ROCKWOOL Foundation Berlin
Institute for the Economy and the Future of Work (RFBerlin)

DISCUSSION PAPER SERIES 006/26

Urban-Biased Structural Change

Horng Chern Wong, Dennis Novy, Carlo Perroni, Natalie Chen

www.rfberlin.com JANUARY 2026

Urban-Biased Structural Change

Authors

Horng Chern Wong, Dennis Novy, Carlo Perroni, Natalie Chen

Reference

JEL Codes: R11, R12, R30

Keywords: Agglomeration, Cities, House Prices, Services, Sorting, Structural Change

Recommended Citation: Horng Chern Wong, Dennis Novy, Carlo Perroni, Natalie Chen (2026): Urban-Biased Structural Change. RFBerlin Discussion Paper No. 006/26

Access

Disclaimer

Imprint

RFBerlin
ROCKWOOL Foundation Berlin –
Institute for the Economy
and the Future of Work

Gormannstrasse 22, 10119 Berlin
Tel: +49 (0) 151 143 444 67
E-mail: info@rfberlin.com
Web: www.rfberlin.com

Urban-Biased Structural Change*

Natalie Chen† Dennis Novy‡ Carlo Perroni§ Horng Chern Wong¶

December 2025

Abstract

Using French micro-data, we show that rapid structural transformation in densely populated cities is driven by the expansion of large tradable services firms and the departure of large manufacturing firms. This reallocation is accompanied by sharply rising house prices but without a compensating increase in urban nominal wages. Using a quantitative spatial equilibrium model, we highlight the role that local consumption services play in reconciling these facts. We show that structural change leads to an expansion of local services varieties, which improves amenities and moderates urban wage growth despite rising house prices. By containing labor costs, this mechanism allows large, urban-centered tradable services firms to capitalize on their fast productivity growth. As a result, the forces underlying urban-biased structural change have facilitated the rise of superstar services firms and have increased the urban-rural welfare gap, even though conventional statistics point in the opposite direction.

Keywords: Agglomeration, Cities, House Prices, Services, Sorting, Structural Change
JEL codes: R11, R12, R30

*Chen, Novy and Perroni acknowledge research support from the Economic and Social Research Council (ESRC grant ES/Z504701/1). Wong acknowledges financial support from the ERC TRADENET grant (714597) and Handelsbanken Program grant (P23-0309). For data access and assistance, we thank DGFiP, INSEE, and CASD. We are grateful for comments from various seminar and conference presentations, in particular by Ernest Liu, Andreas Moxnes, Florian Sniekers, Etienne Wasmer, and Jens Wrona. Chen is also affiliated with CEPR and CESifo. Novy is also affiliated with CEPR, CEP/LSE and CESifo. Perroni is also affiliated with CESifo. Wong is also affiliated with the Rockwool Foundation Berlin.

†Department of Economics, University of Warwick. Email: n.a.chen@warwick.ac.uk
‡Department of Economics, University of Warwick. Email: d.novy@warwick.ac.uk
§Department of Economics, University of Warwick. Email: c.perroni@warwick.ac.uk
¶Department of Economics, Stockholm University. Email: horngchernwong@gmail.com

1 Introduction

Public debate on living standards often centers on cost-of-living pressures. In rural areas, these pressures stem from sluggish wage and employment growth relative to urban counterparts (Weber and Tickamyer, 2020; International Labour Organization, 2024). In cities, they reflect sharply rising house prices that outpace wages (Baum-Snow and Duranton, 2025). What accounts for these contrasting experiences? One salient clue lies in economic structure: urban economies are dominated by services, while rural economies remain manufacturing-heavy. This raises the question of whether the rapid structural transformation—the shift of economic activity from manufacturing to services—observed in many countries can help explain the growing urban-rural divide within them.

In this paper, we use detailed French micro-data and a quantitative spatial equilibrium model to examine how economy-wide structural change maps onto house price and wage variation across locations. Between 1995 and 2018, structural transformation in France has been *urban-biased*: dense cities experienced a faster shift from manufacturing toward services than suburban or rural areas. This pattern is driven by the expansion of large tradable-services firms—such as business services and ICT—and by the decline and relocation of large manufacturing firms. Over the same period, urban house prices per square meter have risen sharply, yet nominal wages have not kept pace. In fact, we document a robust flattening of the urban nominal wage premium. How can we reconcile sharply rising house prices with lagging urban wages?

Our theoretical framework highlights the key role of non-tradable local services—such as restaurants and entertainment—in shaping these urban dynamics. Productivity growth in urban-centered tradable services raises house prices and drives up urban wages. However, the resulting demand-driven expansion in *local services varieties* improves amenities and moderates wage growth. This allows tradable services to concentrate in cities, disproportionately benefiting large, productive firms. Without this amenity channel, urban wages would need to rise further to offset higher house prices, preventing tradable services from fully exploiting their productivity advantage in cities. Structural change would then exhibit little urban bias, house price growth in the densest cities would be less pronounced, and the urban wage premium would increase—contrary to the evidence.

This amenity-based mechanism helps explain why superstar services firms are able to expand rapidly in dense, expensive cities despite a decline in measured real wages. Similar patterns are visible in the United States, where the rise of tradable services has fueled spatial wage gaps (Eckert, 2019; Giannone, 2022) even as house prices surged faster still (Gyourko, Mayer, and Sinai, 2013; Baum-Snow and Duranton, 2025). In our framework, this implies that structural change might have widened real wage disparities between urban and rural areas more than one would infer from conventional indicators such as nominal wages and house prices. This mechanism also complements findings that tradable services stimulate local services growth (Moretti, 2012), but it additionally points to the central role played by local services in the expansion of tradable services. Entry barriers in local services, such as regulatory red tape, may thus hinder the growth of highly productive tradable services firms in major cities.[1]

We begin our analysis by constructing measures of structural change across different commuting zones ('cities' hereafter) in France between 1995 and 2018. Our French administrative data provide detailed information on plant location and sector within multi-plant firms, which are often missing from conventional sources. We use these to measure economic activity by sector across cities, fully accounting for large firms.

Should structural transformation from manufacturing to services proceed faster or more slowly in urban locations? One might expect it to proceed faster: by the 1990s, services already dominated dense cities such as London and New York (Martin, Gardiner, and Tyler, 2003; Glaeser, 2005), while rural areas remained manufacturing-heavy. The same was true in France. In 1995, cities like Paris and Lyon were already highly service oriented, with tradable services accounting for 45% of value added, local services another 25%, and manufacturing the remainder. By contrast, smaller cities were still manufacturing centers—manufacturing made up more than half of value added in places like Poitiers—leaving comparatively greater scope for structural transformation in those cities. Yet between 1995 and 2018, structural change in France was distinctly urban-biased: both tradable and local services expanded more rapidly in larger cities than in smaller ones, while manufacturing grew faster in smaller cities.

A decomposition by firm size reveals that the urban bias is driven entirely by large firms operating mainly in tradable services and manufacturing. Defined as the top 5% of the value added distribution, these firms disproportionately sort into dense cities, generating a positive firm size–density gradient. But, between 1995 and 2018, this gradient steepened in tradable services while it flattened in manufacturing, reflecting the expansion of large tradable services firms and the decline of large manufacturers in urban areas.

Accompanying these patterns is a sharp rise in urban house prices. As detailed in Section 2, in 1995 houses in the densest cities (e.g., Paris and Lyon) cost nearly threefold per square metre relative to the least-dense cities (e.g., Poitiers); by 2018, the gap had widened to almost fourfold. Over the same period, urban nominal wages rose much more slowly and did not keep pace with house prices: in 1995, workers in the densest

[1] There is evidence that red tape significantly raises entry costs, restricting firm entry and growth (Djankov, La Porta, Lopez-de-Silanes, and Shleifer, 2002; Klapper, Laeven, and Rajan, 2006).

cities earned about 15% more per hour than comparable workers in the least-dense areas, and by 2018 this premium had fallen to roughly 10%. These facts pose a puzzle: structural transformation is typically associated with technological improvements that raise real wages, yet cities undergoing faster transformation show weaker—and in some cases declining—real wage growth.

To reconcile these findings, we build and estimate a quantitative spatial equilibrium model with structural change. Building on Gaubert (2018), the model features heterogeneous firms and sectors that sort across cities with different densities, endogenously determined through agglomeration and congestion forces. We extend this framework in two ways. First, we distinguish between tradable services (e.g., business services and ICT), whose output can be sold across cities at zero transport cost, and non-tradable local services (e.g., food, accommodation, and entertainment), whose output can only be sold within a given city. As in tradable sectors, firms in local services produce differentiated varieties and face a free-entry condition. But their local scope means that the number of available varieties differs across locations, unlike in tradable sectors. This local love-of-variety effect acts as an endogenous local amenity.[2] Second, we incorporate structural change through sector-specific productivity growth (Ngai and Pissarides, 2007). Workers consume both local services and a freely traded final good, assumed to be complements following standard estimates (Herrendorf, Rogerson, and Valentinyi, 2014). The final good itself is a bundle of manufacturing and tradable services, which may be complements or substitutes—a relationship we discipline empirically.[3]

Congestion forces operate through higher house prices: more economic activity at a location requires more workers, driving up house prices and nominal wages and, in turn, production costs. Our model extends Gaubert (2018) by allowing firms to use housing directly as an input in production, with sector-specific housing intensities, so higher house prices can crowd out housing-intensive firms more directly. We also allow for spatial and temporal variation in housing sector productivity, so slower productivity growth in construction can amplify urban house price growth and potentially shape the urban bias of structural change.[4]

Based on the French micro-data, we calibrate and structurally estimate the model's key parameters, in particular those that determine sectoral productivity, agglomeration and sorting effects, housing intensity, love-of-variety, substitutability between tradable

[2]Diamond (2016) shows that endogenous changes in city amenities are crucial for understanding skill sorting across US cities. Other factors, such as falling crime rates, have also played a central role (Levitt, 2004).

[3]Not imposing restrictions on substitutability is crucial to rationalize both high productivity growth in tradable services and their rising aggregate share (Duernecker, Herrendorf, and Valentinyi, 2024).

[4]Recent work documents puzzlingly slow productivity growth in the U.S. construction sector, potentially linked to zoning regulations in dense cities (Goolsbee and Syverson, 2023; D'Amico, Glaeser, Gyourko, Kerr, and Ponzetto, 2024).

sectors, and worker mobility costs. The estimated model replicates the urban-biased pattern of structural change and the spatial sorting of large versus small firms across sectors. It also successfully attributes the urban bias to the growth of large firms.

Our parameter estimates highlight two key differences between manufacturing and tradable services that explain why, already in 1995, manufacturing's value added share decreases with population density while the opposite holds for tradable services. First, the sorting effect is stronger for large tradable services firms than for their manufacturing counterparts, consistent with the steeper firm size-density gradient for tradable services observed in the data. Second, manufacturing is more housing-intensive than tradable services. Identification comes from cross-sectional house price variation: conditional on local wages, manufacturing value added covaries more with house prices than does value added in tradable services. In our calibration step, matching the model to the data requires productivity in tradable services to grow about twice as fast as in manufacturing between 1995 and 2018, with both significantly outpacing local services.

To simulate the impact of this differential productivity growth, we start from the model-implied equilibrium for 1995 and introduce only this change into the economy. Our counterfactual simulations indicate that rapid sector-wide productivity growth in tradable services is the primary driver of structural change in the French economy. Since tradable services are concentrated in dense cities, their expansion mainly affects urban residents, even though the underlying productivity growth is not city-specific. The higher labor demand pulls workers out of manufacturing and from other cities, putting upward pressure on wages and house prices in dense cities, which dampens the growth of tradable services.

Local services play a central role in easing this constraint on tradable services growth. The upward pressure on wages and the inflow of workers boost demand for local services, stimulating entry of new varieties. The wider range of local services represents an endogenous amenity improvement that compensates workers for higher house prices. This limits nominal wage growth in dense cities and allows tradable services to expand further. The benefits of an expanding local services sector thus mainly fall on large, urban-centered tradable services firms, whose labor costs make up the largest share of their input expenditure. The limited wage growth therefore allows tradable services firms to take further advantage of their rapid productivity growth, leading them to pull away from other firms in less dense locations. As these larger firms also benefit more from agglomeration externalities, a higher population density further benefits them, reinforcing the demand for local services and pushing up house prices. Higher house prices, in turn, crowd large manufacturing firms out of dense cities due to their greater housing intensity.

To highlight the role of the local services sector, we re-calibrate the model under the assumption that workers do not value local variety. With the same productivity growth differential, the resulting urban dynamics are no longer consistent with the data: structural change exhibits little urban bias, urban house prices only rise modestly, and the urban wage premium steepens. An implication is that entry barriers, such as regulatory red tape discouraging entry of small and medium-sized businesses common in local services, could limit dense cities' comparative advantage in tradable services. Conversely, policies that facilitate entry and competition in local services can expand not only consumer amenities but also support broader urban productivity and competitiveness.

Consistent with the consumption amenity channel in our model, our data suggest that the range of local services varieties has expanded disproportionately in dense cities. Broader empirical evidence supports this channel. Using U.S. retail data, Handbury and Weinstein (2015) show that product variety is wider in dense cities, and that accounting for variety implies that effective price levels decline with city size.[5] Similarly, Hottman (2021) estimates that local services price indices decrease with city size, driven by greater store variety. Focusing on restaurants, Couture (2016) estimates that gains from variety constitute a large share of the consumption value of U.S. cities.[6]

Taken together, our results show that two mechanisms jointly explain the urban bias of structural change. First, rapid productivity growth in tradable services draws activity toward dense cities. Second, the expansion of local services varieties raises urban amenities, amplifying this reallocation. Quantitatively, these forces account for around four-fifths of the increase in the urban–rural house price gap and about a quarter of the flattening of the urban wage premium. Yet the decline in measured urban-rural real wage gap masks a rising welfare gap between urban and rural residents.

Related literature. A large body of work study why and how countries undergo structural transformation as they develop (Kongsamut, Rebelo, and Xie, 2001; Ngai and Pissarides, 2007; Herrendorf et al., 2014; Boppart, 2014; Comin, Lashkari, and Mestieri, 2021). Recent evidence shows that, in high-income economies, structural change in recent decades has been driven by tradable services (Duernecker et al., 2024). Our results are consistent with this view: rapid productivity growth in tradable services is the aggregate driver of structural change in France. We contribute by showing how this differential productivity growth interacts with urban house prices, wages, amenities, and firm performance to produce spatially uneven structural change within a country.

Our paper, therefore, connects directly to the literature on spatial structural change, which focuses on heterogeneous development paths within a country. One set of papers highlight the importance of interregional linkages through trade, migration, and

[5] Combes, Duranton, Gobillon, Puga, and Roux (2012) provide a similar finding using a broader product classification.

[6] See also Schiff (2015) and Su (2022) for further evidence.

technology diffusion in the early stages of industrialization (Fajgelbaum and Redding, 2022; Nagy, 2023; Garriga, Hedlund, Tang, and Wang, 2023; Eckert and Peters, 2025; Pijoan-Mas and Budí-Ors, 2025). For more recent decades, research on the US shows that technological progress—whether skill-biased (Giannone, 2022), driven by falling communication costs or ICT prices (Eckert, 2019), or through spatial diffusion (Desmet and Rossi-Hansberg, 2014)—has concentrated tradable services in dense cities. Related work emphasizes that large services firms are central to this process (Kleinman, 2022; Hsieh and Rossi-Hansberg, 2023; Eckert, Ganapati, and Walsh, 2025). We contribute to this debate by showing that a flexible local services sector is crucial in enabling the expansion of large tradable services firms in response to technological change. This complements findings from the urban economics literature that endogenous amenities help explain skill sorting across cities and neighborhoods (Diamond, 2016). Moreover, by jointly considering house prices, wages, and amenities, we show that urban-biased structural change has widened spatial welfare disparities when measured real wages suggest the opposite. Relatedly, Coeurdacier, Oswald, and Teignier (2022) show that agricultural productivity growth in nineteenth-century France raised urban population and land values.

Our paper links structural change to urban amenities. Historical studies show that industrialization was associated with declining local amenities—for example, through pollution (Kahn, 1999; Hanlon, 2020; Heblich, Trew, and Zylberberg, 2021). Our findings suggest that the more recent shift from manufacturing to tradable services instead helps cities become more desirable places to live, rich with consumption amenities.[7] This complements evidence from contexts in earlier stages of structural transformation toward services (Fan, Peters, and Zilibotti, 2023; Aiba and Yamagishi, 2025).[8]

Roadmap. Section 2 describes the key data patterns that motivate our analysis. In Section 3, we develop our model of differential structural change across locations. In Section 4, we estimate the model. In Section 5, we use the estimated model to decompose structural change into the various driving forces that our framework highlights. Section 6 concludes.

[7] As Glaeser, Kolko, and Saiz (2001) state, "the future of cities increasingly depends on whether cities are attractive places for *consumers* to live."

[8] Fan et al. (2023) show that productivity growth in consumer services raised urban welfare in India, while Aiba and Yamagishi (2025) find that the establishment of US military bases in 1970s Okinawa spurred local services growth without crowding out manufacturing. In both cases, local services expansion raised welfare through lower prices and new employment opportunities. We extend these insights by showing that tradable services productivity growth in France drives an expansion of local services in dense cities, with welfare gains also operating through an amenity channel.

2 Urban-biased structural change: Evidence from France

In this section, we describe the French micro-data and illustrate the main empirical patterns relating to structural change in France over recent decades. These findings motivate our theoretical framework in Section 3 and the structural estimation and calibration in Section 4.

2.1 Data description

To study structural change at both the aggregate and city levels in France, we combine several administrative data sources. Our main data come from firm balance sheets: FICUS (1995–2007) and FARE (2008–2018), which cover all active firms and report revenue, value added, employment, exports, and firms' geographic location. We link these to the DADS matched employer–employee data, which record wages and employment for all individual workers. The DADS are especially useful for measuring the economic activity of multi-plant firms and for documenting the evolution of the urban wage premium. To capture house price dynamics across cities, we draw on the French land registry (*cadastre*), which reports transaction-level prices per square meter (excluding new construction). Our analysis focuses on 1995 and 2018 as the initial and final years.[9]

Measuring population density. Following Combes et al. (2012) and Gaubert (2018), we define a city as a commuting zone ("zone d'emploi"). There are 297 commuting zones covering all of mainland France (excluding Corsica and overseas regions) based on the 2010 revision. We combine commuting zones in Île-de-France into one (referred to as 'Paris' hereafter), leaving us with 279 zones.[10] To arrive at a measure of population density by commuting zone, we rely on the DADS matched employer-employee data set, which records the workplace and residence of all employees at the commune level—a finer unit of geography than commuting zones.[11] We use the total number of employees in the initial year (across all sectors and firm types, including multi-plant firms) as our measure of commune population, and combine this with INSEE's publicly available land area data to calculate population density for each commune.[12] We then construct commuting-zone population density as a weighted average of commune-level densities, with weights given by commune population size. This procedure accounts for the fact that some communes within a commuting zone are very dense while others are sparsely populated. Figure A.1 in Appendix A.1 maps population across commuting

[9] The key data patterns we rely on in our estimation evolve gradually and smoothly over time.

[10] Roissy-Sud Picardie is a separate commuting zone that we do not include in Île-de-France.

[11] Mainland France comprises more than 33,000 communes.

[12] Population in dense cities (except Paris) has grown faster than in smaller cities between 1995 and 2018.

zones.

Measuring structural change. Computing measures of structural change at on aggregate and at the city level requires measuring both the sectoral and spatial distribution of economic activity. This task is complicated by the prevalence of firms that operate multiple plants across different sectors and cities. Standard firm balance sheet data, including the FICUS-FARE, only report the value added, employment, and sector of firms, with the geographic location assigned to headquarters. This creates a measurement challenge: correctly capturing the spatial and sectoral distribution of activity requires plant-level information and a way to attribute firm-level value added across plants. One approach could be to omit such firms, but this would leave a sizable share of economic activity unaccounted for as these firms tend to be large, potentially distorting facts about structural change across cities.

To address this issue, we draw on the DADS dataset, which provides the location (commuting zone), sector, and employment for each plant, along with worker-level information on wages and employer identity (both plant and firm). Plant-level employment allows us to measure the spatial–sectoral distribution of labor directly. To allocate firm-level value added, we combine two measures: (i) the plant's share of the firm's wage bill and (ii) the sectoral median labor share of value added. This approach rests on two assumptions: (a) firms are profit-maximizing, and (b) the labor share of value added is common within a sector.

Formally, the labor share at a plant e belonging to firm i and operating in sector j can be written as

$$\frac{W_{eij}L_{eij}}{P_{eij}Y_{eij}} = \tau_j^{-1}\alpha_j \equiv \tilde{\alpha}_j \, ,$$

where W_{eij}, L_{eij}, P_{eij}, and Y_{eij} are plant-level wages, employment, prices, and output. The common labor share restriction imposes that τ_j, a parameter capturing any sector-wide distortion to labor (e.g., price-cost markups and wage markdowns), is uniform across firms within a sector. To derive $\tilde{\alpha}_j$, we focus on single-plant firms. Given $\tilde{\alpha}_j$, we allocate value added across plants of multi-plant firms using the first-order condition characterizing optimal labor demand:

$$\frac{P_{eij}Y_{eij}}{\sum_{e\in\mathcal{E}_i} P_{eij}Y_{eij}} = \frac{W_{eij}L_{eij}\tilde{\alpha}_j^{-1}}{\sum_{e\in\mathcal{E}_i} W_{eij}L_{eij}\tilde{\alpha}_j^{-1}} \, ,$$

where $\mathcal{E}_i$ is the set of firm i's plants. In Figure A.7 in the Online Appendix, we show that our main structural change patterns are robust to measuring $\tilde{\alpha}_j$ at the one-, two-, or five-digit sector level (our baseline) and to restricting attention to single-plant firms. We refer to plants as firms hereafter.

Classifying sectors as tradable or non-tradable. The French administrative balance-sheet data report export revenues not only for manufacturing firms but also for firms in services. We use this information to classify services as *domestically* tradable or non-tradable (local): sectors with at least 5% of revenue from exports are classed as tradable; the rest as non-tradable.[13] Under this definition, manufacturing is tradable. Tradable services include finance and insurance, information and communications technology, professional, specialized, and technical services, administrative and support services, real estate, and wholesale trade. Non-tradable local services include accommodation and food, arts, entertainment and recreation, retail, transportation, education, health, and personal services. Our definition of tradable and local services turn out to be closely aligned with the definition of 'progressive' and 'stagnant' services in Duernecker et al. (2024), and producer and consumer services in Fan et al. (2023). To focus on manufacturing and services in the private sector, we exclude public services, mining, and agriculture, which together account for only a small share of French value added.[14]

2.2 Empirical patterns

We next describe how structural change occurred across France over the period from 1995 to 2018. We distinguish between cities with different population densities and present the patterns in terms of city density quintiles. We refer to these quintiles as city size *bins*, with bin 1 containing the smallest, least dense cities and bin 5 containing the largest and densest cities. By construction, each bin has roughly the same population, measured as the number of total employees.[15] We define these bins based on population density in 1995 and we do not change the assignment of cities to bins over time. The two densest cities in each bin are: Nimes and Abbeville (bin 1), Lisieux and La Vallée de l'Arve (bin 2), Rennes and Nantes (bin 3), Roubaix-Tourcoing and Grenoble (bin 4), Paris and Lyon (bin 5).

STYLIZED FACT 1: AGGREGATE AND URBAN-BIASED STRUCTURAL CHANGE

On aggregate, France experiences the typical structural change from manufacturing towards services. But structural change is uneven across space: services have expanded much faster than manufacturing in the densest cities.

Focusing on the aggregate level, Figure 1 illustrates the well-known pattern of struc-

[13]Exports can be taken as a sufficient—though not necessary—indicator of domestic tradability. In Figure A.6 in the Online Appendix, we show that our results are robust to using a 10% export-share threshold.

[14]The value added shares of agriculture, forestry and fishing in the French economy were 2.7% in 1995 and 1.9% in 2018. The value added shares for mining and quarrying were 0.2% and 0.1%.

[15]The number of employees is not exactly the same across bins due to the discrete nature of cities. The city density ranking based on total employees is very highly correlated with the ranking based on working-age population.

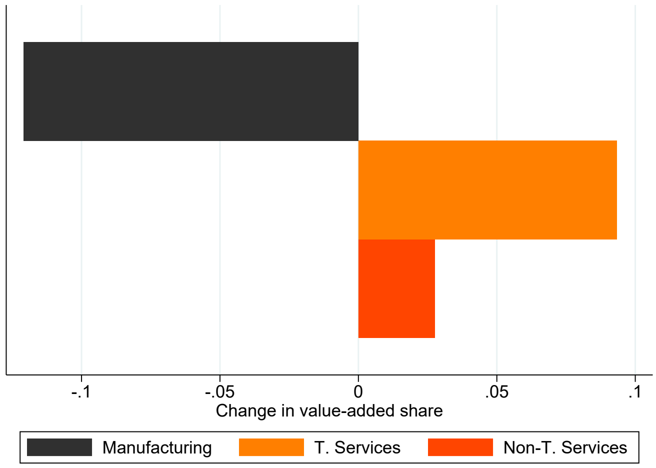


Figure 1: Aggregate structural change in France, 1995-2018

Notes: The bars show the change in aggregate sectoral value added shares for manufacturing, tradable services, and non-tradable local services in 1995 and 2018. These changes add up to zero.

tural change from manufacturing towards services in our sample. It shows how the aggregate value added shares of manufacturing and services changed between 1995 and 2018. While in 1995 the manufacturing sector accounted for almost 40% of total value added, by 2018 its share has decreased by 13 percentage points to 27%. Over the same period, the services share has increased by a mirror amount, particularly in tradable services where the value added share increased 9 percentage points from 34% to 43%. Corresponding shares based on employment are virtually the same.[16]

Overall, the French experience closely parallels developments in other high-income countries. Between 1970 and 2007, Herrendorf et al. (2014) report a rise in the value added share of services by 15–20 percentage points in the EU15, Japan, and the US.[17]

Next, Figure 2 illustrates our key empirical motivation: structural change proceeds faster in larger cities. We refer to this pattern as *urban-biased structural change* (UBSC). The figure plots inflation-adjusted sectoral value added growth between 1995 and 2018 across city density bins. In all bins, manufacturing value added grows more slowly than both service sectors, but the gap widens systematically with population density. Both tradable and local services expand more rapidly in dense cities, while manufacturing grows faster in smaller ones.

As summarized in Table 1, manufacturing value added rose by nearly 50% in the least dense cities, compared with only 30% in dense cities (annual rates of 1.6% and 1.1%). In contrast, tradable services expanded by 186% in dense cities and 149% in

[16] See Figure A.5. Manufacturing employment drops by 14%, similar to value added.

[17] See their Figure 6.2. Specifically, from 1970 to 2007 the nominal value added share of services rises from roughly 65% to 80% in the US, from 50% to 70% in Japan, and from 55% to 75% in the EU15. The corresponding manufacturing shares fall from about 30% to 20% in the US, and from roughly 40% to 25% in Japan and the EU15. The remaining sector is agriculture.

(a) Sectoral value added shares in 1995 | (b) Urban-biased structural change

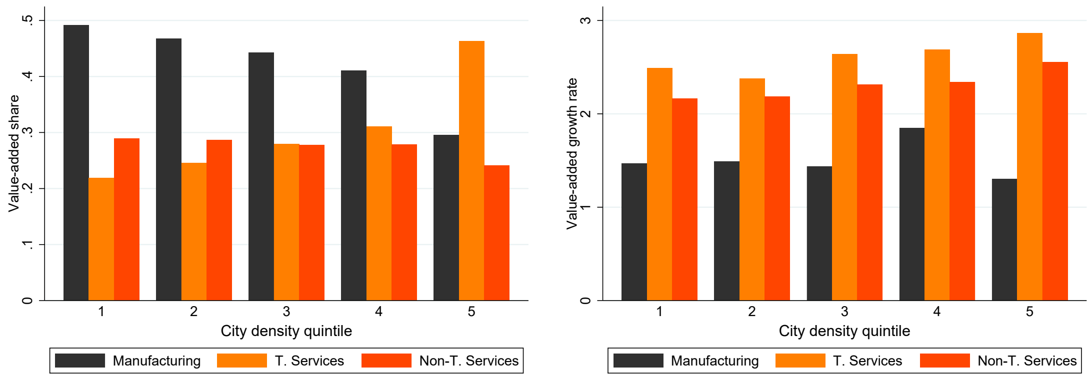


Figure 2: Urban-biased structural change in France, 1995-2018

Notes: In panel (a) the bars show the sectoral value added shares for manufacturing and services in 1995. The shares of the three sectors add up to 1. The horizontal axis represents city bins, with city bin 1 representing the least dense cities and bin 5 the densest cities. Panel (b) shows structural change within French city bins. The bars show the inflation-adjusted sectoral value added *growth rate* for manufacturing and services in each city bin between 1995 and 2018. A value of zero implies zero growth. The vertical axis represents city bins.

Table 1: Sectoral value added growth across French city size bins, 1995-2018

	INFLATION-ADJUSTED GROWTH RATES		
CITY DENSITY BIN	Manufacturing	Tradable services	Non-tradable services
1	1.47	2.49	2.16
2	1.49	2.37	2.18
3	1.44	2.66	2.32
4	1.85	2.69	2.34
5	1.30	2.86	2.55

Notes: The table reports the inflation-adjusted value added growth rate in each city size bin. Bin 1 represents the least dense cities and bin 5 the densest cities. Growth rates are computed as value added in 2018 divided by those in 1995. For example, 1.30 for manufacturing in bin 5 means a growth rate of 30%. Accounting for compounding, this growth rate corresponds to an annual growth rate of 1.1%.

rural areas (annual rates of 4.5% and 3.8%), while local services grew by 155% and 116%, respectively. Consequently, the gap between manufacturing and services growth is markedly larger in dense cities. This urban bias is not merely a "Paris versus the rest" phenomenon: the scatter plot in Figure A.2 in the Online Appendix plots the growth rates of both service sectors relative to manufacturing across all 279 cities and reveals a similar urban bias. Figure A.4 further shows that the urban bias is similar when we compare growth rates by population size rather than density.

STYLIZED FACT 2: LARGE FIRMS ACCOUNT FOR THE URBAN BIAS

Structural change among large firms is urban-biased, but structural change among other firms displays no urban bias.

Firm sizes differ markedly across sectors, and these differences—along with how they evolve across locations—may help explain the urban-biased pattern of structural change. The median manufacturing firm is about 16% and 88% larger than the median tradable and local services firm in 1995 (Table A.1 in the Online Appendix). At the top of the distribution, the gaps are even wider: at the 95th percentile, manufacturing firms are 98% and 399% larger than tradable and local services firms.

To better understand how different firm sizes contribute to urban-biased structural change, we decompose sectoral growth into the contributions of large and non-large firms. We measure structural change within each city-size bin using the same approach as in Figure 2b. The growth rate of sector j in city density bin i between 1995 and 2018 can be written as

$$\%\Delta\omega_{j,2018}(i) = \underbrace{\varsigma^{\text{large}}_{j,1995}(i)\cdot\%\Delta\omega^{\text{large}}_{j,2018}(i)}_{\text{Contribution of large firms}} + \underbrace{\varsigma^{\text{non-large}}_{j,1995}(i)\cdot\%\Delta\omega^{\text{non-large}}_{j,2018}(i)}_{\text{Contribution of other firms}}, \qquad (1)$$

where $\varsigma^{\text{large}}_{j,1995}(i) \equiv \text{VA}^{\text{large}}_{j,1995}(i)/\text{VA}_{j,1995}(i)$ denotes the share of sector j's value added in city i that is generated by large firms in 1995, and $\%\Delta\omega^{\text{large}}_{j,2018}(i) \equiv \text{VA}^{\text{large}}_{j,2018}(i)/\text{VA}^{\text{large}}_{j,1995}(i)$ is the corresponding growth rate. The first term thus measures the contribution of large firms to sectoral value added growth in each city and the second term the contribution of other firms. We use equation (1) to decompose the difference in value added growth between services and manufacturing in each city density bin. Specifically, we compute $\%\Delta\omega_{j,2018}(i) - \%\Delta\omega_{\text{manufacturing},2018}(i)$, where j denotes either tradable or non-tradable services.

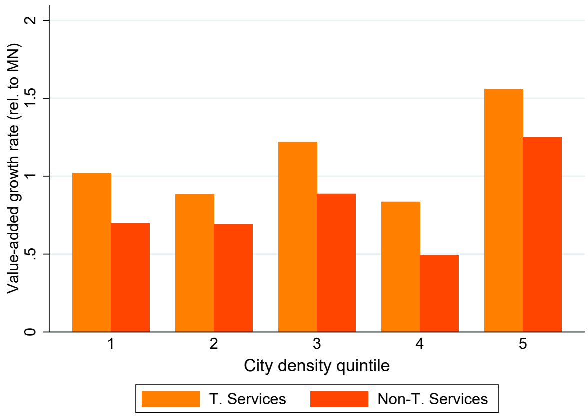
Table 2: Contribution of large firms to urban-biased structural change

	TRADABLE SERVICES			NON-TRADABLE SERVICES		
CITY BIN	All	Large	Non-large	All	Large	Non-large
1	1.02	0.30	0.72	0.70	−0.02	0.72
2	0.88	0.26	0.63	0.69	0.04	0.65
3	1.22	0.67	0.55	0.89	0.33	0.56
4	0.84	0.29	0.55	0.49	−0.10	0.59
5	1.56	1.26	0.30	1.25	0.79	0.45

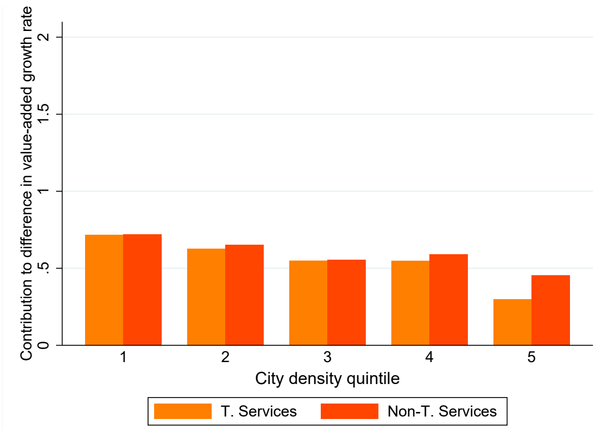
Notes: The table decomposes the gap in value added growth between services and manufacturing in each city density bin between 1995 and 2018 into the contribution of large firms and non-large firms. Large firms are defined as those in the top 5% of value added. The columns 'Large' report the share of sectoral growth gap in a given city account for by large firms, so columns 'Large' and 'Non-large' sum to 'All'. Large City density bin in 1 represents the least dense cities and bin 5 the densest cities.

Figure 3 presents the results of this decomposition. Panel (a) represents urban-biased structural change as the difference in value added growth rates between services and manufacturing in each city density bin. Panel (b) shows that structural change among large firms is clearly urban-biased: in dense cities, value added growth is higher in

(a) *All firms*



(b) *Non-large firms* (bottom 95%)



(c) *Large firms* (top 5%)

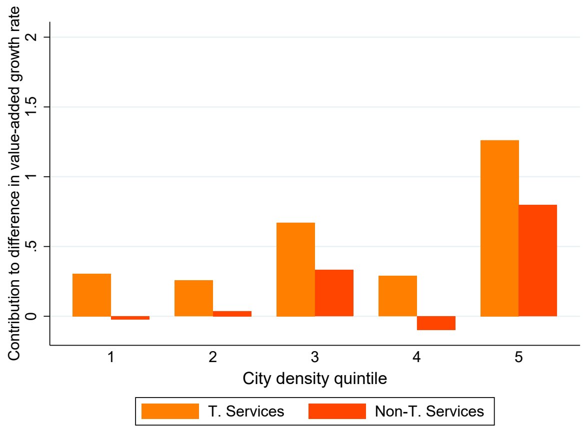


Figure 3: Large firms and urban-biased structural change in France

Notes: City size bin 1 represents the least dense cities and bin 5 the densest cities. Large firms are defined as those in the top 5% of the log value added distribution (at 1995 prices). Panel (a) shows the difference in value added growth rates between services and manufacturing in each city bin, i.e., the bars represent the gap in Figure 2b between the orange/red and black bars. In panel (b) the bars show the contribution of non-large firms to the gap in value added growth between services and manufacturing. The numbers correspond to the second term in the decomposition formula (1). Panel (c) does the same among large firms only. The numbers correspond to the first term in the decomposition formula (1). The sum of the orange/red bars within each city bin in panels (b) and (c) gives the corresponding bar in panel (a).

services than in manufacturing. By contrast, among non-large firms, structural change displays no urban bias (panel (c)). Table 2 reports the corresponding numbers. The columns labeled 'All' correspond to the total sectoral growth rate gaps shown in Figure 3a, while the columns labeled 'Large' isolate the contribution of large firms. Only the latter display a clear bias toward dense cities, indicating that faster services growth in urban areas is driven almost entirely by large firms. These findings suggest that the urban bias in structural change could reflect both differences in firm growth rates and in where large firms choose to locate across sectors. We investigate this next.

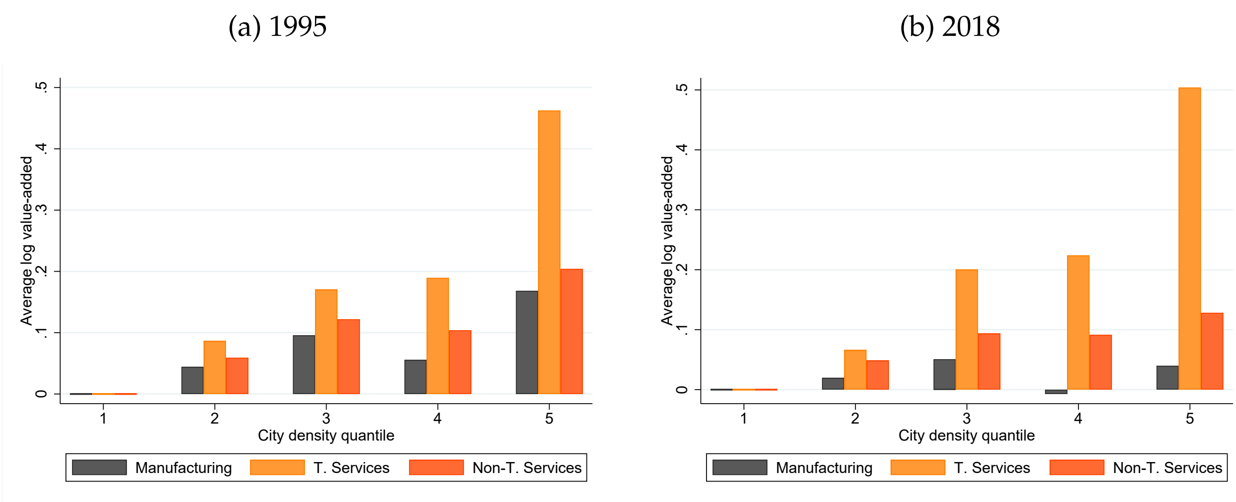


Figure 4: Relationship between firm size and city density

Notes: City density bin 1 represents the smallest cities and bin 5 the largest cities. In panel (a) the bars show the average log value added of firms in a given sector in a city density bin relative to those from the same sector but located in bin 1 in 1995. Panel (b) shows the corresponding figure for 2018.

STYLIZED FACT 3: DIFFERENTIAL FIRM SORTING ACROSS SECTORS

Larger firms are more likely to locate in denser cities in both tradable services and manufacturing, but the size-density gradient is steeper for tradable services than for manufacturing and the gradient gap has widened over time.

Figure 4 shows average log value added across firms for manufacturing and services in each city size bin, normalized to zero for the smallest bin. In 1995, Figure 4a shows a clear positive sorting pattern in each sector: larger firms are located in denser cities. However, the steepness of these patterns vary by sector. In tradable services, firms in the densest cities (bin 5) have value added approximately 46 log points larger than the average firm in the least dense cities (bin 1). In manufacturing and local services, the corresponding numbers are 16 and 20 log points.

By 2018, these patterns have changed drastically. While the firm size-density gradient steepens in tradable services and remains positive in local services, it has almost disappeared entirely in manufacturing. That is, the average firm size in manufacturing has become more even across locations.

The empirical patterns we have highlighted so far indicate that structural change has been faster in dense urban locations, driven by the location choices and differential growth of large firms. We next document how urban house prices and wages have evolved over the same period.

STYLIZED FACT 4: SHARPLY RISING URBAN HOUSE PRICES

The relationship between density and house prices has become markedly steeper over time.

The French land registry (*cadastre*) records all property transactions in France (except new construction) along with price, size, type (e.g., apartment, house, or commercial

(a) House prices per square meter

(b) Hourly wages

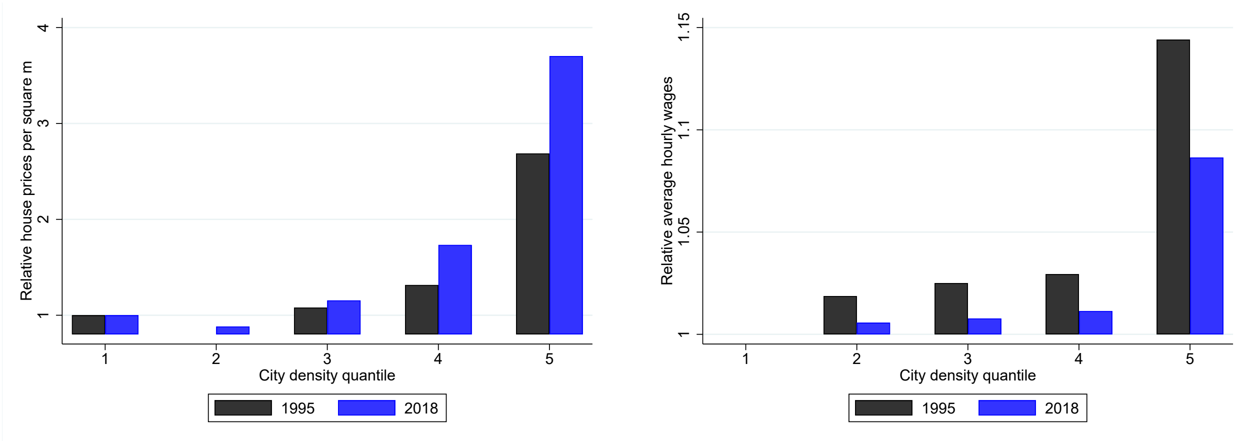


Figure 5: House prices and nominal wages across cities

Notes: City density bin 1 represents the smallest cities and bin 5 the largest cities. In panel (a) the bars show the average residualized house price in a city density bin relative to those of bin 1 (normalized to one). Black bars represent 1995 and blue 2018. Panel (b) shows the corresponding figure for residualized nominal hourly wages.

space), and location. We use these data to construct residualized house prices that are comparable across space and time. Since the dataset is only publicly available from 2017,[18] we used it to build house price indices for 2018. To construct the indices for 1995, we purchased data from ADNOV, a private notary firm, which are based on the same underlying *cadastre* records and used the same methodology, making the 1995 and 2018 indices directly comparable. A key limitation of the ADNOV data is that it omits Île-de-France. To compute the 1995 house price index for Île-de-France, we used publicly available data from INSEE to adjust the 2018 price index for this municipality back to its 1995 level.[19]

Figure 5a shows that urban house prices rose sharply between 1995 and 2018. In 1995, prices were already substantially higher in the densest cities, such as Paris and Lyon, than elsewhere: per square meter, prices in the densest cities (bin 5) were almost three times those in the least dense locations (bin 1). By 2018, this urban–rural price gap had widened to nearly fourfold.[20] Have urban wages kept pace with these rising house prices?

Stylized fact 5: Declining urban nominal wage premium

The urban nominal wage premium has fallen over time.

[18] https://cadastre.data.gouv.fr/datasets/cadastre-etalab.

[19] Île-de-France is a collection of commuting zones. To address the missing 1995 house prices for this municipality, we treat Île-de-France as a single city throughout the paper, while treating commuting zones as cities in all other cases.

[20] Similar to the urban bias in structural change, the sharp increase in house prices is not a "Paris versus the rest" phenomenon. Figure A.3 in the Online Appendix shows that a similar pattern remains after excluding Île-de-France.

The DADS matched employer–employee data contains detailed information on wages, occupations, sectors, and workplace locations. We use this data to track changes in the urban wage premium over time. To construct our baseline measure of urban wage premium, in both 1995 and 2018 we regress log hourly wages on city fixed effects and other observable characteristics—including gender, part-time status, occupations (two-digit level), and sectors (two-digit level)—and define the urban wage premium as the estimated city fixed effects in each year.

Figure 5b show that the relationship between nominal wages and density weakened between 1995 and 2018, even as house prices surged in denser cities. In 1995, hourly wages in the densest cities are about 15% higher than wages in the least dense areas. By 2018, this premium had fallen to roughly 10%.[21] To assess robustness and consistency, we also measure the premium in alternative ways: comparing raw averages, controlling for finer occupation and sector categories, and looking within occupation and sector cells. We find a consistent flattening of the premium; see Figure A.8 in the Online Appendix.

STYLIZED FACT 6: RISING LOCAL SERVICES VARIETY IN DENSE CITIES

The density of distinct local services providers in denser cities has increased over time.

What accounts for the growing disparity between urban house prices and wages? While stylized facts 4 and 5 suggest that real wages may have declined for the urban population, urban consumption amenities—such as restaurants and entertainment—may have become increasingly attractive or accessible. To assess this, we track how the number of local services firms per square kilometer—our measure of local services *variety*—has changed over time across cities.

Figure 6 shows that local services variety has expanded much more rapidly in the densest cities than in less dense areas. Panel (a) illustrates that, in 1995, dense cities such as Paris and Lyon (bin 5) already had about nine times as many local services firms per square kilometer as the least dense locations (bin 1). By 2018, this urban–rural gap had widened by roughly 50 percentage points, while differences among less densely populated cities (bins 2 to 4) remained largely unchanged.

Panels (b)–(f) show that this increase in local services density occurred broadly across subsectors—including food and accommodation, arts and entertainment, transportation, and health services—with the notable exception of retail, which has experienced a relative decline.[22]

[21]These patterns differ from those in the US, where urban nominal wages have diverged from those in less dense areas (Giannone, 2022; Eckert et al., 2025), but they are consistent with the US experience in that house prices in dense cities have risen faster than wages (Baum-Snow and Duranton, 2025).

[22]It is possible, however, that the range of varieties offered per retail store expanded over this period, an empirical question our data do not allow us to examine.

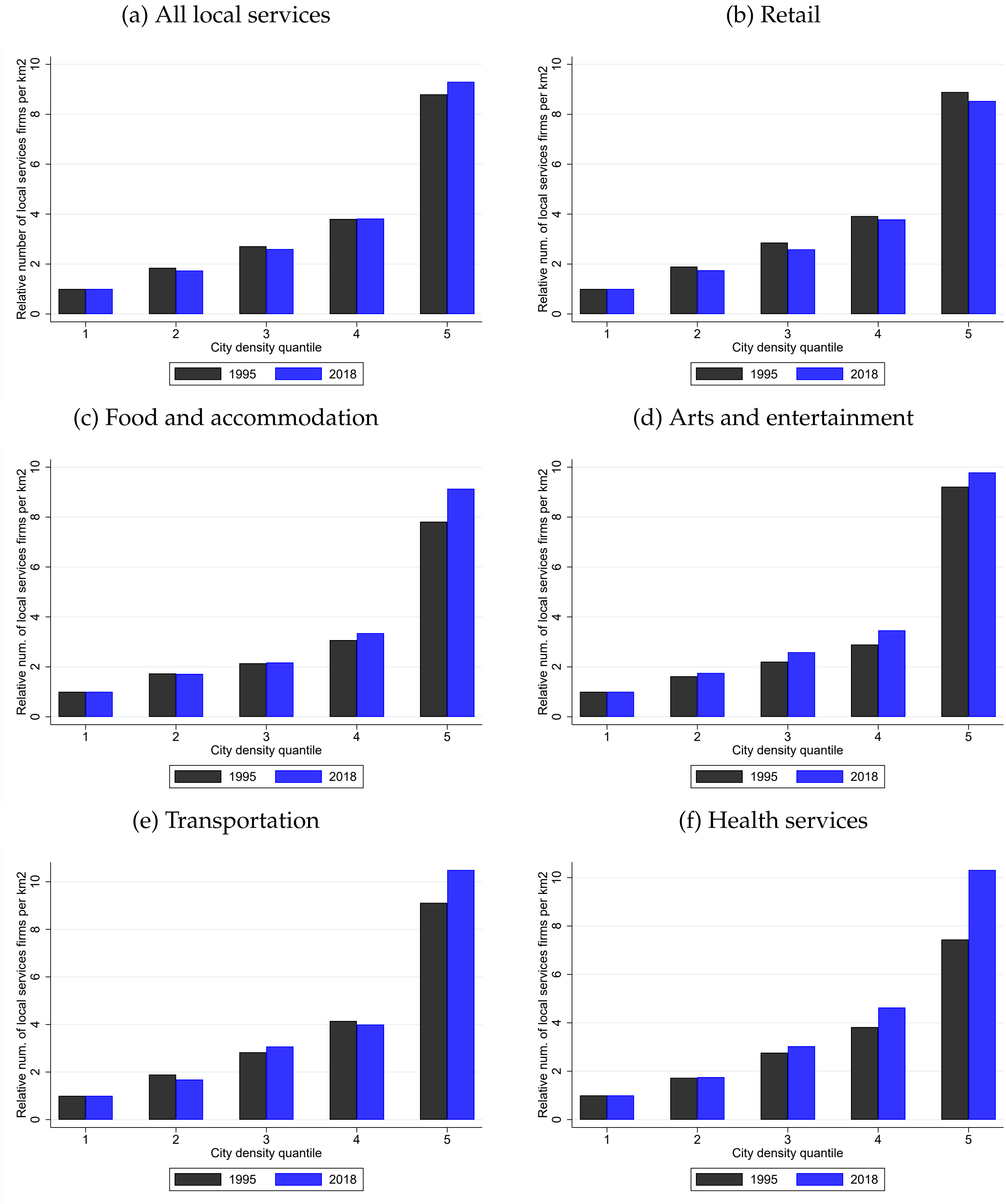


Figure 6: Number of local services variety across cities

Notes: City density bin 1 represents the smallest cities and bin 5 the largest cities. The bars in each panel shows the number of firms within a square kilometer in a city bin relative to bin 1 (normalized to one). Black bars represent 1995 and blue 2018.

Overall, our findings are consistent with a growing body of evidence that highlights the role of urban consumption amenities in shaping location choices. Using US retail data, Handbury and Weinstein (2015) document that denser cities offer greater product variety, implying that once variety is accounted for, effective prices are lower in larger markets. Combes et al. (2012) reach a similar conclusion using broader product categories. In related work, Hottman (2021) shows that local services price indices decline with city size due to greater store variety. Focusing on specific sectors, Couture (2016) quantifies that variety-driven gains account for a substantial share of the consumption value of US cities, while Schiff (2015) shows that both city population and density contribute to increased restaurant variety. Finally, Su (2022) finds that in dense cities, households substitute home-produced services with market-based amenities, suggesting that urban residents value differentiated urban market amenities.

Summary. Taken together, stylized facts 1-5 reveal an apparent disconnect between technological progress and real wage growth across cities: cities experiencing the fastest structural transformation had negative measured real wage growth. Fact 6 points to a potential resolution: the expansion of local services varieties in dense cities. If workers derive utility from greater local services variety, real wages may not have declined. We next develop a quantitative spatial model to formalize this intuition and trace the mechanisms through which these empirical patterns can emerge in equilibrium.

3 A model of cities and structural change

Motivated by the empirical findings, we develop a model of location choices by heterogeneous firms in manufacturing and services in the presence of agglomeration externalities that can give rise to urban-biased structural change. We later use the model to quantify the channels through which economic activity shifts from manufacturing to services across French cities. The framework builds on quantitative spatial equilibrium models in which heterogeneous firms sort across cities of different sizes (Behrens, Duranton, and Robert-Nicoud, 2014; Gaubert, 2018). Firm sorting determines each city's exposure to the forces of structural change, which then arises from sector-specific—but location-neutral—TFP growth.

Cities, population, and industries. The economy consists of $\bar{L}$ workers distributed across I cities, with $L(i)$ denoting the equilibrium population of city i. Each city hosts three sectors: manufacturing, tradable services, and non-tradable local services, indexed by $j \in \{m, s, n\}$. Manufactured goods and tradable services are freely traded across cities at zero cost.

Workers and local demand. A worker in city i derives utility $U(i)$ from consuming freely traded goods ($C_m(i)$) and tradable services ($C_s(i)$), local non-tradable services

($C_n(i)$), and housing $h(i)$:

$$U(i) = \frac{\tilde{B}B(i)}{\eta}\left(\nu C_t(i)^{\frac{\rho-1}{\rho}} + (1-\nu)C_n(i)^{\frac{\rho-1}{\rho}}\right)^{\frac{\rho}{\rho-1}\eta} \frac{h(i)^{1-\eta}}{1-\eta} \exp\left(\epsilon_w(i)\right),$$
$$C_c(i) = \left(\zeta C_s(i)^{\frac{\gamma-1}{\gamma}} + (1-\zeta)C_m(i)^{\frac{\gamma-1}{\gamma}}\right)^{\frac{\gamma}{\gamma-1}},$$

where $C_c(i)$ denotes the bundle of freely traded goods, $B(i)$ represents exogenous city-specific amenities, and $\tilde{B}$ represents endogenous, location-neutral public goods. The parameter ρ is the elasticity of substitution between freely traded final goods and local services. The parameter γ is the elasticity of substitution between manufactured goods and tradable services. This specification of the utility function accommodates structural change through changes in the relative price of final goods and (local) services (Ngai and Pissarides, 2007), although it does not feature structural change through income effects (Comin et al., 2021).

Each worker faces the following budget constraint:

$$P_s C_s(i) + P_m C_m(i) + P_n(i) C_n(i) + P_h(i) h(i) = W(i),$$

where P_s and P_m are respectively the consumption price of traded services and the consumption price of manufactured goods—both location-independent—$P_n(i)$ the price of local services, $P_h(i)$ local house prices, and $W(i)$ local wages. The price index for the bundle of freely traded goods (P_c) and the local price index ($P(i)$) are given by

$$\text{Traded bundle:} \qquad P_c = \left(\zeta^\gamma P_s^{1-\gamma} + (1-\zeta)^\gamma P_m^{1-\gamma}\right)^{\frac{1}{1-\gamma}};$$
$$\text{Local price index:} \qquad P(i) = \left(\nu^\rho P_c^{1-\rho} + (1-\nu)^\rho P_n(i)^{1-\gamma}\right)^{\frac{\eta}{1-\rho}} P_h(i)^{1-\eta}.$$

We normalize the price of the traded bundle to one ($P_c = 1$).

To capture imperfect mobility, workers are assumed to draw idiosyncratic preference shocks $\epsilon_w(i)$, which are Fréchet distributed with shape parameter ξ and mean zero. Solving workers' location choice problem and aggregating over individuals yields the population share of each city:

$$\frac{L(i)}{\bar{L}} = \frac{\tilde{U}(i)^\xi}{\sum_{i' \in I} \tilde{U}(i')^\xi}, \quad \text{where } \tilde{U}(i) \propto B(i)\frac{W(i)}{P(i)}.$$

The supply of workers in city i thus depends on the average utility of workers in location i, $\tilde{U}(i)$, which increases with local wages $W(i)$ and amenities $B(i)$, and decreases with local house prices $P_h(i)$ and the price of local services $P_n(i)$.

Production of non-tradable local services. Local services are subject to infinite trade costs between cities and are horizontally differentiated varieties, indexed by ω. They are produced by an endogenous measure $M_n(i)$ of monopolistically competitive firms with identical productivity, determined by a city-specific free-entry condition:

$$E\left[\pi_n(\omega,i) \mid i\right] = f_n^e,$$

where $\pi_n(\omega,i)$ are the profits of a local services firm producing variety ω in city i and $f_n^e(i)$ is a city-specific entry cost denoted in the bundle of traded goods and services.[23]

Local services varieties in each city are a CES aggregate of output produced by each firm, resulting in the following local services price index:

$$P_n(i) = \left(\frac{M_n(i)}{L(i)^{\lambda}}\, E\left[p_n(\omega,i)^{1-\sigma_n} \mid i\right]\, \omega\right)^{\frac{1}{1-\sigma_n}},$$

where $p_n(\omega,i)$ is the price of a local service variety and σ_n is the elasticity of substitution between local services varieties. The love-of-variety effect is captured by $M_n(i)/L(i)^{\lambda}$ and is regulated by the parameter λ. In all cases, $M_n(i)$ enters the price index with elasticity $1/(1-\sigma_n)$, which in turn reflects preferences for differentiation. When $\lambda = 0$, this effect does not vary with population size; for $\lambda > 0$ a greater population size attenuates the effect. The interpretation for this is that not all varieties are available to all residents—for example, due to local commuting or transportation costs—consistent with the discussion in Glaeser et al. (2001). When $\lambda = 1$, the price index depends only on the number of varieties per capita.

Local services are produced by combining labor and housing inputs using a Cobb-Douglas production technology, $q_n(z,i) = A_n l^{\alpha_n} h^{\beta_n}$, where A_n is the sector-wide local services TFP, and $\alpha_n \in [0,1]$ and $\beta_n \in [0, 1-\alpha_j]$ are the labor and housing intensities. We assume that they are price-takers in input markets, but monopolistically competitive in the local services output market. Prices are then a markup above marginal costs, $p_n(\omega,i) = \dfrac{\sigma_n}{\sigma_n - 1}\left(\dfrac{W(i)}{\alpha_n}\right)^{\alpha_n}\left(\dfrac{P_h(i)}{\beta_n}\right)^{\beta_n}$.

Production of goods and tradable services. Monopolistically competitive firms in the tradable sectors produce horizontally differentiated varieties, ω. Sectoral output are CES aggregates of firm-level output, resulting in the following price index for each trad-

[23]As Figure 4 shows, average firm size in the local services sector increases with city density. Allowing entry costs to vary by city allows the model to match this pattern in the data.

able sector $j \in \{s, m\}$:

$$P_j = \left(\sum_i \int_{\omega \in \Omega_j(i)} p_j(\omega, i)^{1-\sigma_j} \, d\omega \right)^{\frac{1}{1-\sigma_j}} .$$

Since manufactured goods and tradable services are costlessly traded, their price indices are uniform across cities.

Production technologies and agglomeration effects in tradable sectors. Firms in each tradable sector $j \in \{m, s\}$ pay an *ex-ante* entry cost f_j^e, denominated in the bundle of traded goods and services, to draw an idiosyncratic efficiency type z from a sector-specific distribution $G_j(z)$ with support $[1, \infty)$. After entry, goods and services are produced using labor and housing as inputs according to a Cobb–Douglas technology:

$$q_j(z, i) = \Psi_j(z, i) \, l^{\alpha_j} \, h^{\beta_j} ,$$

where $\alpha_j \in [0, 1]$ and $\beta_j \in [0, 1 - \alpha_j]$ denote labor and housing cost shares, respectively. These parameters govern the strength of local congestion forces: a higher α_j increases firms' exposure to local wage costs, while a higher β_j raises sensitivity to house prices. Hence, changes in house prices affect firms both indirectly—through labor costs—and directly, via their own demand for housing inputs.

A firm's factor-neutral productivity level $\Psi_j(z, i)$ depends on its idiosyncratic efficiency draw z, the sector j in which the firm operates, and the population density in its chosen city $L(i)$. The latter captures agglomeration externalities, reflecting the productivity advantage to firms of locating in denser cities, which may arise from knowledge spillovers, labor pooling, inter-firm trade, or demand externalities (Duranton and Puga, 2020; Dauth, Findeisen, Moretti, and Suedekum, 2022).

To rationalize the empirical fact that larger, more productive firms are disproportionately concentrated in dense cities, we follow Gaubert (2018) and assume that the composite productivity function $\Psi_j(z, i)$ is log-supermodular in z and $L(i)$, i.e., $\partial^2 \log \Psi_j(.) / \partial \log z \, \partial \log L(i) > 0$. This condition implies that higher-efficiency firms benefit more from agglomeration, giving rise to positive sorting of firms across cities.

We allow for imperfect sorting by introducing a random, location-specific productivity shock $\hat{\epsilon}(\omega, i)$ on top of their permanent efficiency z. Define firm-level overall productivity as $\Phi_j(z, i) \equiv \Psi_j(z, i) \, e^{\epsilon(\omega, i)}$. Let the location shock $\epsilon(\omega, i)$ be i.i.d. and distributed Type-I Extreme Value (Gumbel) with mean 0 and variance $\nu_{\epsilon,j}$. Then, $\epsilon(\omega, i) \equiv e^{(\sigma_j - 1)\, \hat{\epsilon}(\omega, i)}$ is distributed Fréchet with shape parameter $\chi_j \equiv \nu_{\epsilon,j} / (\sigma_j - 1)$. Firms with identical efficiency may thus choose different cities.

The specific functional form for firm productivity $\Psi_j(z,i)$ follows Gaubert (2018):

$$\log \Psi_j(z,i) = \log A_j + a_j \log \frac{L(i)}{L(1)} + \left(1 + \log \frac{L(i)}{L(1)}\right)^{s_j} \log z, \tag{2}$$

where A_j is a sector-wide, location-neutral component of firms' TFP (hereafter, sectoral TFP). The efficiency draw z follows a Gamma distribution with shape parameter $\nu_{z,j}^{shape}$ and scale parameter $\nu_{z,j}^{scale}$. The parameter $a_j \geq 0$ governs the strength of common agglomeration forces, while $s_j \geq 0$ captures the extent to which these externalities increase with firm efficiency, generating sorting across locations.

Within a chosen city i, firms maximize profits by choosing labor and housing inputs, taking local wages and house prices as given. Under monopolistic competition in the national output market, each firm sets prices as a constant markup over marginal cost:

$$p_j(\omega,i) = \frac{\sigma_j}{\sigma_j - 1} \Phi_j(z,i)^{-1} \left(\frac{W(i)}{\alpha_j}\right)^{\alpha_j} \left(\frac{P_h(i)}{\beta_j}\right)^{\beta_j}.$$

Given these optimal pricing and input choices, firms choose their location to maximize profits. Because each firm faces a random, location-specific productivity shock $\epsilon(\omega,i)$, profits can be expressed as the product of a deterministic component $v_j(z,i)$ and the random draw: $\pi_j(z,i) = v_j(z,i)\,\epsilon(\omega,i)$. The firm's location choice problem can then be expressed as

$$i_j^*(z) = \arg\max_{i \in \mathcal{I}} \; v_j(z,i)\,\epsilon(\omega,i).$$

Production of residential housing and commercial real estate. Each city $i \in I$ has a fixed unit measure of land and a representative housing developer. Housing can be used as residence by workers or as production inputs by firms. Housing developers combine land with labor to produce housing using the following technology:

$$h(i) = z_h(i)\, l^{\delta},$$

where $\delta \in [0,1]$ and $z_h(i)$ represents local housing sector productivity, capturing aspects such as the role of local regulations, terrain, and technology. House prices are determined in perfect competition and developers take the prices as given. Profit maximization by local housing developers yields the following local housing supply curve:

$$h(i) = z_h(i)^{\frac{1}{1-\delta}} \left(\delta \frac{P_h(i)}{W(i)}\right)^{\frac{\delta}{1-\delta}}.$$

Because local land supply is fixed, the housing production function features decreasing returns to scale, implying that housing developers make positive profits. We assume that these profits are fully taxed by a national government and transformed into public goods, $\tilde{B}$, provided to all workers equally.

Equilibrium. An equilibrium is a set of local wages $W(i)$, house prices $P_h(i)$, local services price indices $P_n(i)$, local services firms $M_n(i)$, tradable sector price indices P_j, and worker- and firm-specific location choices that: (i) clears city-specific markets for labor, housing, and local services; (ii) clears national markets for manufactured goods and tradable services; (iii) satisfies the sector-specific free-entry conditions; and (iv) maximizes worker utility and firm profits.

4 Model quantification

To assess the importance of the mechanisms we model in driving the observed patterns of structural change across French cities, we recover the values of the model's parameters from our data through a combination of calibration and structural estimation. The key parameters are those that drive aggregate structural change—sectoral TFP growth—and those shaping the spatial distribution of economic activity—sorting, agglomeration, and congestion forces.

Our baseline quantification approach is designed to exactly match aggregate structural change as well as the observed evolution of local house prices and wages. To do so, we allow sectoral TFP (A_j), exogenous city-specific housing productivity ($z_h(i)$), and exogenous city-specific amenities ($B(i)$) to vary between 1995 and 2018. We thus estimate two sets of these parameters, one for each year, while keeping all other parameters constant over time.

As this section explains, our model quantification proceeds in two steps. First, we detail our structural estimation approach to recover the parameters governing sorting, agglomeration, and congestion forces. Conditional on these estimates, we then recover the exogenous shifters $A_j, z_h(i), B(i)$ for 1995 and 2018. We report the estimated parameters in Table 3 and calibrated parameters in Table B.1.

4.1 Structural estimation of sorting, agglomeration, and congestion parameters

Parameters to estimate. We assume that firm-specific efficiency $\log z$ is drawn from a Gamma distribution with scale parameter $\nu_{z,j}^{scale}$ and shape parameter $\nu_{z,j}^{shape}$. Firm and location-specific shocks $\epsilon(\omega, i)$ are drawn from a Gumbel distribution with scale parameter $\nu_{\epsilon,j}^{scale}$. Given the functional form for firms' composite productivity $\Psi_j(z, i)$ (see equation (2)), the sector-specific parameters to estimate include the agglomeration externality parameter a_j, the sorting parameter s_j, and housing output elasticity β_j. Each of these parameters are kept constant over time. Specifically, the set of parameters we estimate for each tradable sector are

$$\mathbf{\Theta} = \left\{ a_j, s_j, \beta_j, \nu_{z,j}^{shape}, \nu_{z,j}^{scale}, \nu_{\epsilon,j}^{scale} \right\}.$$

These parameters pertain only to the tradable sectors, as described in Section 3.

Identification. We estimate the parameters $\mathbf{\Theta}_j$ in partial equilibrium by solving the firm location choice problem (3). Estimation is conducted separately for manufacturing and tradable services to match a set of sector-specific moment conditions described below. Given the composite productivity function (2), we express firm value added—normalized by the average log value added of firms in the same sector located in the least dense city (indexed by $i = 1$)—as

$$\begin{aligned} \log R_j(z,i) - E\big[\log R_j(1)\big] = (\sigma_j - 1)\bigg(& \log \Psi_j(z,i) - E\big[\log \Psi_j(z,1) \mid z \in \mathcal{Z}_j(1)\big] \\ & - \alpha_j \log \frac{W(i)}{W(1)} - \beta_j \log \frac{P_h(i)}{P_h(1)} \bigg) + \hat{\epsilon}(z,i)\,. \end{aligned} \tag{3}$$

where $\mathcal{Z}_j(1)$ denotes the set of firms in sector j located in the least densely populated city. Because sectoral TFP shifters A_j are assumed to be Hicks-neutral, they difference out when comparing firms in each city to those in the smallest city. In the data, we observe $\log R_j(z,i) - E[\log R_j(1)]$, relative city size $L(i)/L(1)$, relative wages $W(i)/W(1)$, and relative house prices $P_h(i)/P_h(1)$. Conditional on calibrated parameters (σ_j, α_j), the observed firm and city size distributions, and relative wages and house prices, we estimate the parameters $\mathbf{\Theta}_j$ to match data moments that are informative about their underlying values.

Intuition behind identification. The agglomeration externality parameter a_j is identified from proportional shifts in the distribution of $\log R_j(z,i) - E[\log R_j(1)]$ across city sizes, since a_j affects all firms within a sector uniformly. In contrast, the sorting parameter s_j governs how the productivity gains from locating in a larger city vary with firm efficiency z. When $s_j > 0$, more efficient firms benefit disproportionately from locating in denser cities. Accordingly, s_j can be identified from changes in the skewness of $\log R_j(z,i) - E[\log R_j(1)]$ across city sizes—that is, from how the firm size–city size gradient differs across the firm size distribution.

The variance of firm efficiency draws, determined by $\nu_{z,j}^{shape}$ and $\nu_{z,j}^{scale}$, is identified from the overall (non-location-specific) variance of $\log R_j(z,i) - E[\log R_j(1)]$. The variance of the firm–location-specific shock, $\nu_{\epsilon,j}^{scale}$, captures imperfect sorting between firm size and city size and can be inferred from the correlation between $\log R_j(z,i) -$

$E[\log R_j(1)]$ and $\log(L(i)/L(1))$. Finally, the housing output elasticity β_j is identified from how differences in house prices affect $\log R_j(z,i) - E[\log R_j(1)]$, conditional on population size and wages.

Targeted moments. Given the above discussion of which moments are informative about each parameter, we target the following moments for each tradable sector, with the choice of targeted moments being the same as that of Gaubert (2018) with the exception of the fourth set of moments below:

1. the 50-10, 75-25, 90-50, and 90-10 differences of the distribution of log value added;
2. the average (normalized) log value added by city size quintiles $i \in \mathcal{I}$;
3. the share of value added that originates from a city size quintile $i \in \mathcal{I}$;
4. the share of value added in each city among top 5% firms, as measured by log value added.

Estimation is carried out by the Method of Simulated Moments using a pooled specification for 1995 and 2018. We denote the combined vector of empirical moments for 1995 and 2018 by $\boldsymbol{m}$, with $\widehat{\boldsymbol{m}}(\boldsymbol{\Theta})$ the corresponding vector of model moments. With $\mathcal{W}$ an estimate of the matrix of variances and covariances of the empirical moments (obtained by bootstrapping), we derive an estimate $\widehat{\boldsymbol{\Theta}}$ as

$$\widehat{\boldsymbol{\Theta}} = \arg\min_{\boldsymbol{\Theta}} \left(\boldsymbol{m} - \widehat{\boldsymbol{m}}(\boldsymbol{\Theta})\right)' \mathcal{W}^{-1}\left(\boldsymbol{m} - \widehat{\boldsymbol{m}}(\boldsymbol{\Theta})\right).$$

In our implementation, we solve this optimization problem using the Differential Evolution algorithm, which is a global optimizer. For the within-sector elasticity of substitution across product varieties, we set a common value of $\sigma = 3$ across sector. The labor output elasticity parameter α_j is then set to match the median labor share of value added in each sector.

Results. Our estimates, presented in Table 3, point to three reasons why tradable services are more concentrated in dense cities than manufacturing: the former benefit more from agglomeration externalities (a_j of 0.15 compared to 0.11), in particular large firms (s_j of 0.27 compared to 0.03), and they are less housing-intensive in production (β_j of 0.01 compared to 0.23). Appendix B.2 reports the model's fit to the targeted and untargeted moments.

4.2 Calibration of parameters related to local services

Parameters to calibrate. The key parameters to calibrate for the local services sector are entry costs ($f_n^e(i)$), love-of-variety effect (λ), and housing output elasticity β_n. The

Table 3: Summary of estimated parameters

PARAMETER		MANUFACTURING	TRADABLE SERVICES
Agglomeration externalities	a_j	0.11	0.15
		(0.01)	(0.02)
Sorting	s_j	0.03	0.27
		(0.01)	(0.01)
Housing output elasticity	β_j	0.23	0.01
		(0.03)	(0.01)
Shape of firm efficiency distribution	$\nu_{z,j}^{shape}$	0.61	2.48
		(0.02)	(0.00)
Scale of firm efficiency distribution	$\nu_{z,j}^{scale}$	0.61	0.21
		(0.02)	(0.02)
Shape of firm efficiency distribution	$\nu_{\epsilon,j}$	0.49	0.42
		(0.01)	(0.01)

Notes: The table reports the parameter values inferred through structural estimation. Asymptotic standard errors are provided in parentheses.

substitution elasticity (σ_n) and labor output elasticity (α_n) parameters are calibrated in the same way as for the tradable sectors.

Entry costs. In our model, local services firms do not face the same location choice problem as firms in tradable sectors. Local services firms pay a city-specific cost $f_n^e(i)$ prior to entry. We use the free-entry condition to pin down its value:

$$f_n^e(i) = E\left[\pi_n(z,i) \middle| z \in \mathcal{Z}(i)\right] \propto \frac{R_n(i)}{M_n(i)},$$

where $R_n(i)$ is total value added of local services in city i, $M_n(i)$ is the measure of local services firms in city i. This expression shows that entry costs are proportional to average firm size in a city. We normalize entry costs in the least dense city to one, $f_n^e(1) = 1$, and compute entry costs in other cities relative to this value.

Love-of-variety and housing output elasticity. To calibrate λ and β_n, we use the model-implied relationship between the expenditure share on local services and the costs of producing them. The expenditure share on local services is given by

$$\chi_n(i) \equiv \frac{P_n(i)Q_n(i)}{W(i)L(i)} = \frac{\eta}{1 + \left(\frac{\nu}{1-\nu}\right)^{\rho} P_n(i)^{\rho-1}}.$$

Therefore, using the model-implied expression for the local services price index, the relationship between expenditure shares and local production costs for local services can be expressed as

$$\frac{P_n(i)}{P_n(1)} = \left(\frac{\eta\chi_n(i)^{-1} - 1}{\eta\chi_n(1)^{-1} - 1}\right)^{\frac{1}{\rho-1}} = \left[\frac{M_n(i)}{M_n(1)}\left(\frac{L(i)}{L(1)}\right)^{-\lambda}\right]^{\frac{1}{1-\sigma_n}}\left(\frac{W(i)}{W(1)}\right)^{\alpha_n}\left(\frac{P_h(i)}{P_h(1)}\right)^{\beta_n}. \quad (4)$$

While $P_n(i)$ are not observed, we can derive the expenditure shares $\chi_n(i)$ directly from the French data. Together with a value for the elasticity of substitution between the traded consumption bundle and local services (ρ) and the non-housing expenditure share (η), we obtain a measure of the left-hand side of equation (4). We set $\eta = 0.8$ to match the expenditure share of household income on housing-related costs of the average household in INSEE's 2013 household expenditure survey. We set $\rho = 0.4$ following typical estimates in the literature on aggregate structural change (Herrendorf et al., 2014; Comin et al., 2021; Lewis, Monarch, Sposi, and Zhang, 2022). This value implies that local services and traded output are complements. Finally, using data on the number of local services firms (per square kilometer), population density, local hourly wages, and local house prices (per square meter), we implement equation (4) as an OLS regression to derive λ and β_n.

4.3 Other parameters

Before measuring sectoral TFP growth, housing TFP, and exogenous amenities, several parameters must be calibrated: fixed entry costs in the tradable sectors (f_m^e, f_s^e), the elasticity of substitution between manufactured goods and tradable services (γ), the housing supply elasticity (δ), and worker mobility frictions (ξ).

We calibrate f_m^e and f_s^e to match the average firm size (measured by value added) in each tradable sector relative to that in local services. The housing supply elasticity δ is set to match an elasticity of housing production to non-land inputs of 0.8, in line with evidence for France from Combes, Duranton, and Gobillon (2021).[24] Worker mobility frictions are calibrated to $\xi = 7$, following empirical estimates for France in Zerecero (2021). In Appendix B.3.1 and B.3.2, we evaluate the sensitivity of our main quantitative results to a range of commonly estimated values for ξ and δ.

To recover a value for the elasticity of substitution, γ, between the outputs of the tradable sectors, we exploit the model-implied relationship between changes in relative sectoral value added and relative sectoral prices:

$$\Delta \log \frac{R_m}{R_s} = (1-\gamma)\,\Delta \log \frac{P_m}{P_s},$$

[24] That is, we set δ as 0.8 multiplied by the inverse of the median labor share of value added.

where we impose that the preference weight ζ remain constant over time. We estimate this relationship using quarterly data from INSEE on sectoral value added and producer price indices. The implied value of γ is 1.89, indicating that tradable services and manufacturing are substitutes, consistent with existing evidence (Duernecker et al., 2024).

4.4 Calibrating sectoral TFP growth, housing TFP, and amenities

Given the parameters estimated and calibrated above, we determine the remaining parameters by solving the model in general equilibrium to match specific data moments.

The remaining time-invariant parameters are the preference weight between manufactured goods and tradable services (ζ) and the preference weight between local services and the freely traded consumption bundle (ν). We calibrate these parameters to match the aggregate value added shares of manufacturing and tradable services relative to local services in 1995.

The remaining time-varying parameters are sectoral TFP (A_j), local housing sector productivity ($z_h(i)$), and exogenous local amenities ($B(i)$). We normalize sectoral TFP in each sector to unity in 1995 and calibrate A_m and A_s to match the aggregate value added shares of manufacturing and tradable services relative to local services in 2018. Local services TFP (A_n) is held constant at one throughout.

To calibrate local housing sector productivity, we normalize $z_h(i)$ to one in the least dense city and back out city-specific values to match relative land prices per square meter across cities, separately for 1995 and 2018. Similarly, we normalize amenities $B(i)$ to unity in the smallest city and calibrate them to match the cross-sectional relationship between local hourly wages and population density in both years.

Calibrated parameter values. To account for the 13 percentage point decline in aggregate manufacturing value added share and the 9 percentage point increase for tradable services between 1995 and 2018, the model requires TFP growth in manufacturing and tradable services—relative to local services—to be 66% and 115%, respectively. With compounding, this corresponds to average annual TFP growth that is 2.1 percentage points higher in manufacturing and 3.2 percentage points higher in tradable services than in local services.

The model also indicates that housing sector productivity $z_h(i)$ declined in dense cities relative to the least dense ones, except in the densest cities. Figure B.1a shows that in 1995, the housing sector in the densest cities was about 1.7 times as productive as in the least dense cities, with a similarly large gap for mid-density cities. By 2018, this advantage remained the same for the densest cities, but had fallen to between 1.1 and 1.5 in mid-density cities. Finally, to match the observed wage–density relationship, the model implies that exogenous amenities $B(i)$ were about 31% higher in the densest cities than in the least dense ones in 1995, with this gap widening to roughly 37% by 2018 (see Figure B.1b).

5 Spatial implications of structural change

We now use the estimated model to examine how aggregate structural change—driven by differential sectoral TFP growth—interacts with local agglomeration and congestion forces to shape city-specific patterns of structural change, house prices, and wages. We begin by showing that the model successfully produces the urban-biased pattern of structural change observed in the data (Section 5.1). We then isolate the contribution of sectoral TFP growth in Section 5.2, demonstrating that its interaction with the local services sector is central to explaining the urban bias as well as the evolution of wages and house prices. We conclude this section by examining the role of other mechanisms and exploring additional potential drivers of the urban bias discussed in the literature within the context of our framework.

5.1 UBSC in the data and the model

The spatial distribution of value added in the model's 1995 equilibrium closely replicates that observed in the data. Figure 2a shows that in the data the share of value added in tradable services rises systematically with city density, while the share of local services remains roughly constant and the manufacturing share declines. Figure B.5b confirms that the model reproduces these cross-sectional patterns both qualitatively and quantitatively. This indicates that the estimated sorting and agglomeration forces, together with the calibrated housing and amenity gradients, successfully capture the baseline spatial organization of economic activity.

Turning to dynamics, the model replicates the urban bias of structural change observed in the data. Figure B.6a reports the growth of value added in tradable and local services relative to manufacturing across city density bins.[25] In the densest cities (bin 5), value added in tradable services grew about 156 percentage points faster than in manufacturing between 1995 and 2018, while local services grew about 125 percentage points faster. In the least dense cities (bin 1), the corresponding numbers are 102 and 70 percentage points. Figure B.6b shows that the model largely reproduces these patterns,

[25] This figure corresponds directly to Figure 2 in Section 2.2, except that it is the difference in value added growth between tradable/local services and manufacturing in each density bin. Since the model abstracts from mechanisms leading to common productivity growth across sectors, this normalization ensures comparability between the data and the model.

but understates the growth rate of services value added, particularly in less densely populated cities.

Finally, the model also captures the role of firm size in shaping the urban bias. As in the data (Figure 3), Figure B.7 demonstrates that in the model, large firms account for nearly all of the urban bias in structural change.[26]

5.2 The interaction of tradable and local services in explaining UBSC

To account for the rapid structural change in France between 1995 and 2018—a 13 percentage point decline in the manufacturing value added share and 9 percentage point rise in the tradable services share—the model suggests that, over the same period, manufacturing and tradable services TFP grew 66% and 115% faster than local services TFP. In this section, we isolate the effects of this differential sectoral productivity growth across cities and the mechanisms through which it operates. Starting from the model's 1995 equilibrium, we introduce only the estimated differential TFP growth across sectors and compute the resulting counterfactual equilibrium. We then compare this counterfactual economy to the 1995 benchmark to assess how sectoral productivity growth alone shapes spatial patterns of structural change, wages, and house prices.

Structural change. Figure 7a shows that sectoral TFP growth alone produces a 13 percentage point decline in the manufacturing value added share, which is mirrored by a 9 percentage point and 4 percentage point increase in the tradable and local services shares.

Underlying these aggregate patterns, there is an urban bias in sectoral value added growth. Figure 7b plots the gap in value added growth rates between the services sectors and the manufacturing sector. Given the measured TFP growth between 1995 and 2018, both services sectors grow over 100 percentage points faster than manufacturing in the densest cities. In the smallest cities, this difference is much smaller—both service sectors grew about 25 percentage points faster than manufacturing.

Local house prices and wages. Consistent with the facts presented in Section 2.2, Figure 7c shows that house prices in the densest cities rise sharply—by 85 percentage points, compared to the 101 percentage point increase in the data. House price increases are more modest in less dense locations.

At the same time, Figure 7d shows that the urban nominal wage premium flattens, again mirroring the data patterns discussed earlier. The wage premium of the densest cities decrease by about 1.5 percentage points relative to the least densely populated

[26] As Figure B.7 shows, the contribution of large firms to the gap in value added growth between tradable services and manufacturing is negative in smaller cities. This reflects the fact that the model produces lower value added growth in tradable services relative to manufacturing overall.

cities.

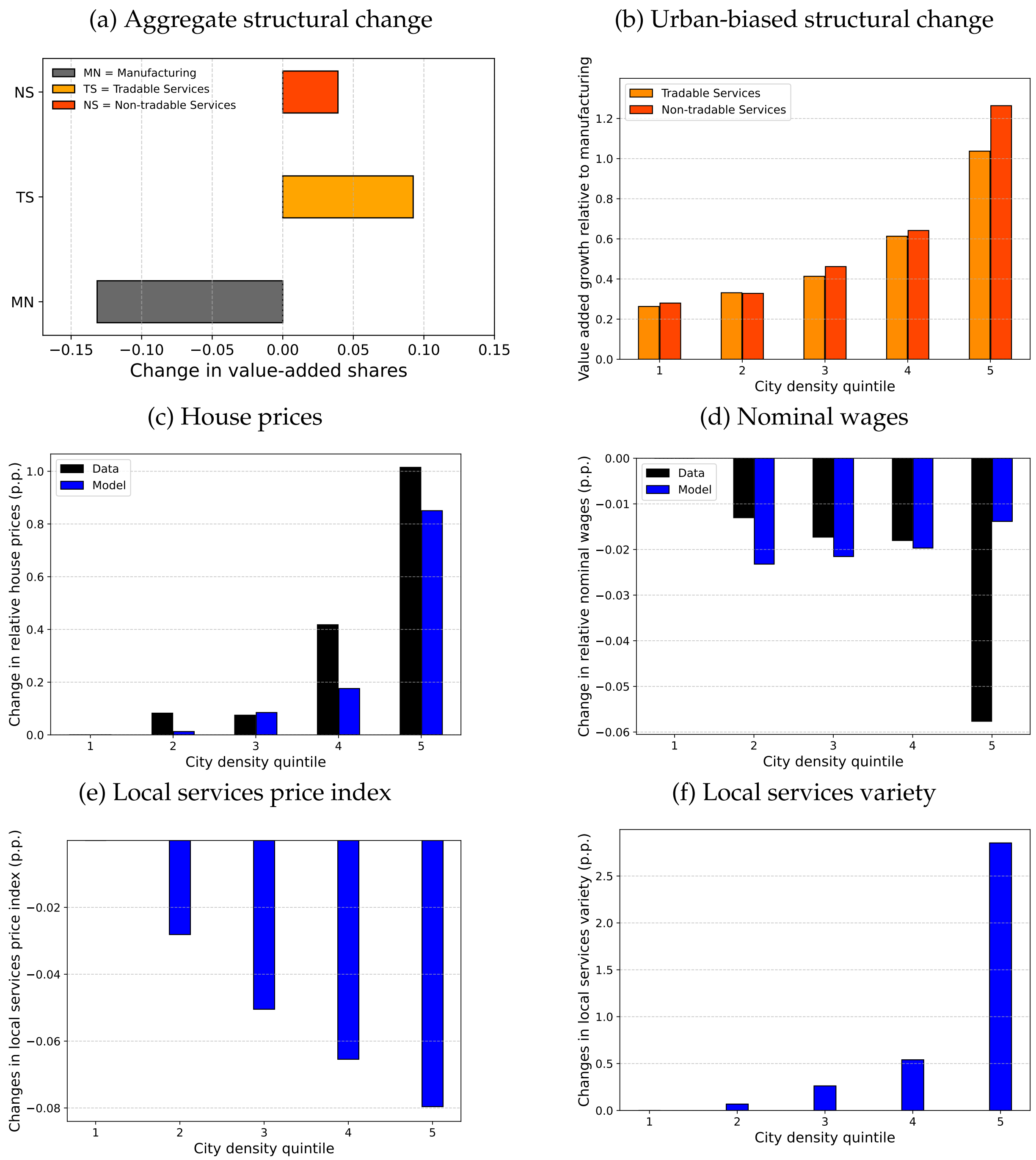


Figure 7: Effects of sectoral TFP growth

Notes: These figures present the effects of introducing only sectoral TFP growth into the estimated model's 1995 equilibrium. City density bin 1 represents the smallest cities and bin 5 the largest cities.

Local services varieties and local price indices. The model reconciles the coexistence of urban-biased structural change, rising urban house prices, and a flattening urban nominal wage premium through a decline in the local services price index in dense cities—driven by an expansion in the variety of local services available. Figure 7e shows that the local services price index falls by about 8 percentage points relative to less dense

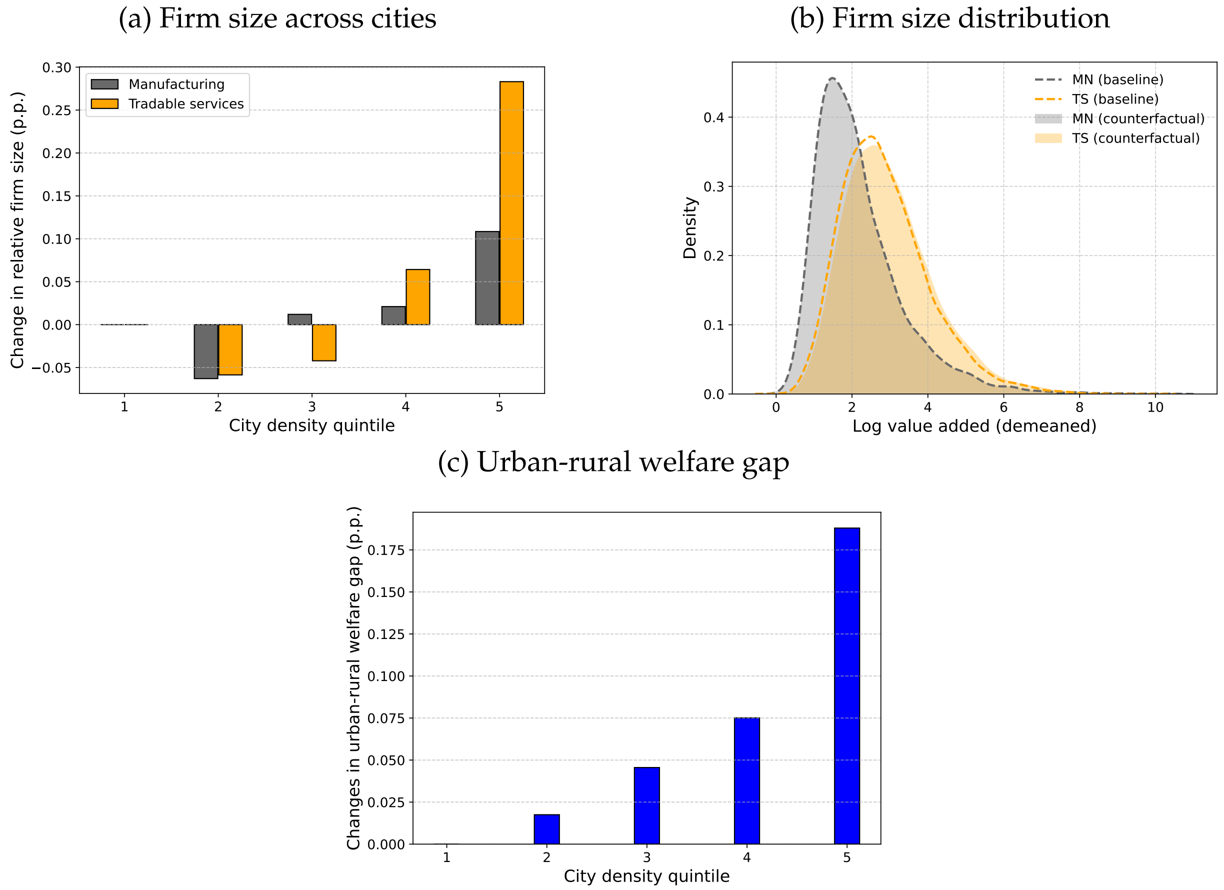


Figure 8: Effects of sectoral TFP growth on firm size and welfare

Notes: These figures present the effects of introducing only sectoral TFP growth into the estimated model's 1995 equilibrium. City density bin 1 represents the smallest cities and bin 5 the largest cities. In panel (c), the change in urban-rural welfare gap is computed as the percentage point change in the ratio of urban and rural welfare.

locations, while Figure 7f shows a sharp increase in local services varieties in dense areas. This increase in variety arises from greater demand for local services, both from incumbent residents and from the inflow of workers attracted by expanding tradable services firms. As these firms grow, they boost local incomes and employment, which in turn stimulate demand for local services, reinforcing the expansion of variety and the relative decline in local variety-adjusted prices.

Firm size distribution. Rising urban density disproportionately benefits large firms in tradable services. Unlike manufacturing firms, their production costs are much less sensitive to local house prices and they gain more from agglomeration externalities. Consequently, these firms expand substantially in the densest cities, increasing their average size by about 28 percentage points relative to tradable services firms in the least dense locations (Figure 8a). By contrast, the size increase among urban manufacturing firms is much more modest, reflecting the sector's greater sensitivity to local house price increases and weaker agglomeration benefits.

Because the largest tradable services firms are concentrated in dense cities, this urban expansion also widens the firm-size distribution within the sector. Figure 8b shows that the distribution of log value added in tradable services develops a noticeably fatter right tail in the counterfactual economy—the interquartile range of log value added rises by 4.5 points, and the 90–50 and 95–90 differences increase by 4.8 and 4.6 points—whereas the corresponding distribution for manufacturing remains largely unchanged.

Urban-rural welfare gap. Despite the decline in urban nominal wage premium and the increase in urban house prices, welfare improves by about 18 percentage points more in the densest cities than in the least dense ones (Figure 8c).[27] Structural change—driven by rapid technological progress in tradable services—raises demand for urban local services, which in turn expands varieties and lowers the local price index. Consequently, the gap between nominal wages and house prices becomes less informative about welfare differences across space, as they do not capture changes in local services price indices. Indeed, the model indicates that a simple comparison between nominal wage growth and house price growth would suggest the opposite—that the urban-rural welfare disparity has narrowed.

5.2.1 Complementarity between local services variety and tradable services growth

To further highlight the key role played by local services variety in explaining these patterns, in this section we present results from an alternative quantification exercise where we dial down the love-of-variety channel for local services by setting $\lambda = 1$, implying that only the number of local services varieties per capita enters price indices. We then re-calibrate the remaining model parameters to match the 1995 economy and introduce only the differential TFP growth of the same magnitude—a 66% and 115% growth in manufacturing and tradable services relative to local services.

Figure B.2 compares structural change, house prices, and nominal wages in this economy with weak love of variety to our baseline. Aggregate structural change slows appreciably, reflected in a smaller decline (3 percentage points) in the manufacturing value added share and a correspondingly smaller rise in the tradable services share. The urban bias in structural transformation also becomes more muted: dense cities experience a narrower gap in value added growth between services and manufacturing, especially in tradable services, which exhibit the largest TFP gains.

House price growth is weaker, but the urban nominal wage premium increases sharply—opposite to what the data show. The reason is that, with little love of variety, the local services price index rises in dense cities rather than falling. As a result,

[27] With linearly homogeneous utility, as we model it, proportional changes in utility provide a meaningful money-metric measure of welfare changes: they can be interpreted as equivalent variations expressed as a fraction of baseline income.

the expansion of local services can no longer counteract the wage pressures induced by higher housing demand. The smaller increase in house prices softens the burden on housing-intensive manufacturing firms, yet the larger urban wage response constrains the expansion of tradable services firms. Consequently, manufacturing firm size rises markedly in dense cities relative to smaller cities, while the increase in tradable services firm size is much more contained: 12 percentage points versus 28 percentage points in the baseline. The resulting change in welfare disparities is also more modest: welfare rises by only 5 percentage points in the densest cities relative to the least dense, compared to 20 percentage points in the baseline.

Taken together, these results point to growth in local services variety playing a central role in enabling tradable services to expand in response to rapid sector-specific TFP gains and in generating the observed urban–rural divergence in wages, prices, and welfare.

5.3 Other determinants of UBSC

Beyond endogenous changes in local services variety, our model features several channels that can amplify or dampen the urban-biased structural change and the associated dynamics in house prices and wages predicted by the main mechanism we have highlighted: large-firm-biased agglomeration effects, worker mobility costs, housing supply elasticities, and housing sector TFP growth. We briefly discuss their roles here; Appendix B.3 provides more detailed analyses.

Large-firm-biased agglomeration externalities. In the baseline model, more productive firms endogenously sort into dense cities because they benefit more from agglomeration externalities. In Appendix B.3.3, we examine how sectoral TFP growth affects city-level outcomes when this large-firm bias is removed. Specifically, we repeat the quantitative exercise from Section 5.2 but freeze the disproportionate agglomeration externalities accruing to large firms at 1995 levels. Without the expansion of large incumbent firms, tradable services productivity growth instead attracts smaller, less productive firms into dense cities. This dampens both aggregate and urban-biased structural change and leads to smaller increases in urban house prices and a more modest expansion of urban local services varieties relative to the baseline.

Worker mobility costs. In the baseline calibration, we set the Fréchet shape parameter governing idiosyncratic worker location preferences, ξ, to 7, guided by estimates for France (Zerecero, 2021). This parameter determines the dispersion of preference draws and hence the degree of imperfect mobility across cities; greater dispersion (lower ξ) reflects higher mobility costs. In Appendix B.3.1, we consider alternative values of ξ between 1 and 5, consistent with evidence in Artuç, Chaudhuri, and McLaren (2010), Bryan and Morten (2019), and Morten and Oliveira (2024). For each value, we recalibrate the model to match the 1995 economy—changing only ξ—and repeat the quantitative exercise from Section 5.2. Higher labor mobility costs dampen the urban bias while higher mobility costs amplify it. However, across this range, the expansion in local services variety and its restraining effect on wage growth remain key determinants of tradable services growth in dense cities in response to productivity growth in that sector.

Housing supply elasticities. In the baseline calibration of our model, we set the labor output elasticity in housing production, δ, to 0.60, informed by Combes et al. (2021). This corresponds to a housing supply elasticity of 1.5, well within the range estimated for US cities (Saiz, 2010). To assess sensitivity, we consider alternative values of δ chosen to match the housing supply elasticities of New York (0.76) and Atlanta (2.55) reported in Table VI of Saiz (2010). These correspond to $\delta = 0.43$ and $\delta = 0.72$, respectively. We recalibrate the model to match the 1995 economy under each value and repeat the quantitative exercise from Section 5.2. A lower housing supply elasticity dampens the urban bias while a higher elasticity amplifies it. Across these values, the expansion in local services variety in response to tradable services productivity growth remains a key enabler of urban biased structural change.

Local housing sector TFP growth. Section 4 shows that housing sector productivity in the densest cities relative to the least dense locations changed little between 1995 and 2018. However, in mid-tier cities—particularly density bins 2 and 4—the housing sector became relatively less productive (Figure B.1a). In Appendix B.3.4, we assess the effects of this decline by introducing only this change into the model's baseline 1995 equilibrium. The decline in mid-tier housing productivity pushes economic activity toward the least dense and densest cities, reducing welfare in mid-tier cities. Rising house prices affect manufacturing firms most and contribute meaningfully to aggregate structural change, though they do not affect the urban bias.

5.4 Policy counterfactuals

Regional disparities have long been central to policy debates. Rather than narrowing these gaps, recent technical change has led to further regional divergence—as evidenced by the biased structural change we document for France. At the same time, cost-of-living pressures in large cities—particularly housing affordability—have also become a central policy concern.

Our findings highlight the central role of house prices in limiting firm expansion in dense cities and the role of local services in facilitating tradable services growth in those cities. This suggests that administrative hurdles to restricting firm entry or home construction may be important in determining urban dynamics in services growth, wages, and house prices. In this section, we conduct two counterfactual simulations that we interpret as reductions in red tape for establishing new local services firms or for building new houses.

Reducing entry costs for local services. Existing evidence suggests that red tape significantly raises entry costs, reducing firm entry and growth (Djankov et al., 2002; Klapper et al., 2006). In France, various policies introduced over the past two decades aimed to simplify the process for starting a new firm.[28] While these policies apply to all firms, they disproportionately reduce entry costs for smaller businesses, typically in local services such as restaurants. When we calibrate entry costs in local services to match average firm sizes across cities, we infer 17% higher entry costs in the densest cities than in the least dense locations. In our first counterfactual exercise, we consider the effects of equalizing entry costs across all cities at the level prevailing in the least dense cities; for the densest cities, this represents a 17% decrease in entry costs.

Results are shown in Figure B.3. Reducing local services entry costs—particularly in dense cities —increases local services variety disproportionately in those locations and reduces local services price indices. The expansion of local services in dense cities leads to growth in manufacturing and tradable services value added there, but at the expense of less densely populated locations. Urban house prices rise while urban nominal wages fall. Nevertheless, the urban-rural welfare gap widens by about 3 percentage points.

Boosting local housing sector productivity in dense cities. Recent evidence suggests that productivity growth in the US construction industry has slowed considerably in the few decades, with regulations playing a potentially important role (Goolsbee and Syverson, 2023; D'Amico et al., 2024). In France, several policies have been implemented with the aim of boosting new housing construction.[29] Our second counterfactual experiment considers the effects of a 10% improving in the housing sector productivity in the densest French cities (city density bin 5).

Results are shown in Figure B.4. The productivity improvement reduces house prices in the densest cities. Lower house prices reallocate economic activity toward the densest cities: value added grows across all sectors there but declines in other loca-

[28]"Choc de simplification" was launched in 2013 to simplify interactions between citizens, businesses, and public administration through hundreds of measures. In 2019, "Loi PACTE" (Plan d'Action pour la Croissance et la Transformation des Entreprises) provided the legal basis for a single electronic portal for business formalities, which became "guichet unique" in 2023. These policies simplify form-filling and replace various centres de formalités des entreprises" with a single online portal, easing formalities for opening or closing businesses ("Cerfa" forms).

[29]For example, "Loi ELAN" (Évolution du Logement, de l'Aménagement et du Numérique) was enacted in 2018 to simplify urban-planning procedures to facilitate and accelerate the construction of housing. French housing policy debate has also revolved around the concept of "Choc de l'offre", which calls for increased housing construction in major French cities.

tions. Urban local services variety expands and urban nominal wages decline. Overall, urban housing productivity improvements widen the urban-rural welfare gap by also about 3 percentage points.

6 Conclusion

This paper examines how structural transformation shapes spatial disparities in wages, house prices, and welfare. Using detailed French micro-data from 1995 to 2018 and a quantitative spatial equilibrium model, we document that structural change has been strongly urban-biased, with dense cities experiencing faster shifts toward services than suburban or rural areas. Over this period, urban house prices surged while nominal wage premia flattened, raising the puzzle of how larger tradable services firms expanded in increasingly expensive cities despite seemingly stagnant real wages.

Our framework highlights the critical role of large tradable services firms and non-tradable local services in reconciling these patterns. Productivity growth in tradable services raises urban wages and house prices, spurring demand-driven expansion in local services varieties. This expansion improves urban amenities, moderating the wage increases necessary to compensate workers for higher housing costs and enabling tradable services to exploit agglomeration economies in dense cities. This mechanism implies that structural transformation has widened urban-rural welfare gaps more than conventional statistics on nominal wages or house prices would suggest.

Entry barriers in local services, such as regulatory red tape, may constrain not only local services themselves but also the growth of highly productive tradable services firms that drive urban economic dynamism. Our simulations show that reducing entry costs for local services in dense cities amplifies their amenity advantages and attracts more tradable services activity, but reallocates economic activity away from rural and suburban locations toward dense cities. Boosting housing supply in dense cities similarly widens spatial welfare disparities.

The patterns we document for France parallel developments in the United States, where tradable services growth has driven spatial wage divergence even as house prices in productive cities have surged faster still, suggesting that the amenity channel we identify may be a general feature of structural transformation in service-oriented economies.

References

Aiba, I. and A. Yamagishi (2025). Urbanization without Industrialization: Evidence from US Bases in Okinawa. Working Paper, University of Tokyo.

Artuç, E., S. Chaudhuri, and J. McLaren (2010). Trade Shocks and Labor Adjustment: A Structural Empirical Approach. *American Economic Review 100*(3), 1008–1045.

Baum-Snow, N. and G. Duranton (2025). Housing Supply and Housing Affordability. Working Paper 33694, National Bureau of Economic Research.

Behrens, K., G. Duranton, and F. Robert-Nicoud (2014). Productive Cities: Sorting, Selection, and Agglomeration. *Journal of Political Economy 122*(3), 507–553.

Boppart, T. (2014). Structural Change and the Kaldor Facts in a Growth Model With Relative Price Effects and Non-Gorman Preferences. *Econometrica 82*(6), 2167–2199.

Bryan, G. and M. Morten (2019). The Aggregate Productivity Effects of Internal Migration: Evidence from Indonesia. *Journal of Political Economy 127*(5), 2229–2268.

Coeurdacier, N., F. Oswald, and M. Teignier (2022). Structural Change, Land Use and Urban Expansion. Discussion Paper 17014, CEPR.

Combes, P., G. Duranton, and L. Gobillon (2021). The Production Function for Housing: Evidence from France. *Journal of Political Economy 129*(10), 2766–2816.

Combes, P.-P., G. Duranton, L. Gobillon, D. Puga, and S. Roux (2012). The Productivity Advantages of Large Cities: Distinguishing Agglomeration from Firm Selection. *Econometrica 80*(6), 2543–2594.

Comin, D., D. Lashkari, and M. Mestieri (2021). Structural Change with Long-Run Income and Price Effects. *Econometrica 89*(1), 311–374.

Couture, V. (2016). Valuing the Consumption Benefits of Urban Density. Working paper.

D'Amico, L., E. L. Glaeser, J. Gyourko, W. R. Kerr, and G. A. M. Ponzetto (2024). Why Has Construction Productivity Stagnated? The Role of Land-Use Regulation. Working Paper 33188, National Bureau of Economic Research.

Dauth, W., S. Findeisen, E. Moretti, and J. Suedekum (2022). Matching in Cities. *Journal of the European Economic Association 20*(4), 1478–1521.

Desmet, K. and E. Rossi-Hansberg (2014). Spatial Development. *American Economic Review 104*(4), 1211–1243.

Diamond, R. (2016). The Determinants and Welfare Implications of US Workers' Diverging Location Choices by Skill: 1980–2000. *American Economic Review 106*(3), 479–524.

Djankov, S., R. La Porta, F. Lopez-de-Silanes, and A. Shleifer (2002). The Regulation of Entry. *Quarterly Journal of Economics 117*(1), 1–37.

Duernecker, G., B. Herrendorf, and A. Valentinyi (2024). Structural Change Within the Services Sector and the Future of Cost Disease. *Journal of the European Economic Association 22*(1), 428–473.

Duranton, G. and D. Puga (2020). The Economics of Density. *Journal of Economic Perspec-*

tives 34(3), 3–26.

Eckert, F. (2019). Growing Apart: Tradable Services and the Fragmentation of the U.S. Economy. Working Paper, Yale University.

Eckert, F., S. Ganapati, and C. Walsh (2025). Urban-Biased Growth: A Macroeconomic Analysis. Working Paper 30515, National Bureau of Economic Research.

Eckert, F. and M. Peters (2025). Spatial Structural Change. Working Paper 30489, National Bureau of Economic Research.

Fajgelbaum, P. and S. Redding (2022). Trade, Structural Transformation and Development: Evidence from Argentina 1869–1914. *Journal of Political Economy 130*(5), 1249–1318.

Fan, T., M. Peters, and F. Zilibotti (2023). Growing Like India—the Unequal Effects of Service-Led Growth. *Econometrica 91*(4), 1457–1494.

Garriga, C., A. Hedlund, Y. Tang, and P. Wang (2023). Rural-Urban Migration, Structural Transformation, and Housing Markets in China. *American Economic Journal: Macroeconomics 15*(2), 413–440.

Gaubert, C. (2018). Firm Sorting and Agglomeration. *American Economic Review 108*(11), 3117–3153.

Giannone, E. (2022). Skilled-biased Technical Change and Regional Convergence. Working Paper, CREI.

Glaeser, E. L. (2005). Urban Colossus: Why Is New York America's Largest City? Technical Report 2, Federal Reserve Bank of New York.

Glaeser, E. L., J. Kolko, and A. Saiz (2001). Consumer City. *Journal of Economic Geography 1*(1), 27–50.

Goolsbee, A. and C. Syverson (2023). The Strange and Awful Path of Productivity in the U.S. Construction Sector. Working Paper 30845, National Bureau of Economic Research.

Gyourko, J., C. Mayer, and T. Sinai (2013). Superstar Cities. *American Economic Journal: Economic Policy 5*(4), 167–199.

Handbury, J. and D. E. Weinstein (2015). Goods Prices and Availability in Cities. *Review of Economic Studies 82*(1), 258–296.

Hanlon, W. W. (2020). Coal Smoke, City Growth, and the Costs of the Industrial Revolution. *Economic Journal 130*(626), 462–501.

Heblich, S. H., A. Trew, and Y. Zylberberg (2021). East Side Story: Historical Pollution and Persistent Neighborhood Sorting. *Journal of Political Economy 129*(5), 1508–1552.

Herrendorf, B., R. Rogerson, and A. Valentinyi (2014). Growth and Structural Transformation. In P. Aghion and S. Durlauf (Eds.), *Handbook of Economic Growth*, Volume 2, pp. 855–941. Amsterdam: Elsevier.

Hottman, C. (2021). Retail Markups, Misallocation, and Store Variety in the US. Working Paper, Board of Governors of the Federal Reserve System.

Hsieh, C.-T. and E. Rossi-Hansberg (2023). The Industrial Revolution in Services. *Journal of*

Political Economy Macroeconomics 1(1), 3–42.

International Labour Organization (2024). Employment and Wage Disparities Between Rural and Urban Areas.

Kahn, M. E. (1999). The Silver Lining of Rust Belt Manufacturing Decline. *Journal of Urban Economics 46*(3), 360–376.

Klapper, L., L. Laeven, and R. Rajan (2006). Entry Regulation as a Barrier to Entrepreneurship. *Journal of Financial Economics 82*(3), 591–629.

Kleinman, B. (2022). Wage Inequality and the Spatial Expansion of Firms. Mimeo. Unpublished manuscript.

Kongsamut, P., S. Rebelo, and D. Xie (2001). Beyond Balanced Growth. *Review of Economic Studies 68*(4), 869–882.

Levitt, S. D. (2004). Understanding why crime fell in the 1990s: Four factors that explain the decline and six that do not. *Journal of Economic Perspectives 18*(1), 163–190.

Lewis, L., R. Monarch, M. Sposi, and J. Zhang (2022). Structural Change and Global Trade. *Journal of the European Economic Association 20*(1), 476–512.

Martin, R., B. Gardiner, and P. Tyler (2003). The Changing Spatial Distribution of Employment in London. Technical report, London, UK. Greater London Authority (GLA) Economics Report.

Moretti, E. (2012). *The New Geography of Jobs*. Boston: Houghton Mifflin Harcourt.

Morten, M. and J. Oliveira (2024). The Effects of Roads on Trade and Migration: Evidence from a Planned Capital City. *American Economic Journal: Applied Economics 16*(2), 389–421.

Nagy, D. K. (2023). Hinterlands, City Formation and Growth: Evidence from the American Frontier. *Review of Economic Studies 90*(6), 3238–3284.

Ngai, L. R. and C. Pissarides (2007). Structural Change in a Multisector Model of Growth. *American Economic Review 97*(1), 429–443.

Pijoan-Mas, J. and T. Budí-Ors (2025). Macroeconomic Development, Rural Exodus, and Uneven Industrialization. Working Paper 013, Structural Transformation and Economic Growth (CEPR).

Saiz, A. (2010). The Geographic Determinants of Housing Supply. *Quarterly Journal of Economics 125*(3), 1253–1296.

Schiff, N. (2015). Cities and Product Variety: Evidence from Restaurants. *Journal of Economic Geography 15*(6), 1085–1123.

Su, Y. (2022). Measuring the Value of Urban Consumption Amenities: A Time-Use Approach. *Journal of Urban Economics 132*, 103495.

Weber, B. and A. Tickamyer (2020). Many Rural Americans Are Still "Left Behind". *Fast Focus* No. 44-2020. Institute for Research on Poverty, University of Wisconsin–Madison.

Zerecero, M. (2021). The Birthplace Premium. Working Paper, UC Irvine.

Online Appendix

Urban-Biased Structural Change

Natalie Chen[1], Dennis Novy[1], Carlo Perroni[1], Horng Chern Wong[2]

[1]University of Warwick
[2]Stockholm University

Email: n.a.chen@warwick.ac.uk, d.novy@warwick.ac.uk, c.perroni@warwick.ac.uk, horngchernwong@gmail.com

A Data Appendix

A.1 Additional tables and figures

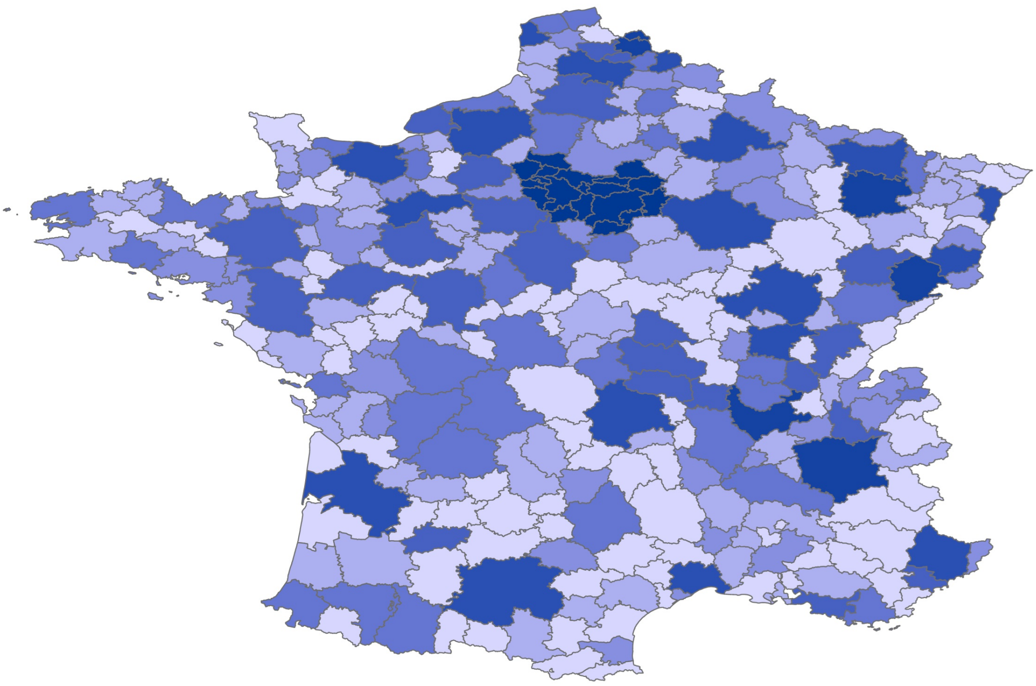


Figure A.1: Population density across French cities

Notes: The map illustrates population density in 1995 across 279 French cities (commuting zones). Population density is measured as the weighted average of commune-level densities, with weights given by population size. The darker the color, the higher population density. See Section 2 for more information.

(a) Manufacturing

(b) Tradable services

(c) Non-tradable services

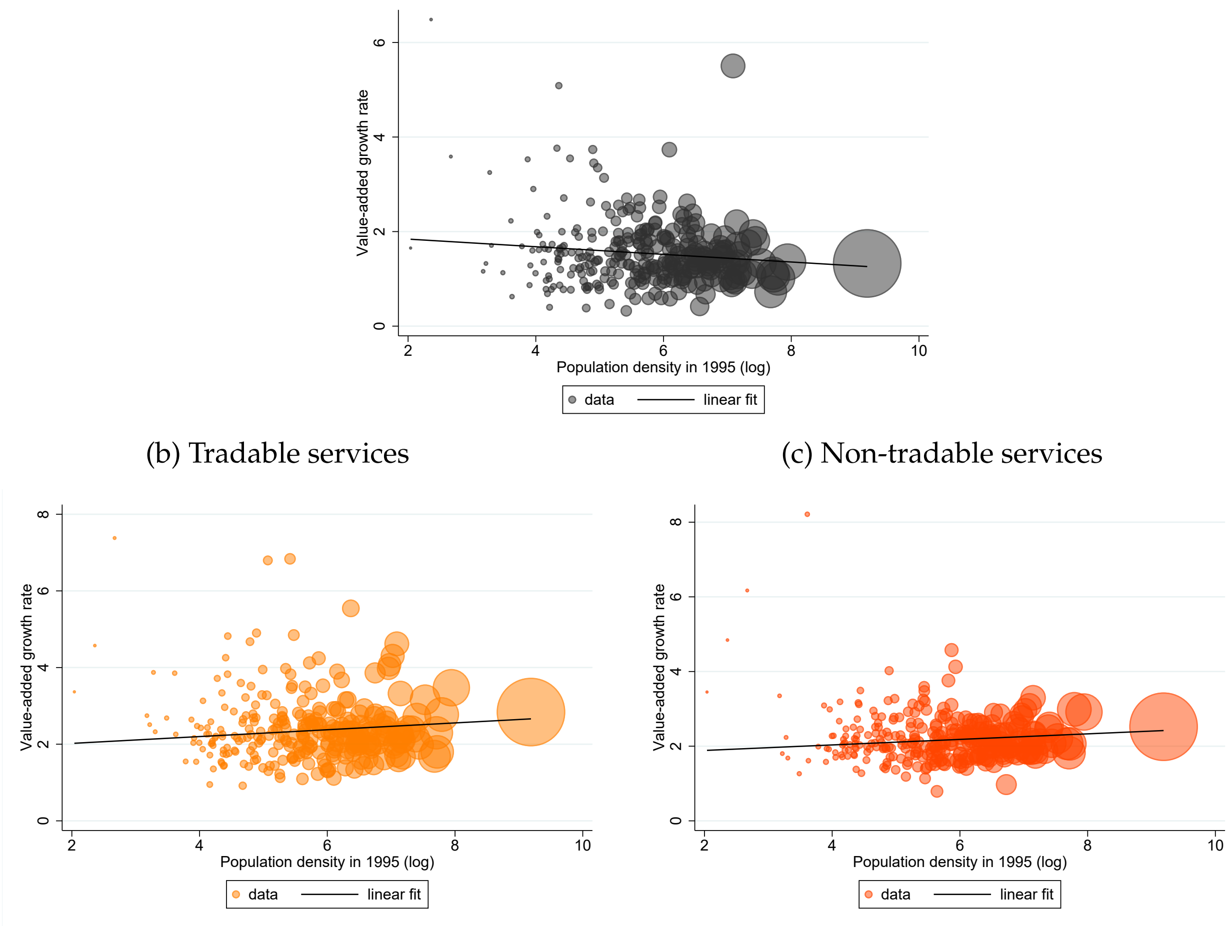


Figure A.2: City density and sectoral value added growth across French cities, excluding Île-de-France, 1995-2018

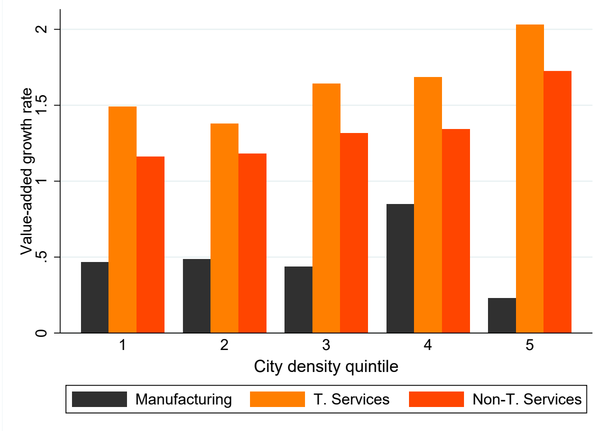
Notes: This figure plots the sectoral value added growth rates across 279 French cities (commuting zones) between 1995 and 2018, excluding Paris. The dots are proportional to city population size. The densest two cities are Lyon and Lille.

Table A.1: Descriptive statistics on establishment size

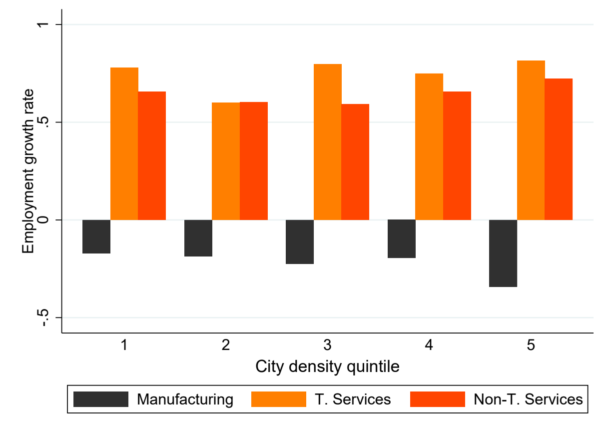
		Value added				Employment			
Sector	Year	25^{th}	50^{th}	75^{th}	95^{th}	25^{th}	50^{th}	75^{th}	95^{th}
Manufacturing	1995	68	147	450	3365	2	6	17	103
	2018	78	185	612	5581	3	7	17	96
Tradable services	1995	56	127	323	1698	2	4	10	58
	2018	66	157	414	2300	2	4	9	55
Local services	1995	40	78	162	674	1	3	7	33
	2018	49	105	244	1226	2	4	9	40

Notes: The table reports descriptive statistics on establishment size for each sector in 1995 and 2018. Value added is reported in 1000s of Euros.

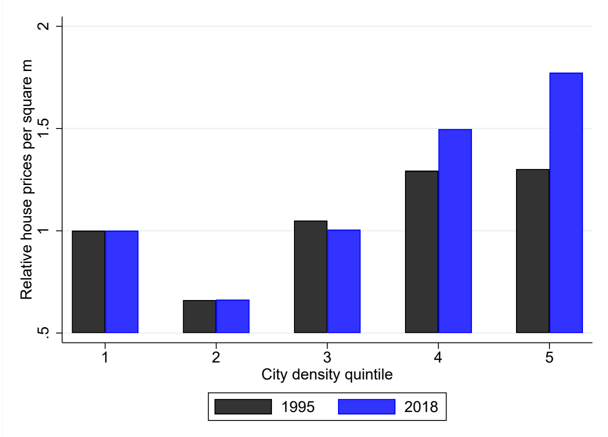
(a) Value added growth



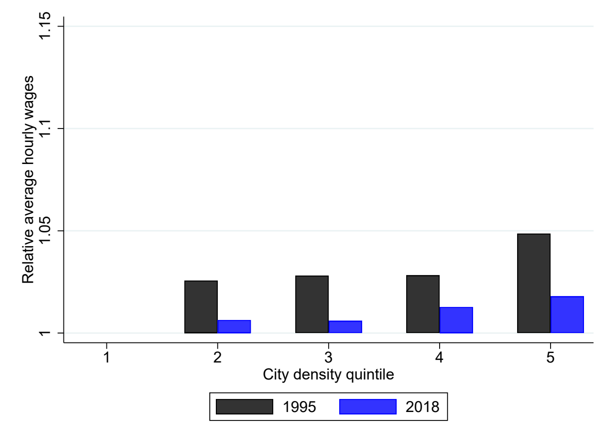
(b) Employment growth



(c) House prices



(d) Nominal wages



(e) Number of local services firms

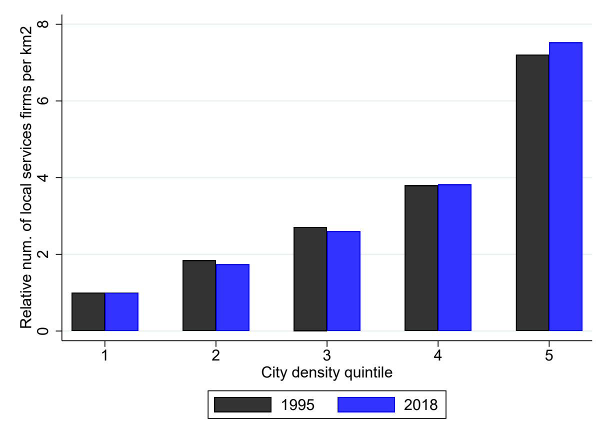
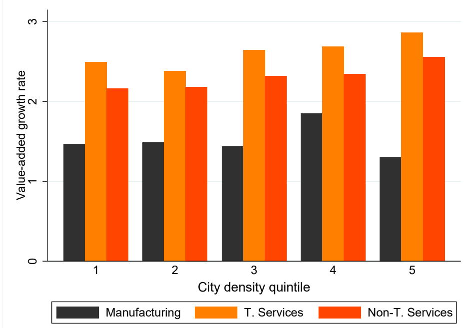


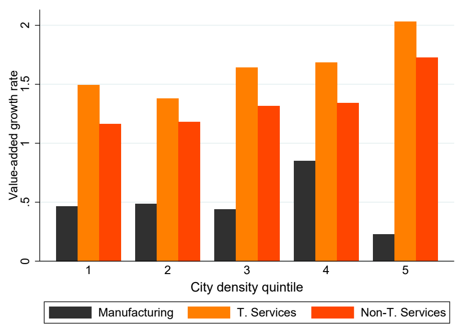
Figure A.3: Structural change patterns (excluding Île-de-France)

Notes: These figures present structural change patterns by city density bin. City density bin 1 represents the smallest cities and bin 5 the largest cities. House prices, nominal wages, and the number of local services firms per square kilometer are normalized to 1 in city bin 1.

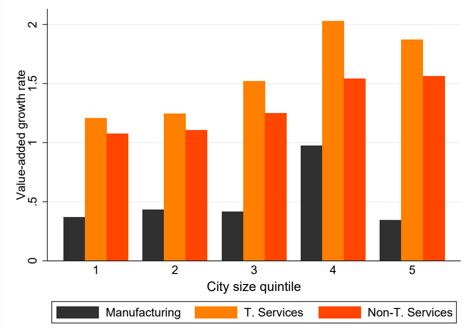
(a) Value added growth, population density



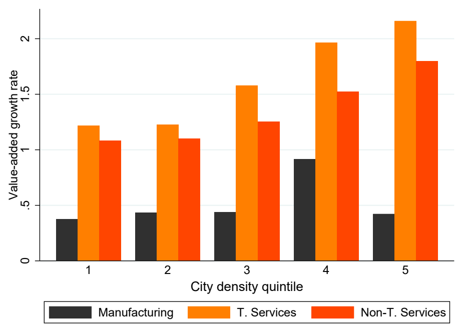
(b) Value added growth, population size



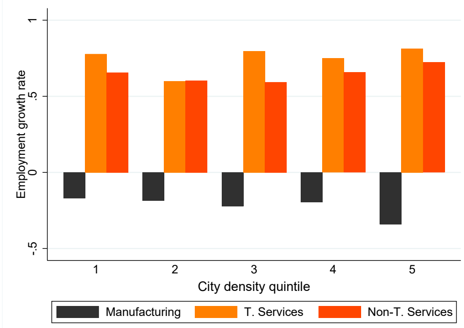
(c) Value added growth, population density (exc. Île-de-France)



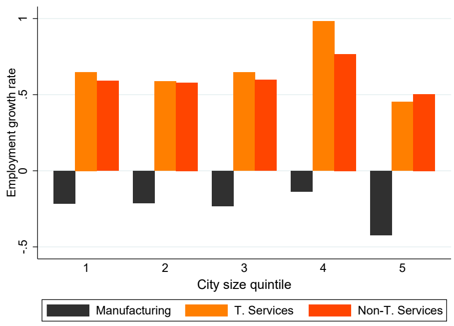
(d) Value added growth, population size (exc. Île-de-France)



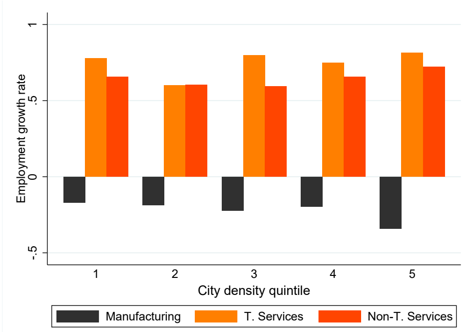
(e) Employment growth, population density



(f) Employment, population size



(g) Employment, population density (exc. Île-de-France)



(h) Employment, population size (exc. Île-de-France)

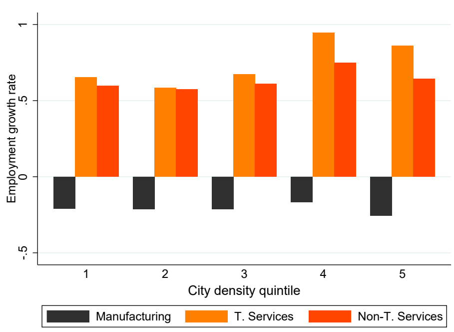


Figure A.4: Structural change patterns by city density and size

Notes: These figures present structural change patterns by city density and size bin. City density/size bin 1 represents the least dense/smallest cities and bin 5 the densest/largest cities.

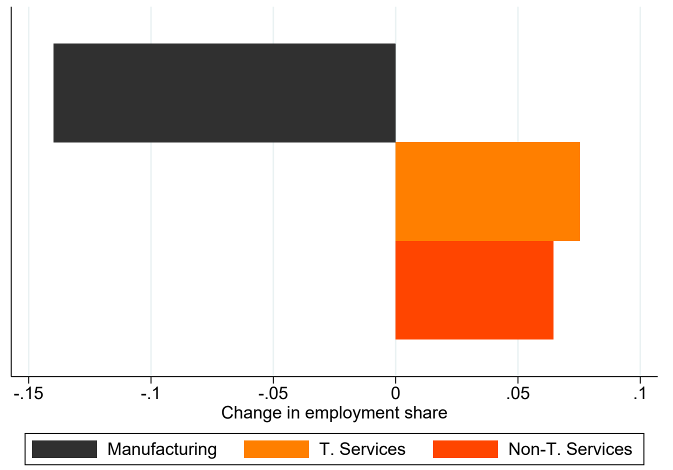
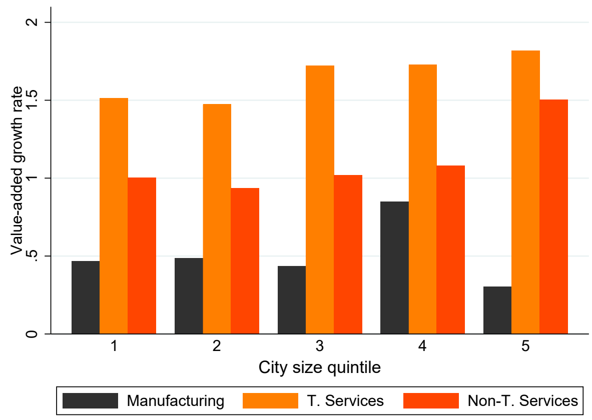


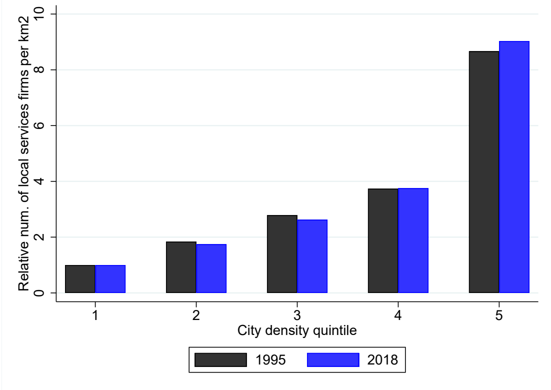
Figure A.5: Aggregate structural change (employment) in France, 1995-2018

Notes: The bars show the change in aggregate sectoral employment shares for manufacturing, tradable services, and non-tradable local services in 1995 and 2018. These changes add up to 0.

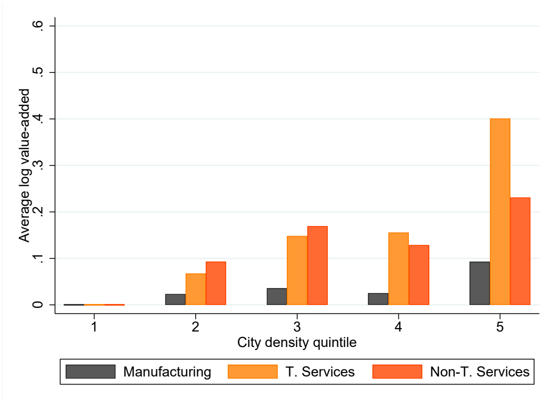
(a) Urban-biased structural change



(b) Number of local services firms



(c) Firm size by city density in 1995



(d) Firm size by city density in 2018

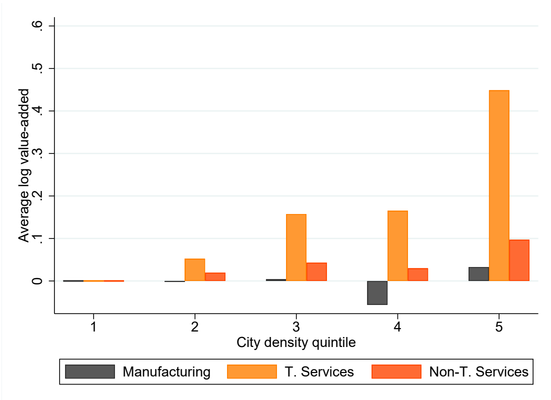


Figure A.6: Structural change patterns under an alternative definition of tradable services

Notes: These figures present structural change patterns by city density bin using an alternative definition of domestic tradability of local services: sectors with at least 10% of revenue from exports are classed as tradable; the rest as non-tradable. Under this definition, tradable services include finance and insurance, information and communications technology, professional, specialized, and technical services, administrative and support services, real estate, wholesale trade, and transportation.

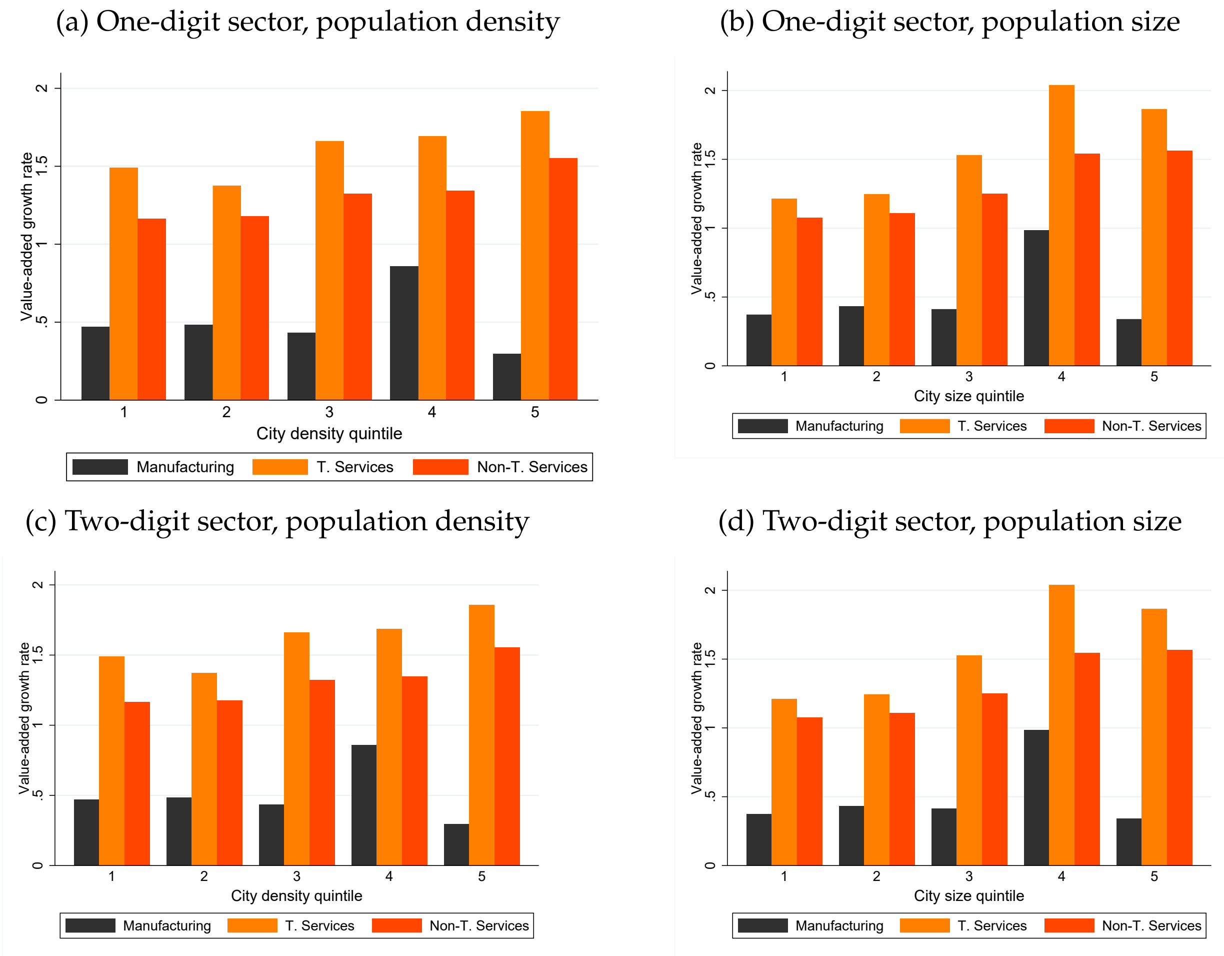


Figure A.7: Structural change patterns when we allocate firm-level value added to plants using one-digit or two-digit sector codes

Notes: These figures present structural change patterns by city population density or size bin when we allocate firm-level value added to individual plants based on their one-digit or two-digit sector classification.

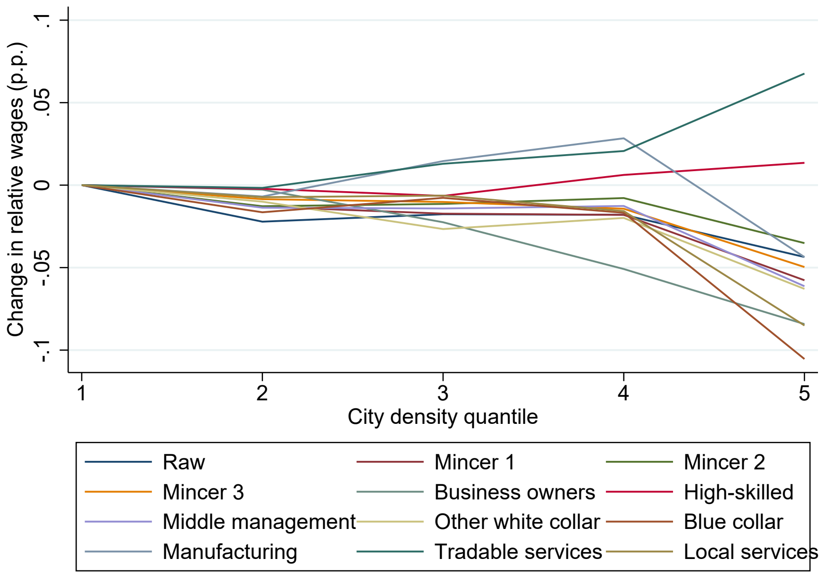


Figure A.8: Changes in the urban nominal wage premium between 1995 and 2018

Notes: This figure presents percentage point changes in relative wages in each city density bin under various measures of city-level wages. A value of -0.05 in density bin 5 indicates a 5 percentage point decrease in the average wage in the densest cities relative to the least dense cities (bin 1), i.e., a flattening of the urban nominal wage premium. 'Raw' denotes the unconditional mean wage, 'Mincer 1' controls for gender and part-time status, 'Mincer 2' further controls for two-digit occupations, 'Mincer 3' further interacts two-digit occupations with two-digit sector codes. All other lines present changes in the urban nominal wage premium by one-digit occupation or sector categories, each controlling for gender and part-time status.

B Model Appendix

B.1 Additional tables and figures

(a) Housing sector TFP (b) Exogenous amenities

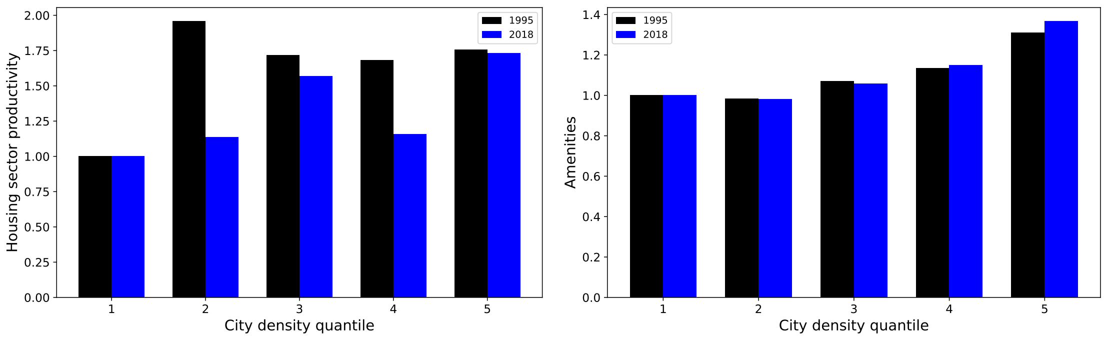


Figure B.1: Model-implied housing sector TFP and exogenous amenities

Notes: In panel (a) the bars show the model-implied housing sector TFP (relative to those in the least dense cities), $z_h(i)$, in 1995 and 2018. The horizontal axis represents city bins, with city bin 1 representing the least dense cities and bin 5 the densest cities. Panel (b) shows the corresponding patterns for exogenous amenities, $B(i)$. The vertical axis represents city bins.

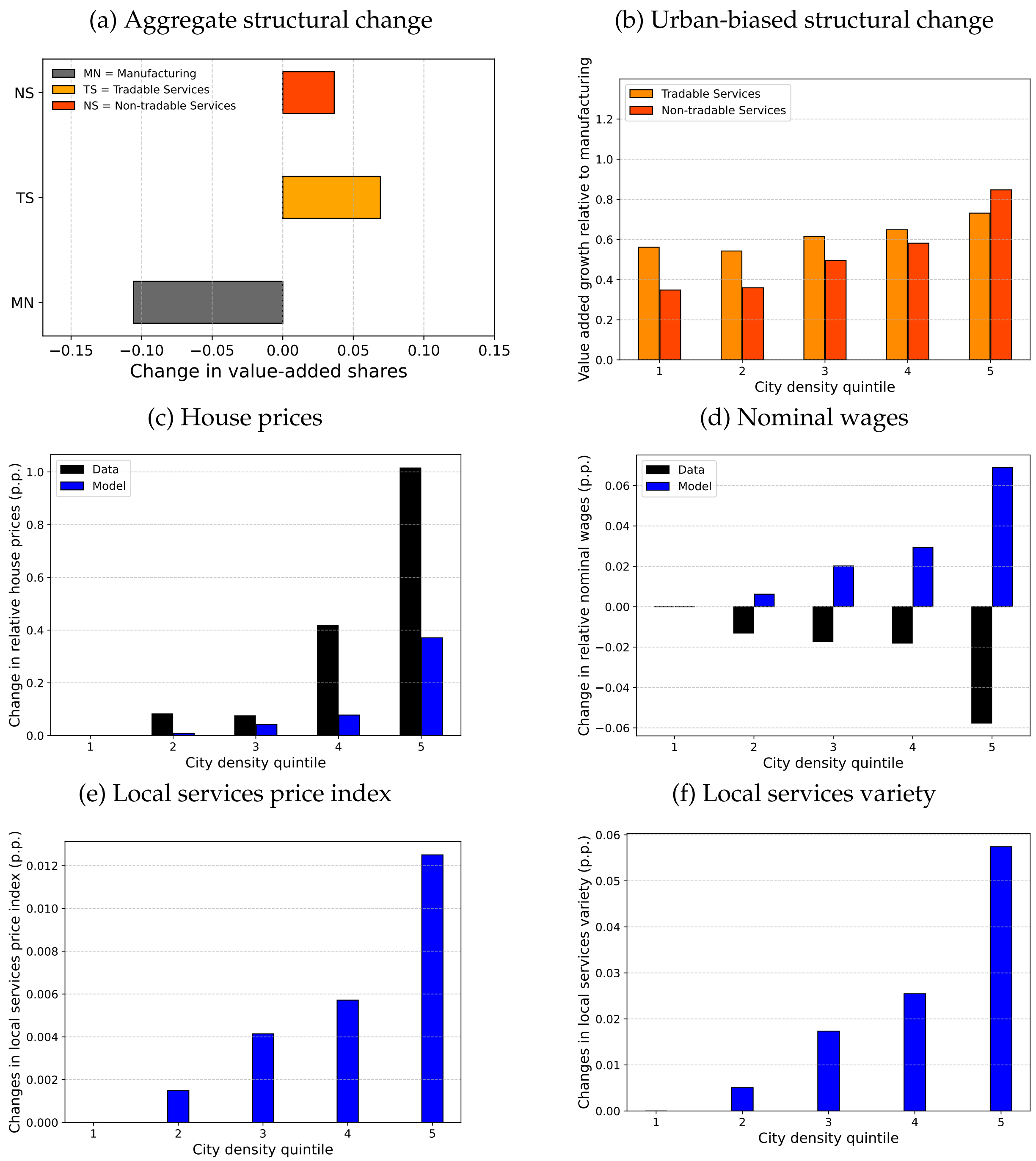


Figure B.2: Effects of sectoral TFP growth under weak love-of-variety ($\lambda = 1$)

Notes: These figures present the effects of introducing only sectoral TFP growth into the estimated model's 1995 equilibrium under weak love-of-variety ($\lambda = 1$). City density bin 1 represents the smallest cities and bin 5 the largest cities.

Table B.1: Summary of calibrated parameters

Parameter		Value	Source/target
Elasticity of substitution between local services and traded bundle	ρ	0.4	Lewis et al. (2022)
Elasticity of substitution between manufacturing and tradable services	γ	1.89	Section 4.3
Household expenditure share on non-housing-related costs	η	0.80	INSEE household expenditure survey 2013
labor output elasticity	$\alpha_m, \alpha_s, \alpha_n$	0.65, 0.66, 0.68	Median labor share
Within-sector elasticity of substitution	σ	3	Eaton, Kortum, and Kramarz (2011)
Tradable sector entry costs	f_m^e, f_s^e	4.27, 1.88	Average firm size relative to local services
Local services entry costs	$f_n^e(i)$	1.00 to 1.17	Average firm size relative to smallest cities (bin 1)
Love-of-variety	λ	0.47	See Section 4.2
Local services housing output elasticity	β_n	0.00	See Section 4.2
Housing production returns to scale	δ	0.60	Combes et al. (2021)
Dispersion of idiosyncratic worker location preferences	ξ	7	Zerecero (2021)
Preference weight on services within traded bundle	ζ	0.36	Sectoral value added in 1995
Preference weight on traded bundle	ν	0.70	Sectoral value added in 1995
Sectoral TFP in 1995	$A_m^{1995}, A_s^{1995}, A_n^{1995}$	1, 1, 1	-
Sectoral TFP in 2018	$A_m^{2018}, A_s^{2018}, A_n^{2018}$	1.66, 2.15, 1	Sectoral value added in 2018
Local housing sector TFP	$z_h(i)$	1 to 1.96	House price–density relationship in 1995 and 2018
Exogenous amenities	$B(i)$	1 to 1.37	Wage–density relationship in 1995 and 2018

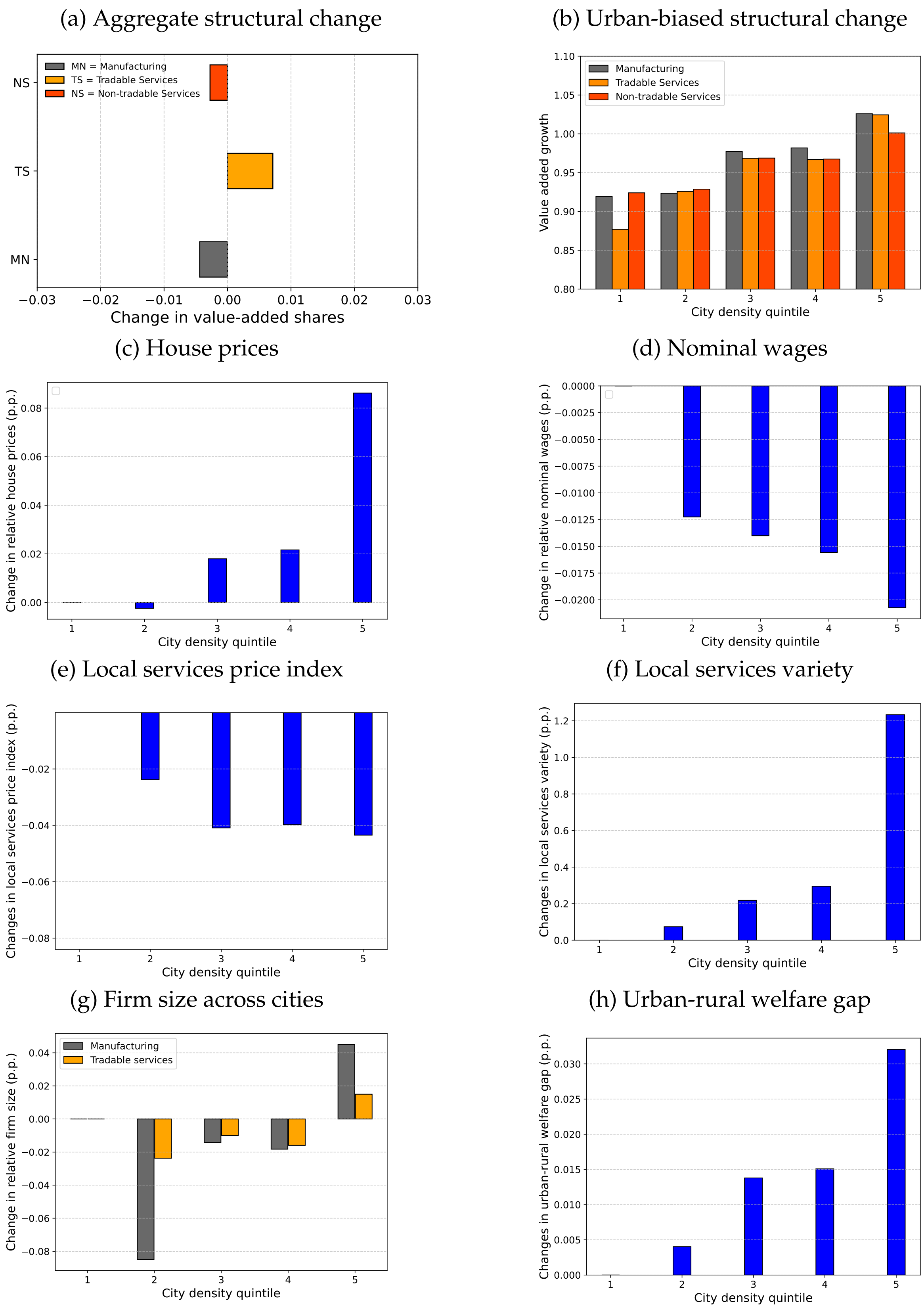
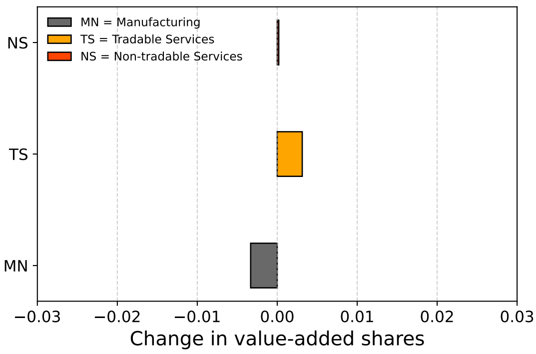


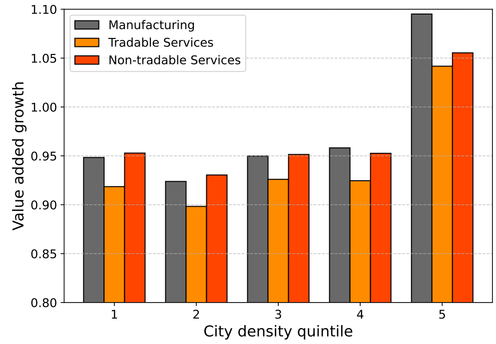
Figure B.3: Effects reducing entry costs for local services in dense cities

Notes: These figures present the effects of only reducing fixed entry costs (f_n^e) for local services to one in all cities compared to the estimated model's 1995 equilibrium in which f_n^e is 17% higher in the densest cities (bin 5) than in the least dense locations (bin 1). City density bin 1 represents the smallest cities and bin 5 the largest cities.

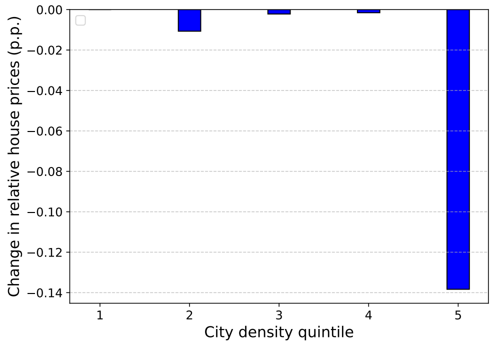
(a) Aggregate structural change



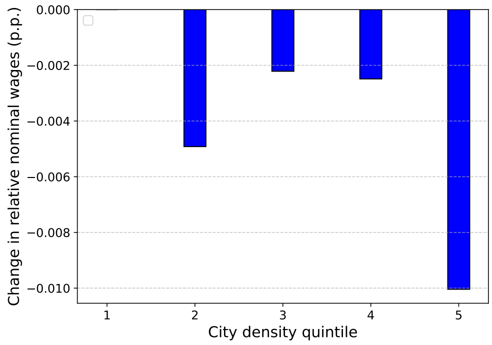
(b) Urban-biased structural change



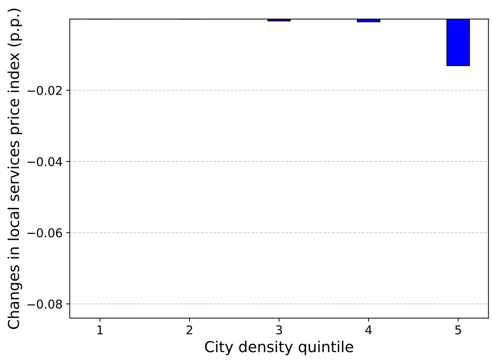
(c) House prices



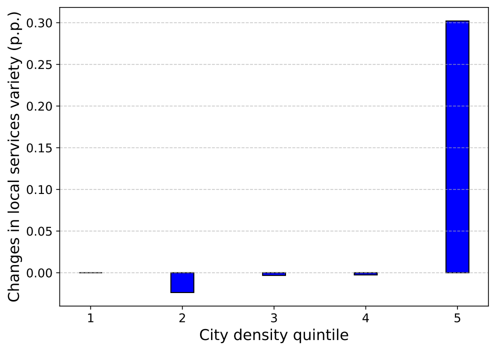
(d) Nominal wages



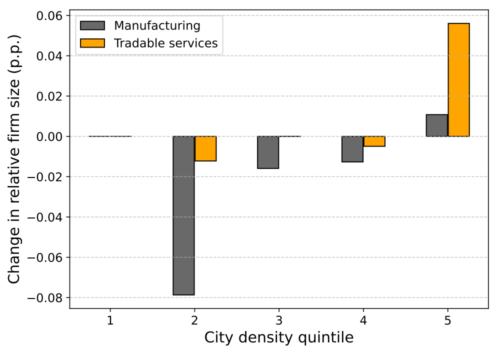
(e) Local services price index



(f) Local services variety



(g) Firm size across cities



(h) Urban-rural welfare gap

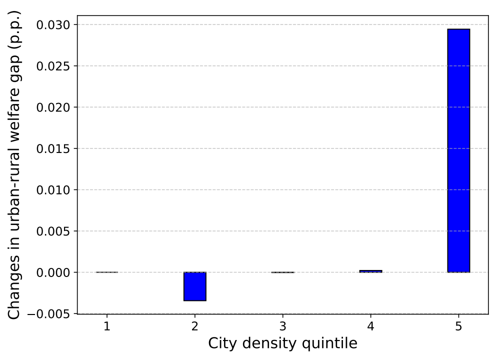


Figure B.4: Effects of increasing housing sector TFP in the densest cities

Notes: These figures present the effects of raising only local housing sector TFP in the densest cities (bin 5) by 10% compared to the estimated model's 1995 equilibrium. City density bin 1 represents the smallest cities and bin 5 the largest cities.

B.2 Model fit

B.2.1 Targeted moments

Table B.2: Model's fit to targeted moments

		1995		2018	
MOMENTS	SECTOR	DATA	MODEL	DATA	MODEL
50-10 difference of log value added	MN	1.37	1.46	1.50	1.45
	TS	1.25	1.17	1.37	1.19
75-25 difference of log value added	MN	1.88	1.90	2.04	1.93
	TS	1.52	1.56	1.60	1.62
90-50 difference of log value added	MN	2.33	2.28	2.54	2.29
	TS	1.76	1.91	1.85	1.92
90-10 difference of log value added	MN	3.70	3.73	4.03	3.74
	TS	3.01	3.08	3.22	3.11
Mean normalized value added in city bin 2	MN	0.04	0.10	0.03	0.07
	TS	0.05	0.17	0.09	0.13
Mean normalized value added in city bin 3	MN	0.11	0.08	0.10	0.05
	TS	0.11	0.24	0.19	0.24
Mean normalized value added in city bin 4	MN	0.07	0.15	0.02	0.10
	TS	0.28	0.33	0.32	0.36
Mean normalized value added in city bin 5	MN	0.23	0.10	0.07	0.11
	TS	0.60	0.55	0.69	0.63
City bin 1's share of sector value added	MN	0.19	0.25	0.18	0.33
	TS	0.08	0.06	0.07	0.05
City bin 2's share of sector value added	MN	0.18	0.21	0.18	0.21
	TS	0.09	0.10	0.09	0.09
City bin 3's share of sector value added	MN	0.19	0.24	0.18	0.11
	TS	0.13	0.15	0.13	0.09
City bin 4's share of sector value added	MN	0.16	0.17	0.20	0.24
	TS	0.24	0.25	0.23	0.23
City bin 5's share of sector value added	MN	0.29	0.14	0.26	0.11
	TS	0.46	0.43	0.48	0.53
City bin 1's share of sector value added (large firms)	MN	0.18	0.27	0.18	0.36
	TS	0.04	0.04	0.03	0.03
City bin 2's share of sector value added (large firms)	MN	0.18	0.21	0.18	0.21
	TS	0.05	0.07	0.05	0.07
City bin 3's share of sector value added (large firms)	MN	0.18	0.24	0.18	0.09
	TS	0.10	0.14	0.10	0.07
City bin 4's share of sector value added (large firms)	MN	0.16	0.16	0.21	0.25
	TS	0.24	0.26	0.20	0.23
City bin 5's share of sector value added (large firms)	MN	0.30	0.13	0.27	0.09
	TS	0.57	0.49	0.62	0.60

Notes: The table reports the model's fit to the targeted moments in the structural estimation routine in Section 4. 'MN' represents manufacturing and 'TS' represents tradable services.

B.2.2 Untargeted moments

(a) Data (b) Model

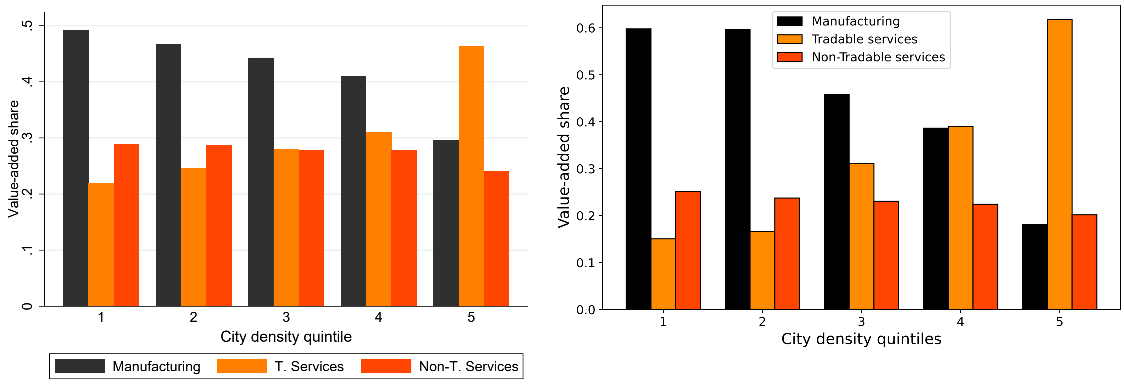


Figure B.5: Spatial distribution of value added in 1995: data vs model

Notes: In panel (a) the bars show the sectoral value added shares for manufacturing and services in 1995 in the data. The shares of the three sectors add up to 1. The horizontal axis represents city bins, with city bin 1 representing the least dense cities and bin 5 the densest cities. Panel (b) shows the corresponding patterns in the data. The vertical axis represents city bins.

(a) Data (b) Model

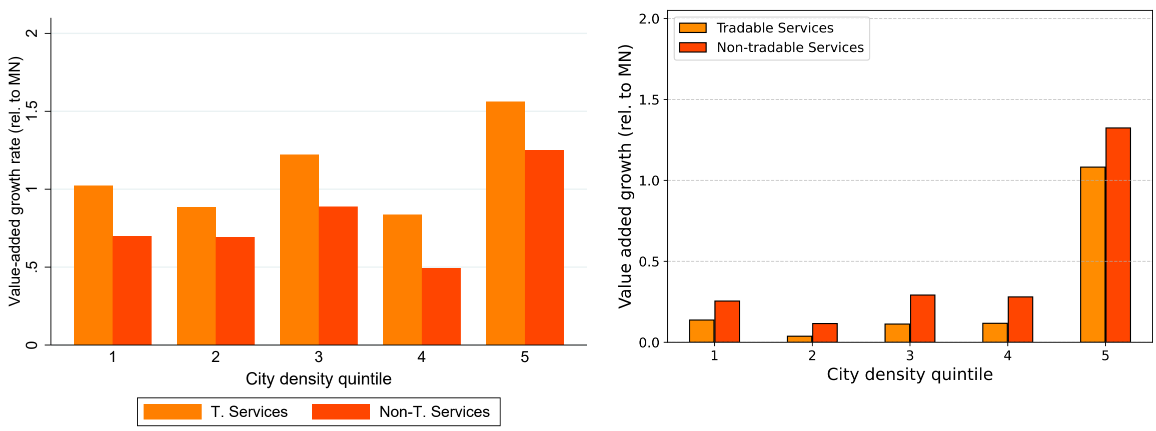


Figure B.6: Urban-biased structural change: data vs model

Notes: In panel (a) the bars show the growth rate of value added in tradable and local services relative to manufacturing in the data between 1995 and 2018. That is, $g_j^{\text{value added}} - g_{\text{manufacturing}}^{\text{value added}}$ where $j \in \{\text{tradable services}, \text{local services}\}$. Panel (b) shows the corresponding patterns produced by the model. The vertical axis represents city bins. Bin 5 are the densest cities while bin 1 are the least dense cities

(a) Data (b) Model

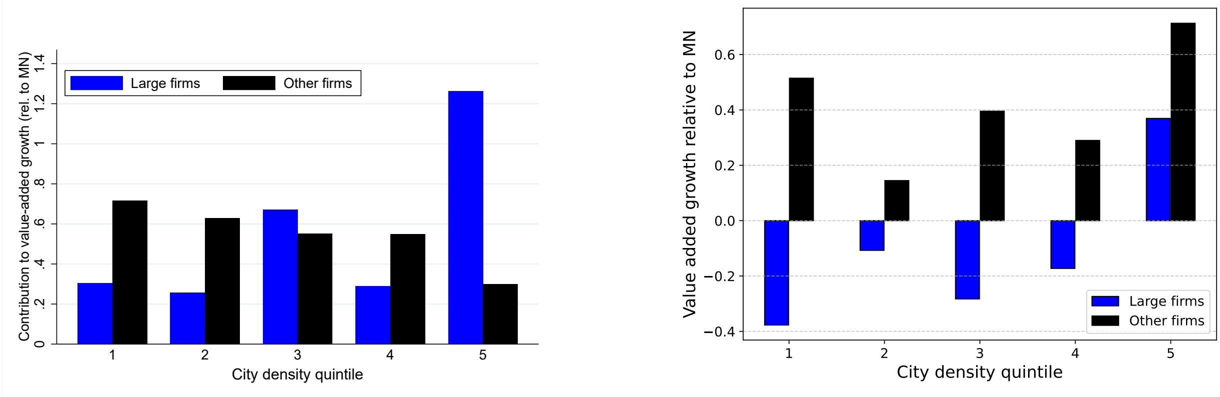


Figure B.7: Large firms and urban-biased structural change in the model

Notes: City size bin 1 represents the least dense cities and bin 5 the densest cities. Large firms are defined as those in the top 5% of the log value added distribution (adjusted to 1995 prices). In panel (a) the bars show the gap in value added growth between tradable services and manufacturing within city bins in the data, between 1995 and 2018, accounted for by large and non-large firms. The numbers correspond to the blue and red elements of the decomposition formula (1). Panel (b) presents the corresponding bars in the model.

B.3 Sensitivity of main quantitative results to alternative parameter values and additional exercises

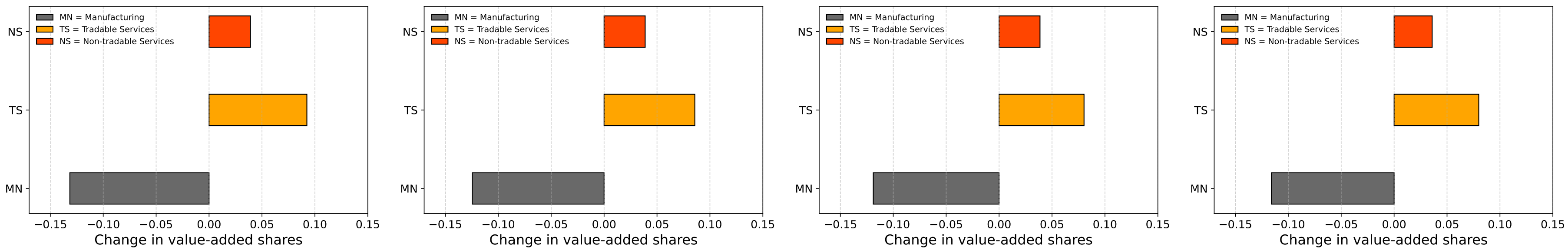
B.3.1 Sensitivity to dispersion in worker mobility costs (ξ)

In the baseline calibration of Section 4, we set the Fréchet shape parameter governing idiosyncratic worker location preferences, ξ, to 7, guided by existing estimates for France (Zerecero, 2021). This parameter determines the dispersion of worker preference draws and therefore the degree of imperfect mobility across cities; we interpret greater dispersion (lower ξ) as reflecting higher mobility costs. In this section, we consider alternative values of ξ between 1 and 5, consistent with evidence in Artuç et al. (2010), Bryan and Morten (2019), and Morten and Oliveira (2024). For each value of ξ, we re-calibrate the model to match the 1995 economy—changing only ξ—and simulate the effects of the same sectoral TFP growth used in our baseline (66% faster growth in manufacturing relative to local services, and 115% faster growth in tradable services). Our main conclusion is that, across this range of mobility costs, expansions in local services variety in response to rapid tradable services productivity growth remain a key mechanism restraining nominal wage growth in dense cities.

Figure B.8 summarizes the results. The first row shows that higher mobility costs have only modest effects on aggregate structural change: the decline in the manufacturing value added share is 1–2 percentage points smaller, and urban-biased services growth remains substantial for most values of ξ. The second row shows that as ξ declines from 7 to 3, the urban bias becomes slightly weaker because higher mobility costs limit the expansion of services firms in dense cities. When ξ becomes very low, tradable services growth is significantly restricted in dense cities, which in turn limits the growth of local services.

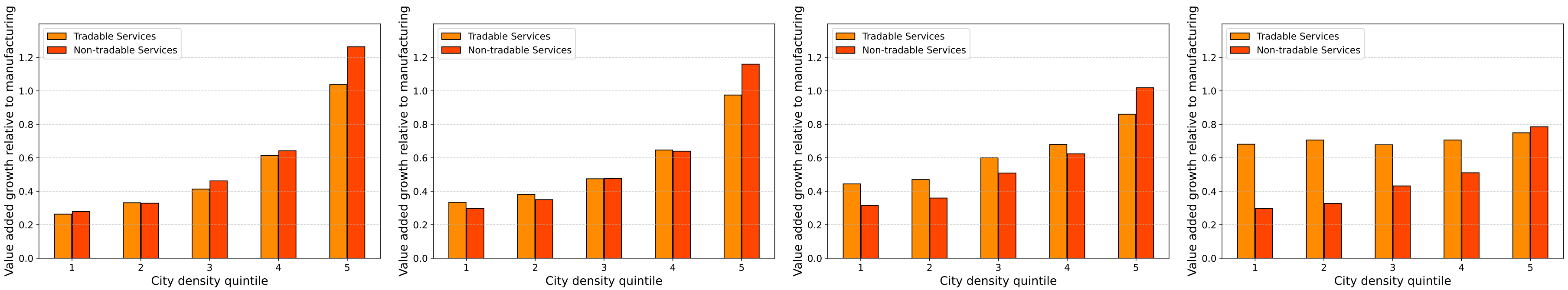
The last row shows that reduced mobility into dense cities, combined with a more constrained expansion of tradable services, lowers the entry of local services varieties. As a result, the decline in local services price indices in dense cities becomes less pronounced. Higher mobility costs and weaker growth in local services variety also moderate housing demand, leading to smaller increases in house prices. Because the expansion of local services variety plays a central role in dampening urban wage growth in the baseline, its attenuation at lower ξ leads the urban nominal wage premium to rise rather than fall. Nonetheless, comparing nominal wages and local services price indices across columns shows that—even when mobility costs are high—growth in local services variety remains an important channel limiting nominal wage growth in dense cities.

Aggregate structural change



(a) $\xi = 7$ (b) $\xi = 5$ (c) $\xi = 3$ (d) $\xi = 1$

Urban-biased structural change

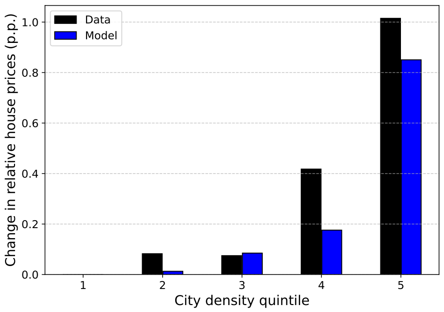


(e) $\xi = 7$ (f) $\xi = 5$ (g) $\xi = 3$ (h) $\xi = 1$

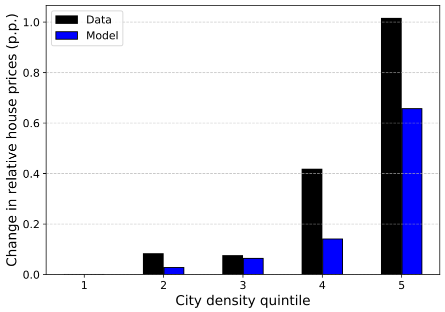
Figure B.8: Simulating the effects of sectoral TFP growth under different worker mobility costs (ξ).

Notes: This figure compares the model's predictions for structural change, house prices, and nominal wages across cities under various worker mobility costs. City density bin 1 represents the least dense cities and bin 5 the densest cities. The parameter ξ governs the distribution of idiosyncratic worker preferences over locations, interpreted as worker mobility costs. Our baseline value is $\xi = 7$, calibrated from Zerecero (2021). We compare this to the model's predictions under alternative values for ξ of 5 (Morten and Oliveira, 2024), 3 (Bryan and Morten, 2019), and 1 (Artuç et al., 2010).

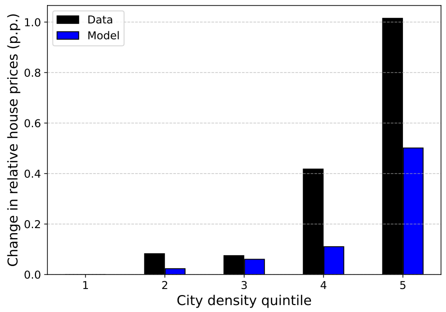
House prices



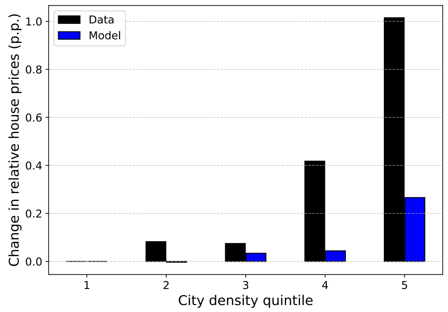
(a) $\xi = 7$



(b) $\xi = 5$

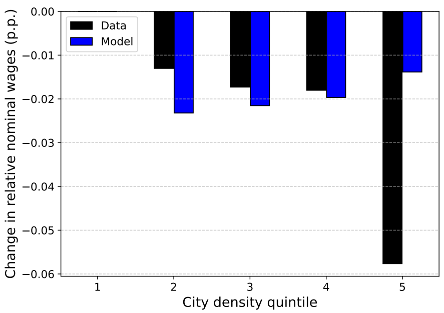


(c) $\xi = 3$

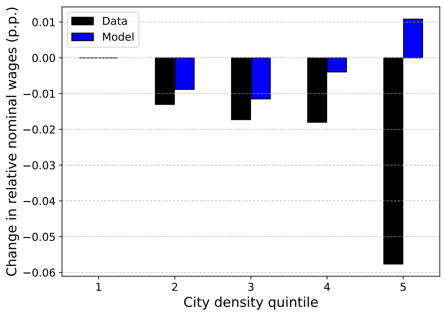


(d) $\xi = 1$

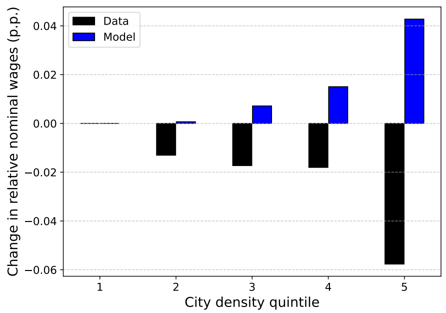
Nominal wages



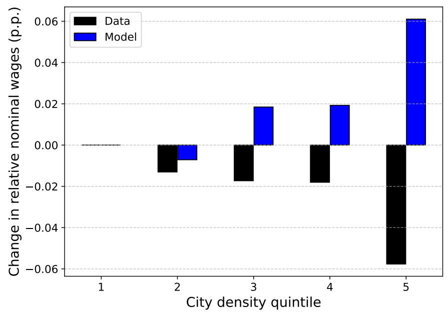
(e) $\xi = 7$



(f) $\xi = 5$

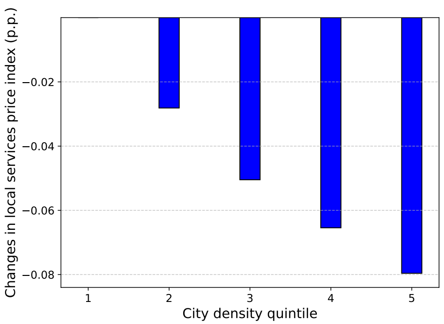


(g) $\xi = 3$

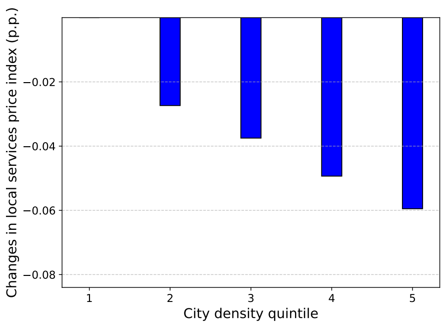


(h) $\xi = 1$

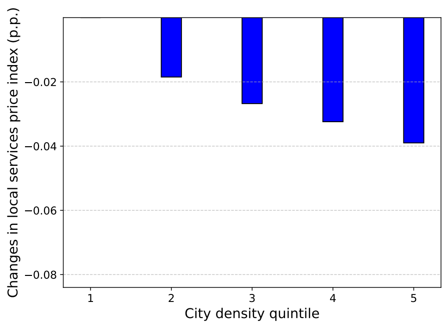
Local services price indices



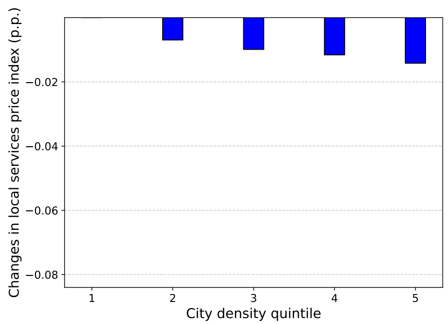
(i) $\xi = 7$



(j) $\xi = 5$



(k) $\xi = 3$



(l) $\xi = 1$

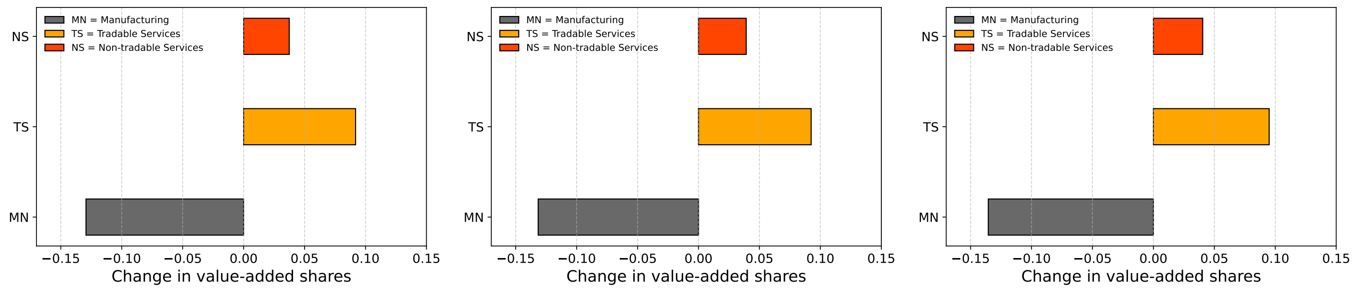
B.3.2 Sensitivity to labor output elasticity in the housing sector (δ)

In the baseline calibration of Section 4, we set the labor output elasticity in housing production, δ, to 0.60. We obtain at this number by combining two pieces of information: the median labor share in the construction industry and the estimate in Combes et al. (2021) that the output elasticity with respect to non-land inputs in housing production for France is 0.80. Together, these imply a housing supply elasticity of 1.5, well within the range estimated for US cities (Saiz, 2010). To assess the sensitivity of our quantitative results, we consider two alternative values of δ chosen to reproduce the housing supply elasticities of New York (0.76) and Atlanta (2.55) reported in Table VI of Saiz (2010). These correspond to $\delta = 0.43$ and $\delta = 0.72$, respectively. We recalibrate the model to match the 1995 economy under each value of δ and then introduce the same differential sectoral TFP growth as in the baseline.

Figure B.10 summarizes our findings. The value of δ has little impact on both aggregate structural change and the urban bias. However, lower housing supply elasticities (smaller δ) lead to larger increases in urban house prices in response to rapid tradable services productivity growth. Higher house prices, in turn, dampen worker mobility toward dense cities and generate a larger urban nominal wage premium. Conversely, higher housing supply elasticities moderate these effects.

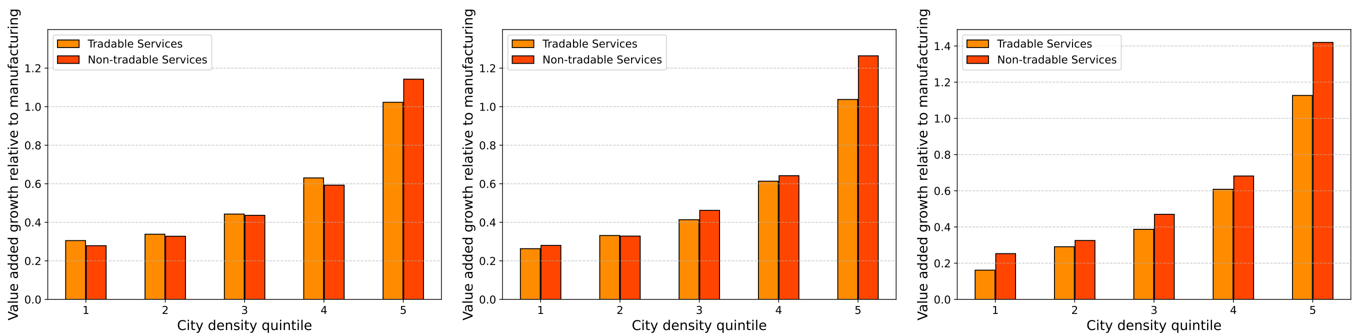
Across all values of δ, however, our main quantitative result remains robust: expansions in local services variety triggered by rapid tradable services TFP growth remain a central mechanism restraining nominal wage growth in dense cities.

Aggregate structural change



(a) $\delta = 0.43$ (b) $\delta = 0.60$ (c) $\delta = 0.72$

Urban-biased structural change

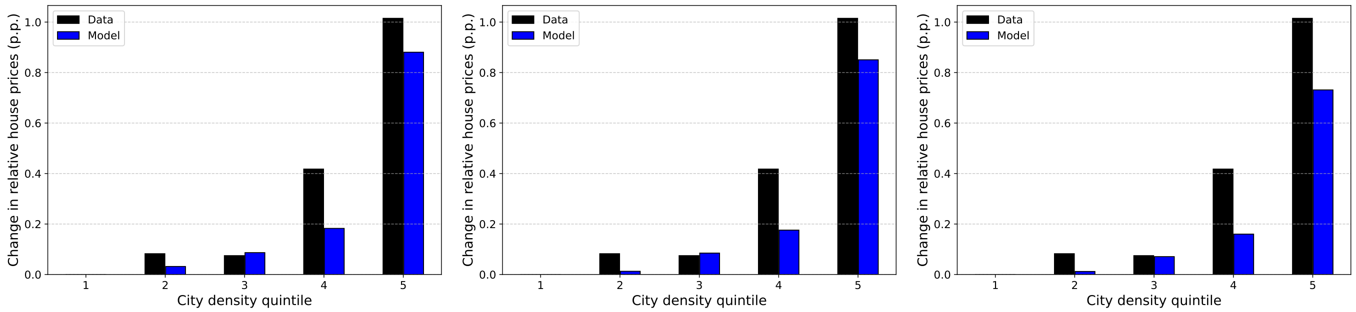


(d) $\delta = 0.43$ (e) $\delta = 0.60$ (f) $\delta = 0.72$

Figure B.10: Simulating the effects of sectoral TFP growth under different housing supply elasticities (δ).

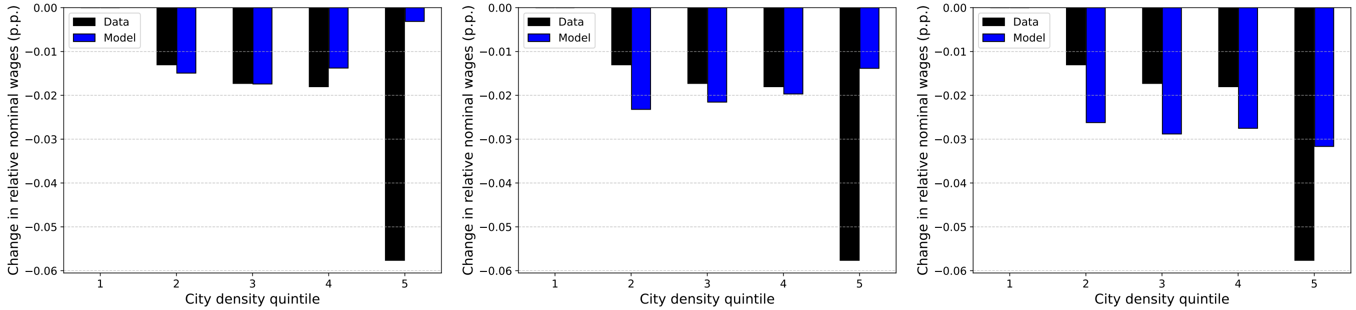
Notes: This figure compares the model's predictions for structural change, house prices, and nominal wages across cities under various housing supply elasticities. City density bin 1 represents the least dense cities and bin 5 the densest cities. The parameter δ governs the elasticity of housing supply. Our baseline value is $\delta = 0.60$, corresponding to a housing supply elasticity of 1.5. We compare this to the model's predictions under alternative values for δ of 0.43 and 0.72 for New York and Atlanta estimated by Saiz (2010).

House prices



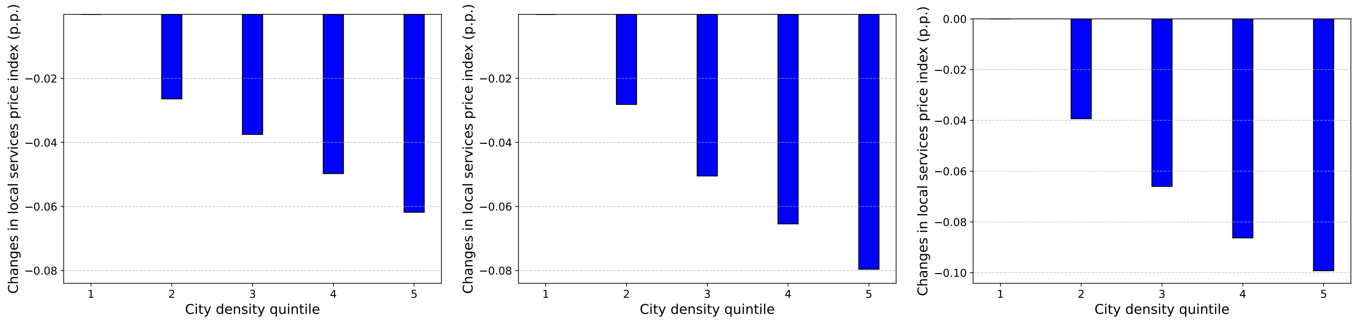
(a) $\delta = 0.43$ (b) $\delta = 0.60$ (c) $\delta = 0.72$

Nominal wages



(d) $\delta = 0.43$ (e) $\delta = 0.60$ (f) $\delta = 0.72$

Local services price indices



(g) $\delta = 0.43$ (h) $\delta = 0.60$ (i) $\delta = 0.72$

B.3.3 The role of endogenous sorting in driving UBSC

In our baseline model, more productive firms endogenously sort into high-density cities because they benefit more from the agglomeration externalities associated with density. As shown in Section 5, rapid productivity growth in tradable services raises urban density and induces large firms—especially in tradable services—to expand. This expansion contributes to higher house prices, growth in the local services sector, changes in urban nominal wages, a widening urban–rural welfare gap, and aggregate structural change. In this section, we examine how sectoral TFP growth affects these city-level outcomes when this large-firm-biased agglomeration force is shut down. We do so by repeating the quantitative exercise in Section 5 but now freezing the disproportionate agglomeration externalities accruing to large firms at their 1995 level. That is, we implement the following productivity function in the counterfactual economy:

$$\log \Psi_j(z,i) = \log A_j + a_j \log \frac{L(i)}{L(1)} + \underbrace{\left(1 + \log \frac{L_{1995}(i)}{L_{1995}(1)}\right)^{s_j} \log z}_{\substack{\text{Freezing large-firm-biased agglomeration} \\ \text{externality at the 1995 level}}}$$

Figure B.12 reports the results. Panel B.12g shows that eliminating large-firm-biased agglomeration effects leads to a substantial decrease in the relative size of tradable services firms in dense cities; opposite to both our baseline results (Figure 8) and the empirical evidence (Figure 4). In the absence of large incumbent firms' expansion, tradable services productivity growth instead attracts smaller, less productive firms into dense cities. This shift generates several notable differences relative to the baseline findings in Figure 7. Aggregate structural change becomes more muted: the rise in the tradable services value added share is roughly 2 percentage points smaller. Services growth remains urban-biased, but the gap between services and manufacturing growth narrows markedly. As a result, both the increase in housing demand and the expansion of local services in dense cities are less pronounced, with the latter continuing to dominate the former, resulting in a decline in the urban nominal wage premium. Finally, the urban–rural welfare gap still widens, but to a more limited extent than in the baseline.

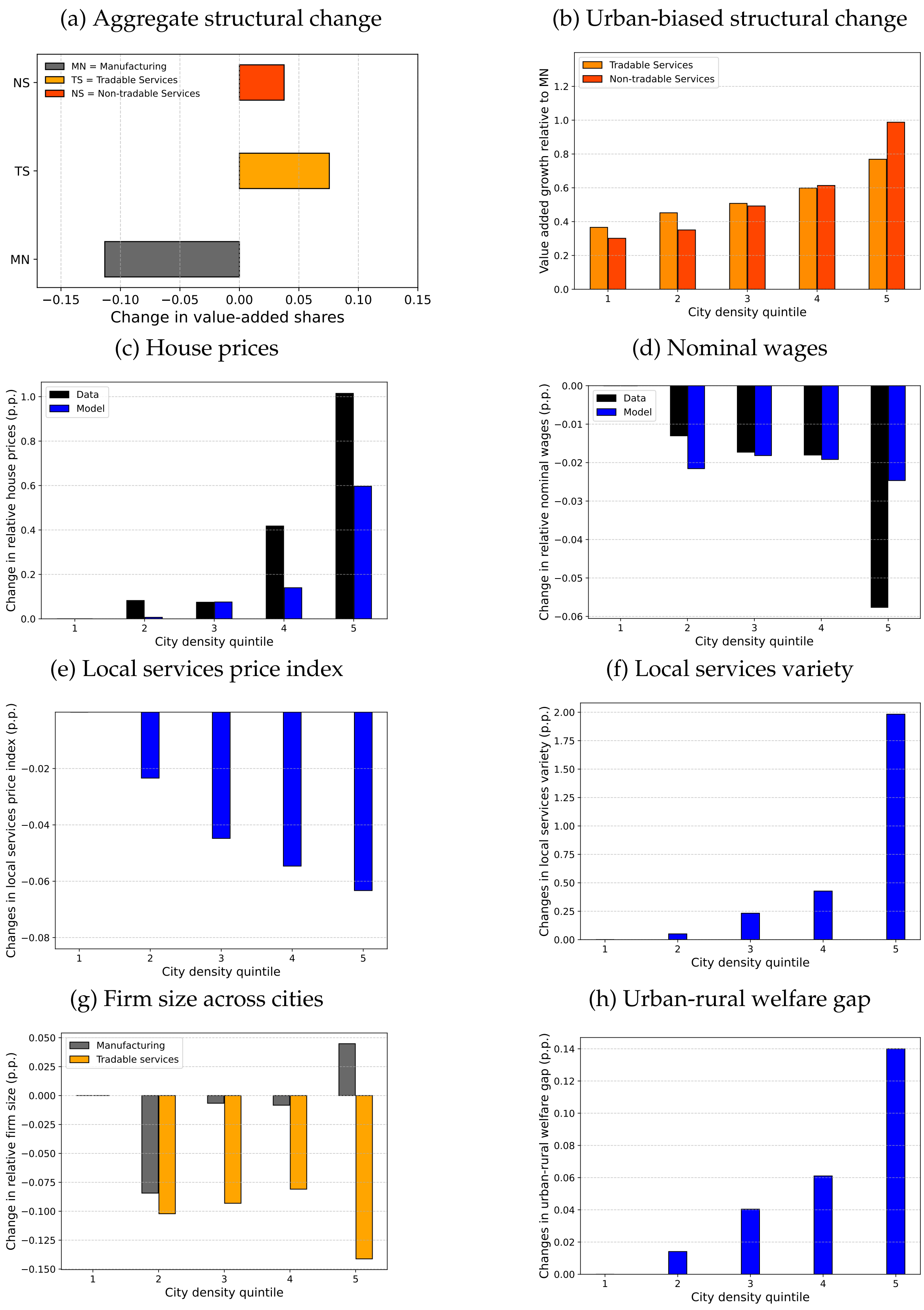


Figure B.12: Effects of sectoral TFP growth (keeping sorting effect at 1995 level)

Notes: These figures present the effects of introducing only sectoral TFP growth into the estimated model's 1995 equilibrium. In this version of the model, we free the sorting effect at the 1995 level—i.e. $\log \Psi_j(z,i) = \log A_j + a_j \log\left(\frac{L(i)}{L(1)}\right) + (\log z)\left[1 + \log\left(\frac{L_{1995}(i)}{L_{1995}(1)}\right)\right]^{s_j}$—therefore, changes in density only affects firms (neutrally) through a_j. City density bin 1 represents the smallest cities and bin 5 the largest cities.

B.3.4 Effects of local housing sector TFP growth

In Section 4, we calibrate local housing sector TFP, $z_h(i)$, to match local house prices relative to those in the least densely populated cities. Figure B.1a shows that the productivity of the housing sector in the densest cities relative to the least dense locations changed very little between 1995 and 2018. However, in mid-tier cities—particularly city density bins 2 and 4—the housing sector became relatively less productive. We now assess the effects of this decline by introducing only this change into the model's 1995 equilibrium.

Figure B.13 presents the results. Declining housing productivity in mid-tier cities raises house prices there. Since manufacturing is more sensitive to house prices than tradable services and manufacturing firms are more prevalent in mid-tier cities, the productivity decline raises the relative price of manufactured goods. Manufacturing's aggregate value added share falls while tradable services' share rises. Higher house prices also raise the relative price of traded goods and services to local services; given their complementarity, local services' value added share rises.

The decline in mid-tier housing productivity pushes firms and workers toward the least dense and densest cities. Large manufacturing firms, which were previously concentrated in mid-tier locations, relocate to dense cities. Consequently, value added in both services and manufacturing declines in mid-tier cities and grows in the least dense and the densest locations. As economic activity leaves mid-tier cities, the number of local-services varieties contracts and local price indices rise. Welfare therefore declines in mid-tier cities relative to both the densest and the least dense locations.

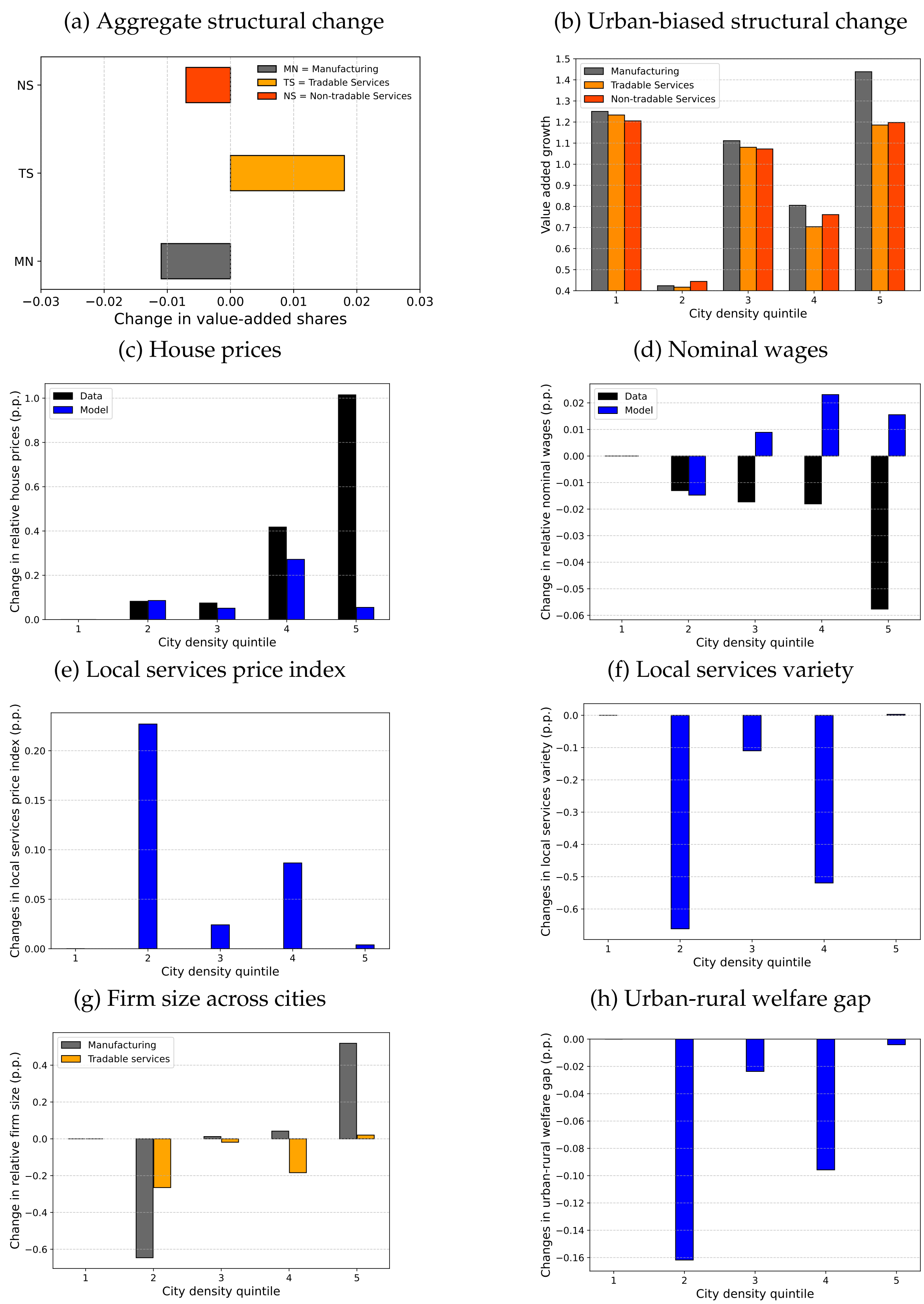


Figure B.13: Effects of uneven local housing sector TFP growth

Notes: These figures present the effects of introducing only changes in local housing sector TFP into the estimated model's 1995 equilibrium. City density bin 1 represents the smallest cities and bin 5 the largest cities.

B.4 Extension: Time-varying firm efficiency distribution and agglomeration externalities

In our baseline calibration and estimation (Section 4), we hold agglomeration externalities a_j and the distribution of firm efficiency $F_j(z)$ fixed over time.[30] Recent research on spatial structural change, however, suggests that both forces may have evolved over time. Desmet and Rossi-Hansberg (2014) develop a theory in which structural transformation induces innovation in services, concentrating employment and production in locations that specialize in services. Giannone (2022) argues that skill-biased structural change has increased the concentration of skilled workers in dense U.S. cities, thereby strengthening agglomeration forces in those locations. These mechanisms imply that agglomeration effects may have intensified for tradable services and weakened for manufacturing. In addition, Eckert et al. (2025) show that the falling price of intangible capital disproportionately benefits large business services firms, which tend to be located in dense cities, leading to their disproportionate expansion. This suggests a widening firm efficiency distribution in tradable services, with a thicker right tail.

In this section, we extend our model quantification exercise in Section 4 to allow agglomeration effects (a_j) and the shape parameter governing the firm efficiency distribution ($\nu_{z,j}^{shape}$) to vary over time. We continue to use the same set of moments in the estimation, but now the year-specific moments—one set for 1995 and another for 2018—identify the corresponding year-specific parameters. We first present the estimated values for these parameters and then analyze how changes in a_j, $\nu^{shape}z, j$, and sectoral TFP (A_j) jointly shape the evolution of structural change, house prices, and wages across cities.

To preview the main results, we continue to find that tradable services TFP grows fastest, followed by manufacturing, with local services exhibiting the slowest productivity growth. Introducing this differential sectoral TFP growth into the model's 1995 equilibrium shows that the key qualitative findings from our baseline analysis remain: structural change is strongly urban biased, house price growth is concentrated in dense cities, and the urban nominal wage premium flattens.

Parameter estimates and calibrated sectoral TFP. Table B.3 reports the parameter estimates. The results indicate that agglomeration externalities strengthened in tradable services and weakened in manufacturing between 1995 and 2018, consistent with the mechanisms highlighted by Desmet and Rossi-Hansberg (2014) and Giannone (2022). We also find notable changes in the firm efficiency distributions: the dispersion of firm efficiency widens substantially in manufacturing but narrows in tradable services. The decline in efficiency dispersion for tradable services reflects two forces. First, stronger

[30] In the structural estimation exercise, all estimated parameters are treated as time invariant.

Table B.3: Summary of estimated parameters

Parameter		Manufacturing 1995	Manufacturing 2018	Tradable services 1995	Tradable services 2018
Agglomeration externalities	a_j	0.09	0.01	0.10	0.20
		(0.01)	(0.01)	(0.02)	(0.02)
Sorting	s_j	0.04		0.34	
		(0.01)		(0.01)	
Housing output elasticity	β_j	0.14		0.01	
		(0.03)		(0.01)	
Shape of firm efficiency distribution	$\nu_{z,j}^{shape}$	0.53	0.82	1.89	1.77
		(0.02)	(0.02)	(0.00)	(0.00)
Scale of firm efficiency distribution	$\nu_{z,j}^{scale}$	0.66		0.22	
		(0.02)		(0.02)	
Shape of firm efficiency distribution	$\nu_{\epsilon,j}$	0.45		0.43	
		(0.01)		(0.01)	

Notes: The table reports the parameter values inferred through structural estimation. Asymptotic standard errors are provided in parentheses.

agglomeration effects in services—associated with the growing concentration of services activity in dense cities—tend to increase firm size dispersion. Second, the data show that the widening of firm size dispersion in services is considerably more modest than in manufacturing. Reconciling these patterns requires a narrower underlying efficiency distribution in tradable services. In this calibration, manufacturing TFP declines 28% relative to local services between 1995 and 2018, while tradable services TFP rises 18% relative to local services. Other parameters, which are held constant over time, remain close to their baseline values in Table 3.

We next conduct a series of simulation exercises to assess the extent to which changes in agglomeration externalities and firm efficiency distributions over time contribute to aggregate structural change. First, we allow agglomeration externalities and sectoral TFP to vary over time while holding the firm efficiency distributions fixed at their 1995 levels. Second, we allow the firm efficiency distributions and sectoral TFP to vary while keeping agglomeration externalities at their 1995 values. Finally, we freeze both agglomeration externalities and firm efficiency distributions at their 1995 levels and allow only sectoral TFP to evolve over time.

Freezing the firm efficiency distributions at 1995 levels. Figure B.14 reports the results when we hold firm efficiency distributions fixed at their 1995 values while allowing agglomeration externalities and sectoral TFP to evolve. Relative to the baseline, both aggregate structural change and the urban bias in services growth become considerably more pronounced. Urban house prices also rise more sharply, and local services price indices fall more steeply in dense cities. In this case, the increase in urban housing costs outweighs the decline in local services price indices, producing a substantial steepening of the urban nominal wage premium.

Two forces account for these sharper effects. First, the strengthening of agglomeration externalities in tradable services and their weakening in manufacturing amplify the expansion of tradable services and the contraction of manufacturing in dense areas. Second, time variation in firm efficiency distributions plays an attenuating role in the baseline: the estimated narrowing of efficiency dispersion in tradable services limits the growth of large firms in dense cities, while the widening of the manufacturing distribution diffuses activity toward mid-tier cities, where large manufacturing firms are more prevalent. Freezing efficiency distributions at their 1995 levels removes these dampening forces, thereby magnifying the extent of urban-biased structural change.

Freezing agglomeration externalities at 1995 levels. Figure B.15 reports the results when we hold agglomeration externalities fixed at their 1995 values while allowing firm efficiency distributions and sectoral TFP to evolve. The results shows that changing agglomeration externalities can be first-order determinants of urban-biased structural change, rising urban house prices, and the flattening of the urban nominal wage premium. In this extension, absent any change in agglomeration forces, structural change reverses direction: the value added share of manufacturing rises while that of tradable services falls. The urban bias in structural change also disappears. In the more parsimonious parameterization we focus on in our main discussion, urban bias is accounted for solely by differential TFP growth through the interplay of heterogeneous sorting, changes in house prices, and local services variety, which together generate effects analogous to those of time-varying agglomeration externalities.

The effects of sectoral TFP growth. Figure B.16 presents the results when only sectoral TFP growth is introduced relative to the model's 1995 equilibrium—the same exercise described in Section 5. The results closely mirror our baseline findings. Sectoral TFP growth raises the aggregate value added share of tradable services relative to manufacturing and generates urban-biased services growth. This, in turn, increases urban house prices while reducing the urban local-services price index. In this scenario, however, the decline in the urban local-services price index is not large enough to offset the rise in urban house prices, leading to a steeper urban nominal wage premium.

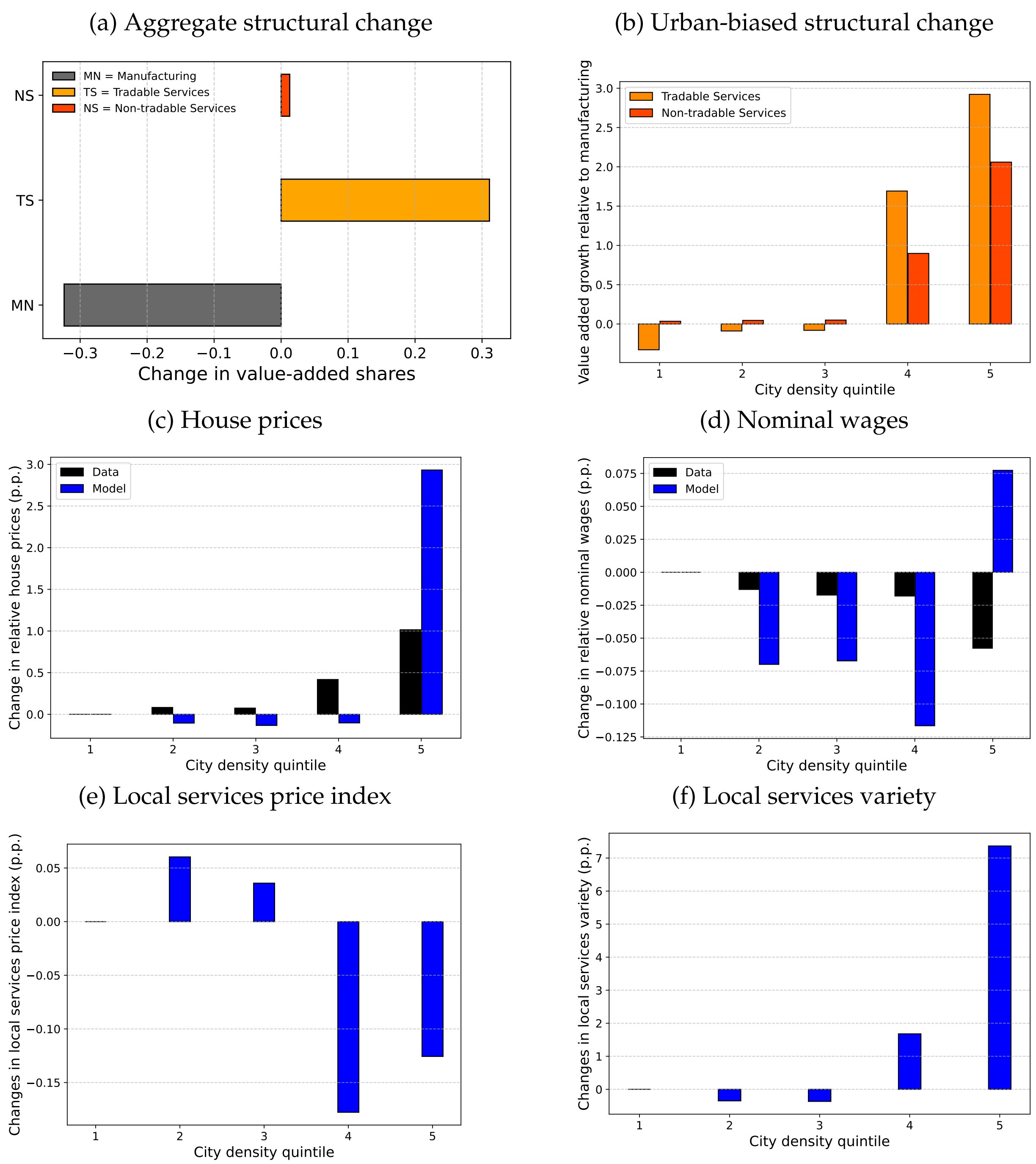


Figure B.14: Effects of freezing time-varying firm efficiency distribution ($F_j(z)$) at 1995 levels

Notes: These figures present the effects of freezing the firm efficiency distributions ($F_j(z)$) at the estimated model's 1995 level, forcing them to remain constant even as other forces change. City density bin 1 represents the smallest cities and bin 5 the largest cities.

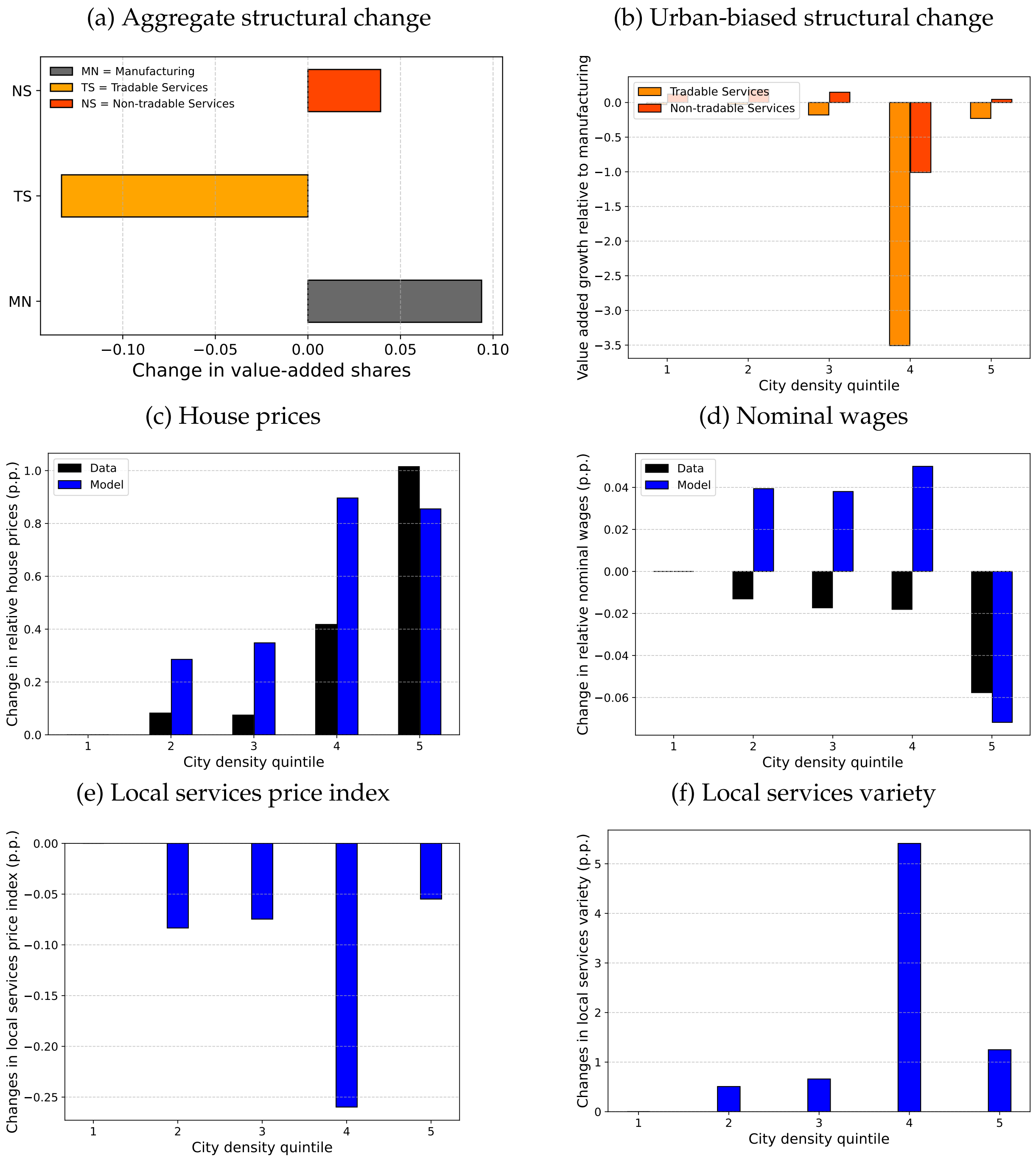


Figure B.15: Effects of freezing time-varying agglomeration externalities (a_j) at 1995 levels

Notes: These figures present the effects of freezing agglomeration externalities (a_j) at the estimated model's 1995 level, forcing them to remain constant even as other forces change. City density bin 1 represents the smallest cities and bin 5 the largest cities.

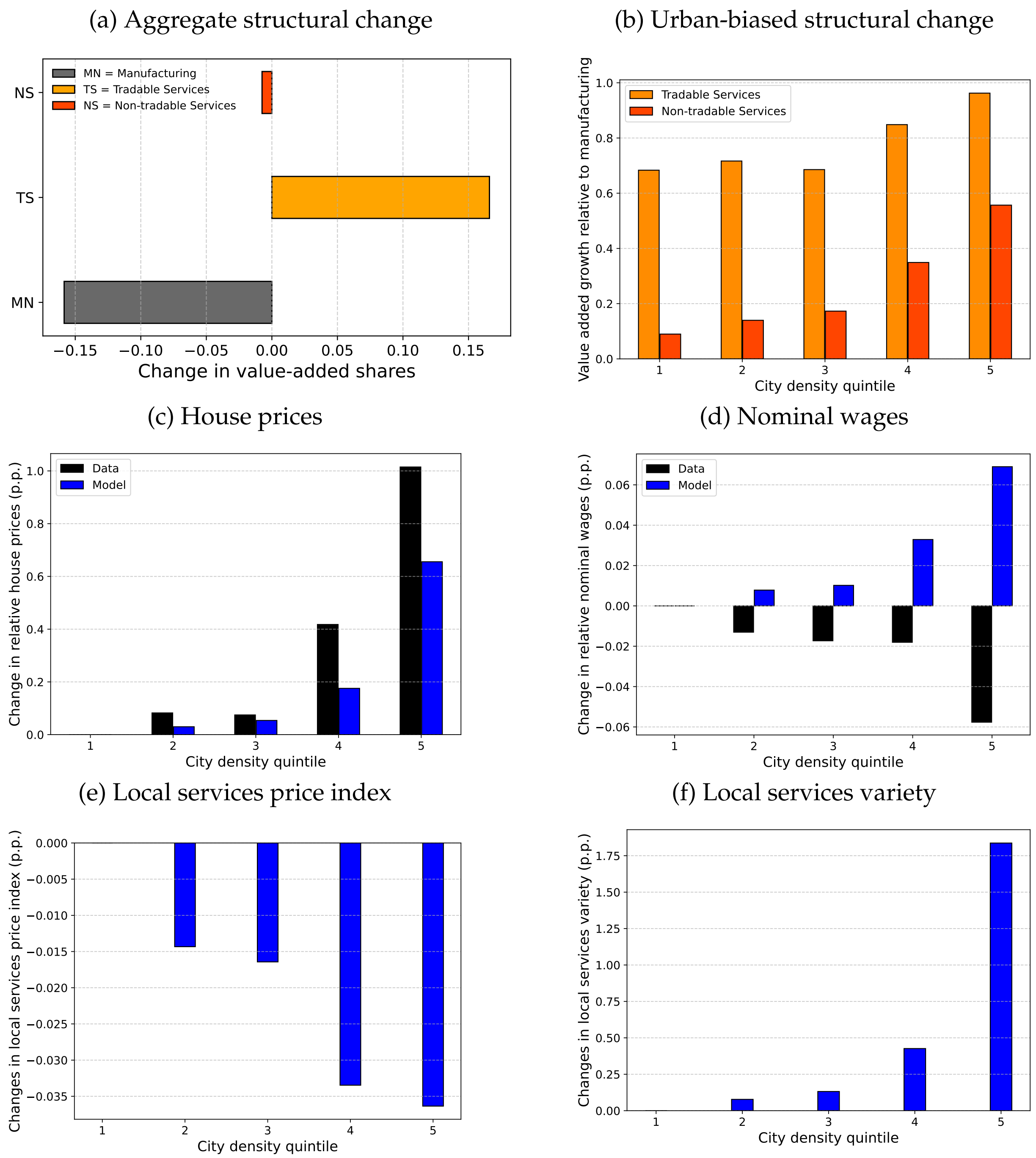


Figure B.16: Effects of sectoral TFP growth, accounting for time-varying firm efficiency and agglomeration externalities

Notes: These figures present the effects of introducing only sectoral TFP growth into the estimated model's 1995 equilibrium. In this version of the model, we infer sectoral TFP growth while allowing both the firm efficiency distribution ($F_j(z)$) and agglomeration externalities (a_j) to vary between 1995 and 2018. City density bin 1 represents the smallest cities and bin 5 the largest cities.

References

Artuç, E., S. Chaudhuri, and J. McLaren (2010). Trade Shocks and Labor Adjustment: A Structural Empirical Approach. *American Economic Review 100*(3), 1008–1045.

Bryan, G. and M. Morten (2019). The Aggregate Productivity Effects of Internal Migration: Evidence from Indonesia. *Journal of Political Economy 127*(5), 2229–2268.

Combes, P., G. Duranton, and L. Gobillon (2021). The Production Function for Housing: Evidence from France. *Journal of Political Economy 129*(10), 2766–2816.

Desmet, K. and E. Rossi-Hansberg (2014). Spatial Development. *American Economic Review 104*(4), 1211–1243.

Eaton, J., S. Kortum, and F. Kramarz (2011). An Anatomy of International Trade: Evidence From French Firms. *Econometrica 79*(5), 1453–1498.

Eckert, F., S. Ganapati, and C. Walsh (2025). Urban-Biased Growth: A Macroeconomic Analysis. Working Paper 30515, National Bureau of Economic Research.

Giannone, E. (2022). Skilled-biased Technical Change and Regional Convergence. Working Paper, CREI.

Lewis, L., R. Monarch, M. Sposi, and J. Zhang (2022). Structural Change and Global Trade. *Journal of the European Economic Association 20*(1), 476–512.

Morten, M. and J. Oliveira (2024). The Effects of Roads on Trade and Migration: Evidence from a Planned Capital City. *American Economic Journal: Applied Economics 16*(2), 389–421.

Saiz, A. (2010). The Geographic Determinants of Housing Supply. *Quarterly Journal of Economics 125*(3), 1253–1296.

Zerecero, M. (2021). The Birthplace Premium. Working Paper, UC Irvine.