationships between metropolitan areas (H2) and the third assesses the corporate and sectoral network institutional mechanisms underpinning these relationships (H3). Finally, the paper ends with a summarising conclusion.

2. Challenging territorial assumptions in America's debt-driven growth model

The United States occupies a central place in Comparative Political Economy (CPE) as an archetype for understanding national growth dynamics. Baccaro and Pontusson's (2016) influential application of the post-Keynesian growth models perspective (e.g., Stockhammer, 2016) to CPE classified national economies according to their primary sources of aggregate demand, distinguishing between export-led growth regimes dependent on external demand and consumption-led regimes sustained through domestic spending. From this perspective, the United States is consistently identified as the archetype of a consumption-driven economy, where household borrowing and housing wealth effects support aggregate demand (Reisenbichler & Wiedemann, 2022; Stockhammer & Gouzoulis, 2023).

Rising house prices play a particularly important role in this growth model through four channels: stimulating residential investment as construction firms expand the housing stock (Kohl & Spielau, 2022; Kohler et al., 2023); increasing the consumption of housing services, such as gross rents and utilities paid by renters, as well as owners' imputed rents and utility payments (Weinstock, 2025); generating wealth effects that encourage homeowners to increase non-housing consumption (Shiller, 2007); and enabling homeowners to extract equity through mortgage borrowing to finance consumption and privately mitigate economic risks, such as healthcare provision (Crouch, 2009; Hay, 2024). Whilst these mechanisms are often associated with the anglophone economies of the US, UK and Ireland, econometric evidence suggests that house prices drive household debt and subsequent growth across both consumption-led and export-oriented economies (Wood & Stockhammer, 2023).

Although Baccaro and Pontusson's (2016) application of the growth models perspective to CPE is a major intervention in the literature, it focuses predominantly on national-level dynamics and thereby embeds an implicit territorial assumption where the benefits of debt-driven growth accrue within the same boundaries where debt accumulates. This assumption has recently attracted criticism from Regan and Blyth (2025) who argue that growth models scholarship insufficiently appreciates sub-national regional dynamics, downplaying the heterogeneity of regions and cities that experience fundamentally different growth trajectories and distributional outcomes. The territorial assumption matters because the mechanisms through which debt-driven growth operates are spatially differentiated. Housing markets are highly localised, shaped by local demand and supply conditions, commuting patterns and labour market boundaries, with the dwelling itself constituting a geographically fixed asset (Martin, 2011). In contrast, consumption need not be territorially bounded, as regional economies are not autonomous units but are systematically integrated through sub-national trade and financial flows, which cannot be accounted for by focusing solely on the national level (Martin et al., 2015). Whilst the impacts of trade have been examined at a regional level in the US (e.g., Rodrik, 2018), the regional effects of house prices and household debt on growth dynamics, and the extent to which they are spatially distributed, remain under-explored.

Global production networks (GPNs) and national value chains (NVCs) provide key theoretical frameworks for understanding how consumption-driven growth, supported by household debt and rising house prices, may be spatially distributed rather than contained within territorial boundaries. GPNs can be understood as geographically distributed networks through which firms source inputs, manufacture products and deliver goods and services to consumers (Henderson et al., 2002). GPNs produce systematic patterns of value creation and capture across international space, as economic activity in one location (particularly emerging economies) may generate value that is systematically captured elsewhere (particularly advanced economies), typically at corporate headquarters or in higher-value segments of the production or wealth chains (Henderson et al., 2002; Seabrooke & Wigan, 2017). National institutions, corporate structures and tax policies can influence whether value generated locally is retained or flows to distant nodes in the international network (Henderson et al., 2002; Seabrooke & Wigan, 2017).

NVCs operate through the same spatial logic as GPNs, but with a national focus. Here, production occurs in peripheral regions with comparative advantages, such as lower wage costs, technical expertise or natural resources, whilst revenue from nationwide sales is redirected towards geographically bounded corporate headquarters (Feser & Isserman, 2009; Lane, 2008). Logistics hubs ensure physical goods are nationally distributed (Bolumole et al., 2015), and firms investing in spatially distant network capital achieve higher growth rates (Huggins & Thompson, 2017). Interregional trade, which is dominated by intermediate goods used in the production process in the US, is a clear example of how economic activity in one US region contributes to economic growth elsewhere through the NVC (Baldwin et al., 2023; Bias, 1992). Interregional financial flows can also move from rural areas to local financial institutions, which, in turn, are redirected towards major financial centres such as New York and Chicago (Bowsher et al., 1958). This may be considered a domestic parallel to the international wealth chains identified by Seabrooke and Wigan (2017). Whilst positive spillover effects can diffuse economic activity from prosperous cores to peripheral regions, such diffusion often fails to materialise due to various barriers, leading to persistent territorial inequalities (Döring & Schnellenbach, 2006; Rodríguez-Pose et al., 2024).

Corporate networks create the organisational infrastructure for spatial redistribution. Lead firms occupy privileged positions in national and global production networks, capturing value generated across geographically distributed operations (Feser & Isserman, 2009; Henderson et al., 2002). Headquarter functions focus on high-value added activities, such as research and development, strategic decision-making, and financial coordination, which produce high-wage employment opportunities and are located in specific large urban metropolitan areas. In contrast, the low-value added activities of production and distribution, as well as the final consumption of goods occur elsewhere. This creates systematic spatial asymmetries, with regions hosting corporate headquarters capturing value from economic activity occurring across the national economy, whilst regions, particularly rural areas, serving as production sites or consumption markets, bear costs without commensurate benefits (Feser & Isserman, 2009). The Fortune 500 firms represent the most extensive lead firms of these networks, with supply chains, distribution systems and revenue streams spanning the continental USA and international markets.

Sectoral composition shapes how metropolitan areas fare within this system. The shift towards a knowledge-based economy has systematically privileged service-providing over goods-producing sectors (Hall, 2020). Service sectors, such as finance, information technology, professional services and corporate management, tend to operate in large urban centres and are inherently higher value-added than retail, manufacturing, agriculture or raw material extraction (Hsueh, 2025). But within any sector, value-added also varies along the value chain, and there are also American lead firms with cross-sectoral supply chains operating regionally, nationally and internationally, such as Apple and Google (Lee & Gereffi, 2021). Metropolitan areas therefore face a double differentiation: those dominated by high-value added services outperform those dominated by low-value manufacturing or agriculture, and within each sector, those hosting headquarters functions outperform those hosting production. These sectoral and functional hierarchies suggest that debt-financed consumption may systematically benefit some metropolitan areas at the expense of others, depending on their position within the NVCs.

To summarise, the growth models and economic geography literatures offer contrasting expectations about how debt-driven growth may operate spatially. The growth models perspective identifies household debt and house prices as drivers of aggregate demand, but its national-level focus has an implicit territorial assumption, namely that growth benefits accrue where debt accumulates. The GPN and NVC literatures challenge this assumption, specifying key mechanisms through which lead firms concentrate value capture at headquarters whilst production, distribution and consumption occur across geographically distant locations. When applied to debt-driven growth, this suggests that debt-financed consumption flows through national corporate networks and supply chains to service-providing, value-capturing metropolitan areas regardless of where the debt was accumulated, whilst house price effects remain spatially bounded as residential investment and construction are inherently local.

These competing perspectives generate three progressive hypotheses. The first tests the territorial assumption embedded in the debt-driven growth model literature:

H1: Household debt and house prices drive metropolitan-level GDP growth.

If territorial coherence is not supported, this motivates testing whether spatial relationships are systematic:

H2: Spatial economic relationships operate through systematic patterns rather than random or proximity-based spillovers.

If systematic patterns are identified, H3 tests whether they follow the corporate and sectoral hierarchies suggested by the GPN/NVC literatures:

H3: Corporate and sectoral networks constitute the institutional mechanisms facilitating systematic spatial redistribution.

3. Empirical design

The empirical design proceeds through three stages corresponding to each hypothesis. The first stage tests whether household debt and house prices drive metropolitan-level GDP growth (H1) through a progressive econometric analysis using Autoregressive Distributed Lag (ARDL) specifications reparametrised as Error Correction Models (ECMs). Each specification models total real GDP as a function of household debt-to-income ratios and nominal house prices across 321 Metropolitan Statistical Areas (MSAs) from 2001–2023. MSAs are defined as having 'at least one urban area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties' (OMB, 2023, p. 2). MSAs are used as the primary geographical unit of analysis as they represent functionally integrated economic regions capturing household consumption patterns within integrated labour and housing markets that span major cities and their economically connected suburbs (Glaeser & Maré, 2001). The focus on MSAs rather than states avoids aggregation bias from combining economically disparate regions, whilst the focus on MSAs rather than counties ensures sufficient economic scale and data availability for robust econometric analysis.

The dependent variable is total real GDP for each MSA, a standard measure of aggregate economic output measuring the total value of goods and services produced within each MSA adjusted for inflation. Total GDP rather than GDP per capita is the appropriate measure to examine the growth model perspective, as the theoretical mechanisms being assessed in this analysis (i.e., residential investment, consumption driven by housing wealth effects, and debt-financed spending) operate through aggregate economic activity. Several analyses of the growth model perspective use total GDP (e.g., Baccaro & Pontusson, 2016; Kohler et al., 2023; Stockhammer, 2016; Wood & Stockhammer, 2023), not GDP per capita, which is typically employed for analyses of regional convergence or cross-regional welfare comparisons and is not the focus here. Data for the total GDP variable was obtained from the Bureau of Economic Analysis (BEA, 2025).

The main independent variable of interest is total household debt measured as a ratio of income for each MSA. This captures the extent to which households have leveraged their borrowing capacity to finance consumption beyond their current income, and the literature suggests there should be a positive effect on aggregate demand (Crouch, 2009; Hay, 2024; Wood & Stockhammer, 2023). Whilst it would have been preferable to obtain more fine-grained data on different debt forms (mortgage debt, student loans, credit card debt, auto loans etc), disaggregated MSA-level data separating mortgage from other forms of consumer debt is not consistently available across the full panel. Therefore, this total household debt measure was used. The data for each MSA was obtained from the Federal Reserve (2025), which provides quarterly ranges and the analysis uses the midpoint of each quarterly range, then averages these midpoints across the four quarters to create annual debt-to-income ratios.

The second independent variable is house prices, measured using a nominal index for each MSA. While GDP is measured in real terms, nominal house prices are theoretically appropriate as they capture wealth effects and collateral constraints that directly affect household consumption and investment decisions that are made in nominal terms, representing the value of the primary asset in most household portfolios and serving as the foundation for mortgage-based borrowing (Campbell & Cocco, 2003; Madsen, 2012; Shiller, 2007). From the growth models literature, house prices should exhibit positive relationships with GDP growth through direct wealth effects and enhanced borrowing capacity that increases household spending within the metropolitan area (Wood & Stockhammer, 2023). The MSA-level house price index data was obtained from the Federal Housing Finance Agency (FHFA, 2025). All three variables have been transformed into natural logs, allowing coefficients to be interpreted as elasticities and providing a convenient approximation for percentage changes.

The growth models literature documents feedback loops between growth, house prices and household debt (Stockhammer & Gouzoulis, 2023; Wood & Stockhammer, 2023), raising potential concerns about mutual determination and endogeneity. These concerns are addressed through several features of the specification. First, only lagged effects of household debt and house prices are considered, which are predetermined and, at worst, 'weakly exogenous' in dynamic panel specifications (Bellemare et al., 2017). Second, there are theoretical priors for using lags, as the effects of house prices and household debt on growth are not contemporaneous (Wood & Stockhammer, 2023). Third, the error correction framework models adjustment towards long-run equilibrium, partially capturing dynamic interdependencies.

ARDL models consider the dependent variable to be a function of its lagged values and are widely used in time series econometric analyses as they provide a flexible modelling strategy. The lag structure for each variable follows a testing-down procedure starting from four lags and eliminating statistically insignificant final lags, with statistical significance at the 90 percent level suggesting two lags are appropriate. Therefore, the baseline ARDL specification takes the form:

$$log(GDP)_{i,t} = \alpha_i + \varphi 1 i log(GDP)_{i,t-1} + \varphi_{2i} log(GDP)_{i,t-2} + \beta_{1i} log(HouseholdDebt)_{i,t-1}$$
$$+\beta_{2i} log(HouseholdDebt)_{i,t-2} + \gamma_{1i} log(HousePrices)_{i,t-1} + \gamma_{2i} log(HousePrices)_{i,t-2} + \varepsilon_{i,t}$$

where φ_{1i}, φ_{2i} represent autoregressive coefficients capturing persistence in GDP growth, β_{1i}, β_{2i} capture debt coefficients measuring the temporal impact of household borrowing on metropolitan economic output, and γ_{1i}, γ_{2i} represent house price coefficients allowing for distributed lag effects of asset price changes. This ARDL (2,2,2) specification, with two lags each of GDP, house prices and debt, provides sufficient temporal structure for calculating long-run multiplier effects whilst avoiding contemporaneous regressors that would introduce endogeneity bias. Long-run multipliers are calculated as the ratio of the sum of coefficients on the lagged independent variables to one minus the sum of coefficients on the lagged dependent variable: $(\beta_{1i} + \beta_{2i})/(1 - \varphi_{1i} - \varphi_{2i})$ for debt effects and $(\gamma_{1i} + \gamma_{2i})/(1 - \varphi_{1i} - \varphi_{2i})$ for house price effects. The adjustment speed is calculated as $- 1(1 - (\varphi_{1i} + \varphi_{2i}))$.[1] Standard errors for these derived parameters are calculated using the delta method through Stata's nlcom command. While estimated in levels, the long-run multipliers and adjustment speeds allow interpretation as error correction parameters, with the adjustment speed representing the rate of convergence to long-run equilibrium following temporary shocks. This framework accommodates both immediate and delayed effects of household borrowing on aggregate economic activity, whilst the autoregressive terms capture the inherent persistence in metropolitan growth patterns.

This econometric analysis progresses through three separate estimators to assess the regional impacts of debt-driven growth. The first baseline specification uses a pooled ordinary least squares with panel-corrected standard errors (OLS PCSE) and MSA-level fixed effects, assuming panel-level heteroskedastic errors and using an autoregressive (AR)(1) autocorrelation structure to address within-panel serial correlation. However, pooled OLS models treat all observations in a panel dataset as if they were part of a single cross-section, which assumes homogenous debt-driven growth effects across all MSAs. To address this issue, the second specification uses a Mean Group (MG) estimator that allows for heterogeneous effects of debt-driven growth across MSAs by first estimating the relevant equation for each MSA individually, then averaging the coefficients across MSAs to obtain aggregate parameters (Pesaran & Smith, 1995). However, despite controlling for heterogeneous local responses, the use of an MG estimator in this analysis would assume that MSAs operate as autonomous territorial units that are fundamentally independent of each other. This poses a major issue as the US' MSAs cannot be treated as independent observations as they are systematically integrated through national financial markets, corporate networks, supply chains, as well as monetary and fiscal policy transmission mechanisms.

The third specification addresses this by using a Common Correlated Effects Mean Group (CCEMG) estimator. This simultaneously allows for coefficient heterogeneity at the MSA level whilst controlling for cross-sectional dependence between MSAs through unobserved common factors. Furthermore, the CCEMG controls for spatial autocorrelation through cross-sectional averages (Pesaran, 2006). In this analysis, cross-sectional error dependence arises when MSAs are systematically linked through unobserved factors that create correlations between their error terms, potentially leading to omitted variable bias and inconsistent estimates if left unaccounted for (Everaert & de Groote, 2016).

An alternative approach for addressing cross-sectional correlation is the seemingly unrelated regression (SUR) estimator, but SUR requires estimation of an $N \times N$ error covariance matrix, which becomes computationally infeasible as N grows large (Pesaran, 2006). With 321 MSAs, this would require estimating over 51,000 covariance parameters. CCEMG avoids this problem whilst also being particularly suited to this analysis because the common factors it captures plausibly represent the spatial redistribution mechanisms identified in the theoretical framework and directly tested by H2 and H3.

The use of a CCEMG estimator requires the formal testing of cross-section dependence. Table 1 reports the results of the cross-section dependence tests, which formally assess whether the MSAs exhibit a systematic cross-sectional dependence rather than operating as independent territorial units. The standard cross-sectional dependence (CD) test statistic of 826.78 ($p < 0.001$) exceeds critical values, indicating strong cross-sectional correlation in the MG residuals that cannot be attributed to common macroeconomic shocks or shared time trends. The results of the CDw and CDw + tests confirm this dependence is robust to heteroskedasticity and represents genuine economic linkages between MSAs. The CD* test indicates that even after controlling for four principal components, residual cross-sectional dependence persists ($p = 0.048$), suggesting that common factor models can adequately capture but not eliminate the spatial interdependence. This provides support for the argument that MSAs cannot be analysed as independent territorial units and they are systematically linked through unobserved networks, justifying the use of the CCEMG in this analysis.

While the parsimonious specification focuses on two key independent variables, this reflects a specific methodological choice rather than a limitation, and the empirical design addresses omitted variable bias concerns through multiple complementary mechanisms. First, the analytical purpose of this paper is not to provide a comprehensive overview of the US' growth model, but to test the different hypotheses assessing whether household debt and house prices support growth at the local level or more nationally through network redistribution mechanisms, following theoretical priors based on the established debt-driven growth literature (Stockhammer, 2016; Stockhammer & Gouzoulis, 2023; Wood & Stockhammer, 2023). Second, the CCEMG framework's cross-sectional averages of the GDP, debt and house price variables function

Table 1. Cross-sectional dependence tests.

Test statistic	Value	*p*-value	Interpretation
CD	826.78	<0.001	Strong cross-sectional dependence
CDw	2.05	0.04	Dependence robust to heterogeneity
CDw+	210,000	<0.001	Power-enhanced dependence test
CD*	−1.98	0.048	Residual dependence after four factors

Note: Tests applied to Mean Group residuals. CD tests null of weak cross-sectional dependence; CD* tests independence in presence of common factors.

as comprehensive controls for unobserved common factors, effectively capturing national-level omitted variables such as monetary policy, fiscal policy, technological shocks and macroeconomic business cycles that could simultaneously affect these variables across MSAs (Chudik & Pesaran, 2015; Pesaran, 2006). Third, and relatedly, the strong cross-sectional dependence identified in Table 1 indicates that traditional omitted variable concerns are less relevant when MSAs operate as systematically integrated network components rather than independent territorial units, making the identification of common factors through the CCEMG the appropriate methodological response rather than attempting to specify additional control variables that would be inadequate for capturing such systematic interdependence. Fourth, all specifications control for time-invariant MSA-level heterogeneity through MSA-specific intercepts, which function as fixed effects controlling for omitted variables including geographic characteristics, institutional quality, industrial structure and human capital endowments (Wooldridge, 2010). Fifth, the ARDL specification with lagged dependent variables captures persistence effects and acts as a control for unobserved factors that influence GDP growth over time (Shrestha & Bhatta, 2018).

The second stage tests whether there are spatial economic relationships operating between MSAs rather than random spillovers (H2) through a pairwise correlation analysis of residuals from the CCEMG specification results (Baltagi et al., 2003; Pesaran, 2006). The residuals represent the idiosyncratic component of each MSA's GDP growth that cannot be explained by either the MSA's own economic fundamentals in terms of household debt, house prices and past GDP performance history, as well as common national-level factors affecting all MSAs similarly. If MSAs operated as independent territorial units, these residuals should be largely uncorrelated, as each MSA's unexplained GDP performance should be independent after controlling for local fundamentals and national trends. In contrast, statistically significant correlations between residuals suggest that unobserved spatial relationships systematically connect MSAs beyond what standard econometric controls capture, indicating that GDP dynamics are spatially interconnected rather than territorially bounded through mechanisms not captured by local economic fundamentals or common macroeconomic factors.

While the theoretical maximum is approximately 51,000 unique correlation coefficients (321 choose 2) between MSAs, data constraints reduce the sample to 34,787 pairs. Correlations are calculated over the full time series, capturing persistent rather than transitory relationships between MSA pairs. With typical MSA time series lengths of ~21 years (19 degrees of freedom), the threshold for statistical significance at $p < 0.05$ is $|r| > 0.433$, calculated using the standard t-distribution approach where $t = r\sqrt{(n-2)}/\sqrt{(1-r^2)}$. This represents a conservative threshold since many MSA pairs have substantially more than 21 overlapping years, strengthening the reliability of any significant correlations identified. This threshold provides a robust statistical foundation for identifying genuine spatial relationships between MSAs rather than spurious correlations arising from multiple testing. Positive correlations between residuals indicate co-movement patterns where MSAs systematically over- or under-perform together, suggesting complementary economic relationships between the two. Negative correlations indicate substitution patterns where one MSA's over-performance coincides with another's under-performance suggesting spatial redistribution mechanisms where economic gains in one location may occur at the expense of another.

The third stage examines whether corporate networks constitute the institutional mechanisms underlying the spatial relationships between MSAs (H3) identified in stage 2 using two complementary analyses. The first corporate network analysis maps Fortune 500 company headquarters to MSAs using ZIP-core based statistical area (CBSA) crosswalk data from HUD (2025) and examines whether they facilitate spatial transfer relationships (negative correlations indicating redistribution) or co-movement relationships (positive correlations indicating complementarities). T-tests and Cohen's d effect sizes are used to compare correlation patterns for MSAs with Fortune 500 headquarters versus those without. The logic behind this assessment is that if corporate networks facilitate systematic spatial redistribution, MSAs with Fortune 500 headquarters should exhibit systematically different patterns of spatial relationships compared to MSAs without, through national supply chains linking production, consumption and profit centres. The second analysis focuses on sectors to examine whether spatial relationships between MSAs follow economic hierarchies based on the increasing dominance of the service sector in the US' knowledge-based growth regime (Hall, 2020; Hsueh, 2025). Bureau of Economic Analysus (BEA) CAGDP9 data is used to classify each MSA's dominant sector as either goods-producing or services-providing based on the largest share of GDP (as per the BEA's own classification system). The logic is that spatial redistribution through corporate networks should create systematic flows from goods-producing to service-providing regions, as industrial decline in manufacturing areas creates structural economic vulnerabilities while corporate value chains concentrate coordination and profit capture in distant service centres, creating predictable directional patterns rather than random spillover effects. Net arbitrage scores for each MSA are calculated as (times as target – times as source) / total relationships to classify MSAs as systematic 'net gainers', 'net losers' or 'balanced' in terms of their associations with other MSAs. Chi-square tests and factorial analysis of variance (ANOVA) examine whether directional flows follow predictable sectoral hierarchies and whether corporate networks amplify these patterns.

This comprehensive framework identifies the specific institutional mechanisms through which systematic spatial relationships operate, providing direct organisational evidence for the infrastructure underlying spatial arbitrage theory. The empirical design also incorporates comprehensive robustness testing across six dimensions, including network threshold sensitivity analysis, bootstrap validation and spatial boundary tests, with full details provided in the online supplemental material.

4. Econometric results: testing America's regional debt-driven growth models

Table 2 presents the core econometric results testing whether household debt and house prices drive metropolitan-level GDP growth (H1) across 321 Metropolitan Statistical Areas from 2001–2023. Given the strong cross-sectional dependence identified in the empirical design, the CCEMG estimator is considered the main specification, whilst the OLS and MG estimators serve as diagnostic baselines illustrating the biases that arise when cross-sectional dependent network effects are ignored. The results of the Fisher-type augmented Dickey-Fuller unit root tests confirm that all three variables contain unit roots (log_gdp: $p = 1.000$, log_hpi: $p = 0.996$, log_debt: $p = 0.687$) indicating I(1) integration order. Cointegration testing using the Westerlund variance ratio confirms long-run equilibrium relationships between GDP, household debt and house prices (test statistic: 6.98, $p < 0.001$), validating the use of the ARDL specifications reparametrised as ECMs, which accommodates both short-run dynamics and long-run cointegrating relationships.

The progression from the OLS, MG and CCEMG specifications demonstrates the bias introduced when network interdependence between panels is ignored. The OLS specification (Model 1) treats all MSAs as homogeneous and independent, reporting significant (at the 1% level) negative long-run household debt effects (−0.32) on GDP, and a significant (also at the 1% level) positive long-run house price coefficient (0.22). The Mean Group estimator (Model 2) accounts for coefficient heterogeneity but maintains the assumption of cross-sectional independence. These results also show the negative long-run effects of household debt (−0.11) and the positive long-run effects of house prices (0.22), both significant at the 1% level. However, the strong cross-sectional dependence documented in Table 1 demonstrates that these coefficients

Table 2. Main regression results.

Dependent variable: real GDP	(1) OLS	(2) Mean Group	(3) CCEMG
Short Run Household Debt to Income Ratio	−0.0202**	−0.0566***	−0.0218
	(0.0083)	(0.0158)	(0.0501)
Short Run Nominal House Prices	0.0864***	0.0587**	−0.0521*
	(0.0126)	(0.0265)	(0.0279)
Adjustment Speed	−0.0927***	−0.3550***	−0.8932***
	(0.0093)	(0.0210)	(0.0269)
Long Run Household Debt to Income Ratio	−0.3210***	−0.1127***	−0.4121
	(0.0501)	(0.0423)	(0.4337)
Long Run Nominal House Prices	0.2213***	0.2167***	0.1254***
	(0.0419)	(0.0265)	(0.0218)
Constant	1.3621***	5.3658***	2.3834***
	(0.1231)	(0.3113)	(0.6494)
Observations	6481	6481	6451
Number of MSAs	321	321	318
R-Squared	0.9992		0.18
Chi-squared		2744.41	
RMSE			0.0270

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$. *** $p < 0.01$.

conflate genuine MSA-specific relationships with national-level cross dependent factors, suggesting the results are not reliable.

The CCEMG results in model 3 show fundamentally different household debt effects on growth when MSA interdependence is controlled for. Although the coefficients remain negative, the short-run and long-run household debt growth effects become statistically insignificant when common factors are accounted for. Therefore, H1 is partially rejected. This suggests that the local household debt effects on growth identified in the OLS and MG specifications represent spurious correlations created by unobserved common factors rather than genuine territorially-specific local economic relationships. This is supported by the change in the R-squared value from 0.9992 in the OLS specification to 0.18 in the CCEMG specification. This suggests that the OLS specification's apparent explanatory power was largely due to spurious correlations from ignoring cross-sectional interdependence, which is supported by the results of the cross-sectional dependence tests in Table 1.

In contrast, house price effects remain significant at the 1% level under common factor controls. The coefficients demonstrate that a 1% increase in long-run nominal house prices corresponds to a 0.13% increase in real GDP, providing consistent evidence for the spatially-fixed housing effects on growth that operate independently of cross-sectional dependence. Short-run house price effects show a negative coefficient (−0.05) that is weakly significant at the 10% level. This suggests potential volatility in the growth effects of housing when MSA interdependence is controlled for, which makes intuitive sense based on the short-run instability of local housing markets. However, these short-run effects are overridden by the long-run effects, and the 0.89 adjustment speed suggests a rapid return to the long-run equilibrium. The persistent significance of house prices suggests their growth effects potentially operate through residential investment, construction and housing-based consumption mechanisms that are spatially captured at the local level (Kohl & Spielau, 2022; Kohler et al., 2023; Shiller, 2007). The robustness checks provide further support for the core findings of this analysis, with real and nominal house price effects maintaining significance across alternative specifications, and debt effects remaining consistently insignificant under various CCEMG specifications (see the online supplemental material for a more comprehensive discussion of the robustness test results).

While these results partially reject H1 at the MSA level they do not contradict the broader debt-driven growth literature (e.g., Stockhammer & Gouzoulis, 2023); rather they reveal its spatial limitations. The application of the growth model approach to CPE correctly identifies the specific mechanisms underpinning debt-driven growth and considers the US as an archetype of the model. However, it relies on national-level aggregation, which does not sufficiently examine whether consumption benefits accrue territorially where debt accumulates, thereby downplaying the heterogeneity and interconnected nature of sub-national regions that experience fundamentally different growth dynamics and distributional outcomes (Regan & Blyth, 2025). The disappearance of local household debt effects in the CCEMG specification, combined with the cross-sectional dependence test results, suggests that household debt may drive growth through spatially connected mechanisms rather than having territorially bounded localised effects, with debt-financed consumption in one MSA potentially generating economic benefits in other MSAs. This also provides a potential explanation as to why the OLS and MG results report negative effects of household debt on growth at the local level. The CCEMG common factors appear to be capturing the very mechanisms through which debt-driven growth operates. These unobserved factors cannot be addressed through conventional omitted variable controls or multi-level approaches, as they represent systematic horizontal relationships between MSAs rather than unmeasured territorial characteristics or hierarchical nesting effects. The CCEMG framework is uniquely suited to control for such interdependence without requiring direct specification of the underlying mechanisms, which are examined further in the following sections.

5. Identifying systematic spatial relationships in America's debt-driven growth model

Having established that debt-driven growth operates through cross-sectional interdependence captured by unobserved common factors connecting metropolitan areas rather than territorial mechanisms, this section examines whether these common factors represent systematic relationships between specific MSA pairs (H2). Table 3 transforms the abstract finding that debt effects disappear under CCEMG controls into more tangible evidence for interconnected economic relationships between MSAs. The methodological

Table 3. CCEMG residual correlation network analysis.

Network structure	Count	Percentage
Total MSA pairs analysed	34,787	100.00%
Statistically significant transfers (negative correlations) ($p < 0.05$, $\|r\| > 0.433$)	4001	11.50%
Inter-regional significant transfers	2825	70.61%
Intra-regional significant transfers	1165	29.12%
Unclassified due to MSA/census boundary issues	11	0.27%
Statistically significant co-movement (positive) ($p < 0.05$, $\|r\| > 0.433$)	25,783	74.12%
Inter-regional significant co-movement	19,363	75.10%
Intra-regional significant co-movement	6420	24.90%
Non-significant correlations (statistical noise)	5003	14.38%

logic builds directly on CCEMG's elimination of common factors: as cross-sectional averages successfully capture shared national influences, spillover effects and macroeconomic shocks, any remaining statistically significant pairwise correlations in the CCEMG residuals must represent genuine bilateral relationships between those specific MSAs.

Table 3 provides evidence supporting H2, demonstrating that spatial economic relationships between MSAs operate through systematic patterns rather than random spillovers. Of the 34,787 MSA pairs analysed, 85.6% exhibit statistically significant correlations, which, in conjunction with the CCEMG finding, suggests that MSAs operate as a part of integrated economic network rather than independent territorial units. This explains why the OLS and MG panel methods assuming cross-sectional independence produced biased coefficients. The analysis reveals two distinct types of relationships. Transfer relationships characterised by negative correlations (4001 pairs, 11.5%) indicate systematic substitution effects where one MSA's over-performance coincides with another's under-performance, suggesting spatial redistribution mechanisms where economic gains systematically flow from one location to another rather than occurring independently. There are also co-movement relationships characterised by positive correlations (25,783 pairs, 74.1%), suggesting complementary rather than competitive spatial dynamics. Both relationship types operate predominantly at inter-regional scale, with 70.6% of transfer relationships and 75.1% of co-movement relationships crossing the Census' regional boundaries. The dominance of these inter-regional relationships indicates that spatial economic integration transcends local, regional and state administrative boundaries, and operates through structured mechanisms that connect metropolitan areas across vast geographic distances rather than through proximity-based spillovers or random regional effects.

Table 4 identifies the specific geographic corridors facilitating the spatial connections between MSAs by breaking the 29,784 significant relationships identified in Table 3 across ten distinct pathways based on the four standard US Census regions (Northeast, Midwest, South, West). The analysis shows that inter-regional corridors account for 22,358 relationships (75.1%) compared to only 7426 intra-regional relationships (24.9%). The largest inter-regional corridors are between the Midwest and Northeast (4589 relationships), the Midwest and the West (3989) and the Northeast and West (3875); all of which collectively account for 41.8% of the significant relationships. This demonstrates that spatial connections between MSAs span the entire continental US rather than being isolated to localised regions. Transfer rates are consistent across geographic corridors, ranging from 10.5% between the Midwest and the West and 16.6% the Northeast

Table 4. Regional corridor analysis.

Corridor	Transfers (Count and %)	Co-Movement (Count and %)	Transfer Strength	Co-Movement Strength	Total
Midwest ↔ Northeast	681 (14.8%)	3908 (85.2%)	0.627	0.77	4589
Midwest ↔ West	417 (10.5%)	3572 (89.5%)	0.618	0.766	3989
Northeast ↔ West	430 (11.1%)	3445 (88.9%)	0.66	0.789	3875
Midwest ↔ South	551 (15.6%)	2975 (84.4%)	0.618	0.779	3526
Northeast ↔ South	568 (16.6%)	2845 (83.4%)	0.639	0.804	3413
South ↔ West	348 (11.7%)	2618 (88.3%)	0.642	0.797	2966
Inter-regional total					22,358
Within Midwest	337 (14.5%)	1991 (85.5%)	0.61	0.749	2328
Within Northeast	349 (16%)	1827 (84%)	0.667	0.801	2176
Within West	106 (6.4%)	1561 (93.6%)	0.638	0.779	1667
Within South	214 (17.1%)	1041 (82.9%)	0.636	0.818	1255
Intra-regional total					7426

and the South. However, the Northeast (1679) and the Midwest (1649) have higher transfer volumes than the South (1467) and the West (1195), which also has the lowest transfer involvement across all regional relationships. The Midwest–Northeast corridor exhibits the highest individual transfer volume (681), which is a pattern consistent with the systematic redistribution from manufacturing regions in industrial decline towards regions with strong financial and service sectors. The Midwest also has the highest intra-regional relationships (2328), which is nearly double that of the South (1255). The consistency of correlation coefficients across all corridors (0.61–0.67 for transfers, 0.75–0.82 for co-movement) suggests these relationships represent robust structural patterns rather than statistical anomalies or random regional effects.

The results from the pairwise correlation analysis summarised in Tables 3 and 4 provide support for H2, suggesting that spatial economic relationships operate through systematic patterns rather than random spillovers. These findings provide empirical support for the economic geography literature's argument that regional economies operate as systematically integrated networks, which is consistent with the spatial logic identified by the GPN and NVC literatures. The results of the robustness tests (see the online supplemental material) show consistent results across 15 correlation thresholds, whilst boundary sensitivity testing suggests independence from regional and scale definitions, and the bootstrap analysis using the CCEMG residuals suggests these represent genuine economic relationships between MSAs. Having empirically established the existence and geographic structure of the systematic spatial economic networks between MSAs, the next section examines the institutional mechanisms behind these continental-scale transfer relationships.

6. Corporate and sectoral networks as spatial redistribution infrastructure

Whilst the first part of this empirical analysis demonstrated that household debt does not drive growth at the local level (H1) and the second identified the spatial economic growth relationships between MSAs (H2), this third section explores the institutional mechanisms underlying these economic relationships. Table 5 tests whether corporate networks constitute the primary institutional mechanism for systematic spatial redistribution (H3) by systematically mapping corporate headquarters to Metropolitan Statistical Areas and analysing their involvement in transfer relationships, investigating the concrete organisational infrastructure that facilitates the bilateral redistribution relationships identified in the preceding network analysis.

Table 5 demonstrates that Fortune 500 corporate networks play systematically different roles across transfer and co-movement relationships, revealing sophisticated bilateral economic relationships between regions with and without major corporate institutions. MSAs with Fortune 500 corporate headquarters are involved in 47.5% of all statistically significant spatial relationships, with higher participation rates in co-movement relationships (49.5%) compared to transfer relationships (34.0%). The mean coefficients reinforce this finding, showing that MSAs with Fortune 500 firms have slightly smaller transfer effects than MSAs without (0.627 vs. 0.638, $p < 0.01$, Cohen's d = −0.098), whilst also demonstrating higher co-

Table 5. Corporate network involvement in spatial arbitrage.

Corporate network metrics	Value
Fortune 500 companies mapped to MSAs	454/500 (90.8%)
MSAs containing F500 headquarters	97
Transfer relationships involving F500 MSAs	1362/4001 (34.0%)
Co-movement relationships involving F500 MSAs	12,773/25,783 (49.5%)
All relationships involving F500 MSAs	**14,135/29,784 (47.5%)**
Mean transfer coefficients: F500 MSAs	0.627
Mean transfer coefficients: Non-F500 MSAs	0.638
Transfer coefficients difference (F500 vs Non-F500)	−0.011*** ($p < 0.01$)
Transfer effect size (Cohen's d) – F500	−0.098
Average co-movement coefficients: F500 MSAs	0.798
Average co-movement coefficients: Non-F500 MSAs	0.766
Co-movement coefficients difference (F500 vs Non-F500)	0.032*** ($p < 0.01$)
Co-movement effect size (Cohen's d) – F500	0.211

Note: Arbitrage strength measures average correlation magnitude in network relationships. F500 MSAs show systematically higher network participation but lower individual relationship intensity.

movement effects (0.798 vs. 0.766, $p < 0.01$, Cohen's d = 0.211). This asymmetric pattern suggests corporate networks facilitate complementary relationships between geographic locations, rather than zero-sum economic competition or redistribution between local areas. Having established corporate networks' coordination role, the analysis now examines whether spatial relationships follow systematic sectoral patterns.

Panels A and B in Table 6 examine whether sectoral networks play a role in the economic relationships between MSAs. Panel A shows the share of transfer relationships from MSAs that are predominantly goods-producing and service-providing (29.0%) is similar to reverse flows from services to goods (25.7%). However, chi-square testing ($\chi^2 = 5.723$, $p = 0.017^{**}$) provides statistical evidence that the systematic flow between MSAs operates from goods to services rather than being random or operating in reverse. 31.8% of transfer relationships are between service-providing MSAs, suggesting potential sectoral complementarities driving competition between MSAs. Panel B shows that service-providing MSAs comprise 70.8% of all complementary MSA relationships, further reinforcing the cooperative integration of the service sector. However, the one-way ANOVA testing shows there are no significant differences in complementary relationships within sectors ($p = 0.349$), indicating that whilst services-providing MSAs participate more frequently in sectoral network complementarities, systematic redistribution between MSAs operates through transfer relationships. These findings suggest that manufacturing-based MSAs face a double disadvantage where they transfer growth to service-oriented MSAs and they participate less in sectoral institutional complementarities. In contrast, service-based MSAs extract economic growth from manufacturing-focused MSAs, whilst also developing extensive institutional complementarity networks between each other. This reveals a systematic sectoral hierarchy in America's growth regime, where service-dominated regions extract economic benefits from manufacturing-focused MSAs whilst developing extensive networks amongst themselves, thus explaining why debt-driven growth operates through spatial redistribution mechanisms rather than locally.

Having established that sectoral networks systematically shape spatial relationships between MSAs, Table 7 examines how corporate networks interact with these patterns. The table demonstrates services-providing MSAs (0.090) systematically outperform goods-producing MSAs (0.001) when neither hosts the corporate headquarters of a Fortune 500 firm. The results also demonstrate that when service-based MSAs host Fortune 500 corporate headquarters, this enhances their economic benefits from 0.090–0.225. Conversely, when Fortune 500 corporate headquarters are located in goods-producing regions, they transform an MSA's neutral performance (0.001) into a systematic disadvantage (−0.174). Chi-square testing ($\chi^2 = 0.321$, $p = 0.321$) shows that Fortune 500 corporate headquarter locations are not systematically tied to service or manufacturing-focused regions, yet the spatial economic flows between them persist. This suggests that it is sectoral specialisation, not the presence of corporate headquarters that drives spatial inequalities between regions that gain and those who are 'left behind' in the modern economy. However, corporate headquarters amplify these sectoral effects, confirming the double differentiation identified in the theoretical framework: metropolitan areas are systematically advantaged or disadvantaged both by their dominant sector and by whether they host headquarters functions within those sectors. Therefore, corporate institutions reinforce existing economic structures through the transfer of economic growth between service and manufacturing MSAs, rather than benefiting local areas, providing support for H3.

Table 6. Sectoral flow patterns by relationship type.

Panel A: Transfer relationships (redistribution)			
Flow direction	Relationships	% of total	Mean coefficient strength
Services → Services	899	31.8%	0.639
Goods → Services	819	29.0%	0.626
Services → Goods	725	25.7%	0.630
Goods → Goods	311	11.0%	0.634
Panel B: Co-movement relationships (complementarities)			
Pattern type	Relationships	% of total	Mean coefficient strength
Services ↔ Services	18,261	70.8%	0.782
Goods ↔ Services	6437	25.0%	0.783
Goods ↔ Goods	577	2.2%	0.793

Table 7. Sectoral hierarchy independence analysis.

Sector	F500 status	MSAs	Net transfer score	Winners (%)	Co-movement participation
Goods-producing	With	6	−0.174	33.3%	High (0.800)
Goods-producing	Without	35	+0.001	42.9%	Moderate (0.766)
Services-providing	With	54	+0.225	61.1%	High (0.798)
Services-providing	Without	181	+0.090	50.3%	Moderate (0.766)

These findings explain why household debt coefficients appear insignificant in the econometric specifications, as debt accumulation creates local financial burdens whilst growth benefits flow systematically to distant service centres through corporate networks, challenging the growth models' spatial assumptions that debt-financed consumption generates localised economic benefits. Rather, the results of this part of the analysis provide empirical support for the institutional mechanisms driving spatial redistribution posited by the economic geography literature, whilst challenging the territorial assumptions underlying growth models perspective and place-based development policy. The corporate and sectoral analysis highlights the importance of knowledge-based sectors to the wider US economy (Hall, 2020; Hsueh, 2025), demonstrating how the shift towards services systematically privileges information processing, financial coordination and strategic decision-making over physical production. Here, systematic transfer patterns occur from manufacturing-based MSAs to service-oriented MSAs, operating through NVC where manufacturing regions create value that is systematically captured by service centres hosting headquarter functions. The finding that manufacturing regions become systematically disadvantaged when attracting Fortune 500 headquarters highlights the importance of sub-national state governments shifting from traditional 'smokestack chasing' to more pro-innovation industrial strategies from the 1980s onwards (Eisinger, 1990; Wood, 2025). These findings also highlight the challenges of supporting 'left behind' places through conventional economic development strategies, as manufacturing-focused regions in long-run industrial decline will potentially leak the economic benefits of supportive policies to more successful service-based regions (Rodríguez-Pose et al., 2024).

7. Conclusion

To conclude, this analysis demonstrates that America's debt-driven growth model operates through systematic spatial redistribution mechanisms rather than localised territorial development, with house price effects locally bounded whilst debt-financed consumption flows through NVCs to service-providing regions. The network analysis identifies nearly 30,000 statistically significant connections between metropolitan areas, with 65% crossing regional boundaries, and Fortune 500 corporate networks involved in nearly half of all relationships. Rather than challenging the growth model approach, this analysis makes a key contribution by revealing the spatial foundations of debt-driven growth in the US, providing empirical support for the presence of the value creation and capture logics identified by the GPN and NVC literatures (e.g., Feser & Isserman, 2009; Henderson et al., 2002) at the sub-national scale. Regions face a double differentiation in terms of growth, as those dominated by service sectors outperform those dominated by goods production, and within each sector, those hosting higher-value added headquarters functions outperform those hosting lower-value added production. Whilst the growth models literature correctly identifies household debt, supported by rising house prices, as drivers of aggregate demand in the US (e.g., Baccaro & Pontusson, 2016; Stockhammer & Gouzoulis, 2023), its national-level focus obscures these spatial mechanisms. This analysis directly answers recent calls for greater attention to regional heterogeneity within growth models scholarship (Regan & Blyth, 2025) by demonstrating that debt-driven growth operates through sub-national network mechanisms rather than territorial boundaries.

These findings also demonstrate how financialisation and corporate networks intersect to create systematic geographic inequalities between where economic risks accumulate and where the benefits of growth are captured. As such, the results provide additional support for research emphasising the economic and spatial foundations of contemporary political discontent in the US (Rodríguez-Pose, 2018; Rodríguez-Pose et al., 2021). Manufacturing-focused regions systematically experience debt accumulation without the corresponding growth benefits, creating financial vulnerability in areas already experiencing sustained economic decline. This provides a partial explanation of the political resentment towards metropolitan service centres evident in anti-establishment movements, as these areas disproportionately capture the benefits of growth. These findings also highlight some of the fundamental challenges for regional development policy, particularly in addressing the sustained economic decline of left-behind regions (Rodríguez-Pose et al., 2024). As the US economy demonstrates systematic economic relationships between regions, particularly from areas dominated by manufacturing to service-providing regions well adapted to the knowledge economy, policies designed at the state or regional levels cannot capture the mechanisms by which spatial economic redistribution occurs. Therefore, traditional growth strategies, such as expanding credit access, stimulating local consumption or attracting corporate headquarters through 'smokestack chasing', may inadvertently exacerbate regional inequalities by increasing their financial vulnerability whilst transferring growth benefits to distant areas with large knowledge-based service sectors through NVCs.

Whilst this analysis highlights that Fortune 500 corporate networks are systematically involved in spatial redistribution patterns, it is beyond the scope of the analysis to trace the specific supply chain linkages of individual firms that connect individual MSA pairs in the US. This could be an important area for future research to directly test whether the geographic structure of individual corporate supply chains aligns with the bilateral transfer relationships identified here using proprietary data on subsidiary locations, supplier networks and revenue flows. As this analysis was limited to the US case, future research could also examine whether similar spatial redistribution mechanisms operate in other debt-driven economies, such as the UK, whether export-led growth models exhibit similar or different territorial dynamics, or the wider subnational and international spatial dynamics linking states with different growth models.

Note

1. Upon first reading this may not appear to represent the standard ECM long-run/short-run equation as it is lacking the difference form of the short-run coefficient. This is due to the specific lag structures used in the ARDL and the reparametrisation to the ECM. If in doubt about whether the reparametrisation of the ARDL to the ECM is correct, this can be confirmed by doing this process manually.

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I have read and agree to comply with the Taylor & Francis AI Policy. In accordance with this policy, I confirm that I used Claude Sonnet 4.5 (accessed via claude.ai) during the preparation of this manuscript. The AI tool was used for copy editing assistance, overcoming writers block and helped with restructuring elements of the argument. The tool was not used to conduct a literature review (i.e., there are no ghost citations), develop a research design, data collection, data analysis or the generation of original ideas or interpretations. All substantive intellectual content, theoretical contributions, empirical findings and conclusions remain entirely my own work.

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Data availability statement

All data used in this study are publicly available from the following sources: Metropolitan Statistical Area GDP data from the Bureau of Economic Analysis (https://www.bea.gov/data/gdp/gdp-county-metro-and-other-areas); household debt-to-income ratios from the Federal Reserve (https://www.federalreserve.gov/releases/z1/dataviz/household_debt/msa/table/); house price indices from the Federal Housing Finance Agency (https://www.fhfa.gov/data/hpi/datasets); Fortune 500 headquarters locations from the Fortune 500 list matched to MSAs using HUD ZIP-CBSA crosswalk files (https://www.huduser.gov/portal/datasets/usps_crosswalk.html); and sectoral GDP data from the Bureau of Economic Analysis CAGDP9 tables.

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