Urban ladders and the spatial diffusion of services

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10th January 2026

Motivation

- It is increasingly unlikely that industry- and export-led growth will be the sole pillars of future job growth *(Goldberg and Reed, 2024; Diao et al., 2024)*.

- Services, in particular consumer services, are a complementary source of employment growth *(Hsieh & Rossi-Hansberg, 2023; Fan et al., 2023; Rodrik & Stiglitz, 2024; Schwartzman, 2024)*.

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  - Beyond demand: What are supply side drivers of service sector growth? *(Ngai and Pissarides, 2007; Chen et al., 2023; Fan et al., 2023; Hsieh & Rossi-Hansberg, 2023; Schwartzman, 2024)*

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  2. Over time probability of entry at a given level of demand increases.
  3. Falling marginal cost seem to play a role.

Literature

Determinants of the contemporary service sector transformation in low- and middle-income countries (Ngai and Pissarides, 2007, Gollin et al., 2016, Nayyar et al., 2021, Ngai et al., 2022, Fan et al., 2023, Parvathaneni and Yang, 2024, Schwartzman, 2025).

- Firm dynamics behind service sector growth.
- Drivers: Income growth and marketization + access to cheaper inputs.

Local market size and firm entry (Bresnahan and Reiss, 1991).

- Similar in spirit but with input-output linkages and non-local demand and input sourcing by firms.

Overview of the data

1. Administrative data on formal firms and firm-to-firm transactions (2016-2024)
   - Value added: about 1/3 of GDP
   - Private sector employment: 4% of working population
   - Key advantage: 4-digit sector codes + measure of sales channels to distinguish between consumer and business services

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2. Census data (2019 cross-section)
   - Subcounty level info: working population
   - Individual level info (10%): employer (formal/informal, private/public, sector)
3. Household surveys (comparison with admin data and economic survey: shares, absolute)
   - Kenya Integrated Household Budget Survey (KHIBS, 2015/16)
   - Kenya Continuous Household Survey (KCHS, 2020-22)
   - employer, modern sector consumption shares (Bachas et al., 2023)
4. Other geographically disaggregated data
   - Updates to road and fiber optic network
   - Subcounty-level population (WorldPop)
   - Gross County Product per capita (regional GDP) 2018-2023

Some definitions

Classification of services:

1. Based on sector codes:
   - Business services: transport, ICT, professional, administrative services
   - Consumer services: wholesale and retail, personal services, hospitality, entertainment, health and social work
2. Based on sales channels:
   - Business services: Firm-level share of sales to final demand < 0.5

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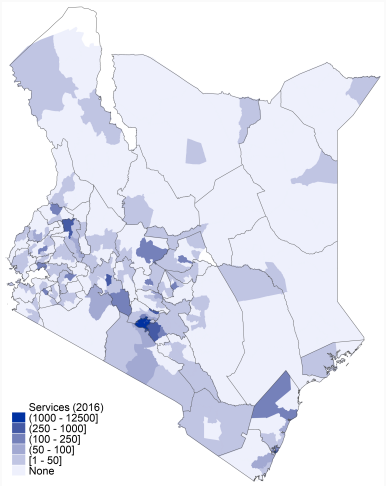
Geographic grouping of subcounties

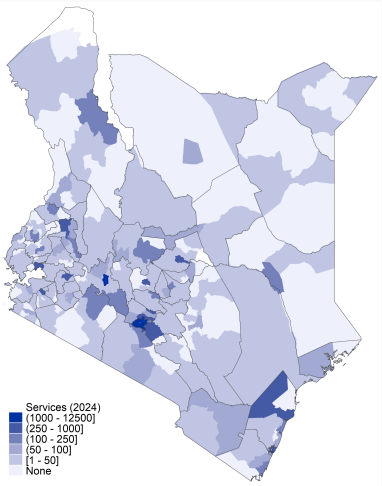
1. Cities. Density $> 1,500$ pop per km^2 + a settlement >500k. (e.g. subcounties within Nairobi, Mombasa)
2. Metropolitan areas and large towns. Density > 300 pop per km^2 + a settlement $> 150,000$ or neighbour of a city. (e.g. Athi River, Rongai, Nakuru East)
3. Small towns and rural areas. All remaining sub-counties. (e.g. Embu East, Nyandarua South, Tana River)

Spatial diffusion of services over time and space

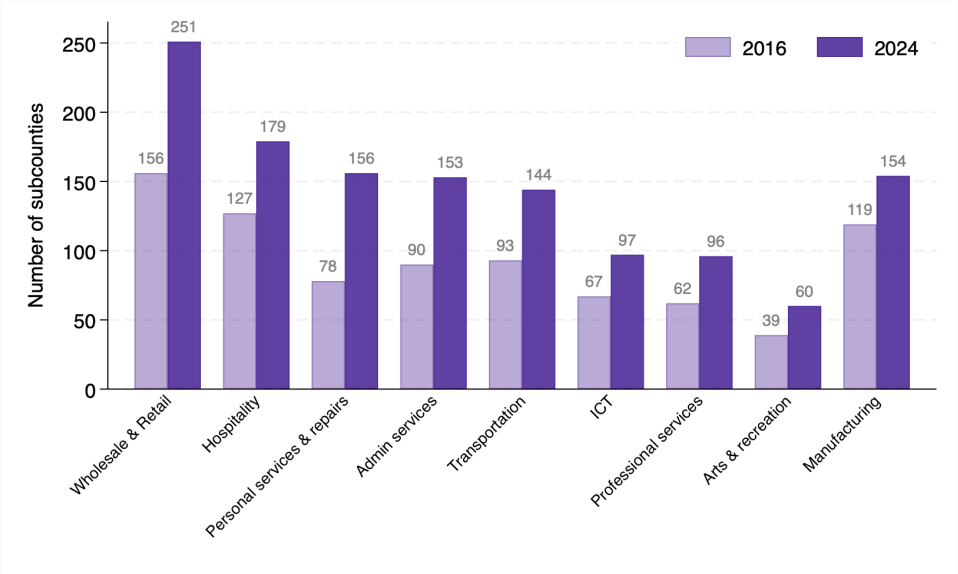
2016



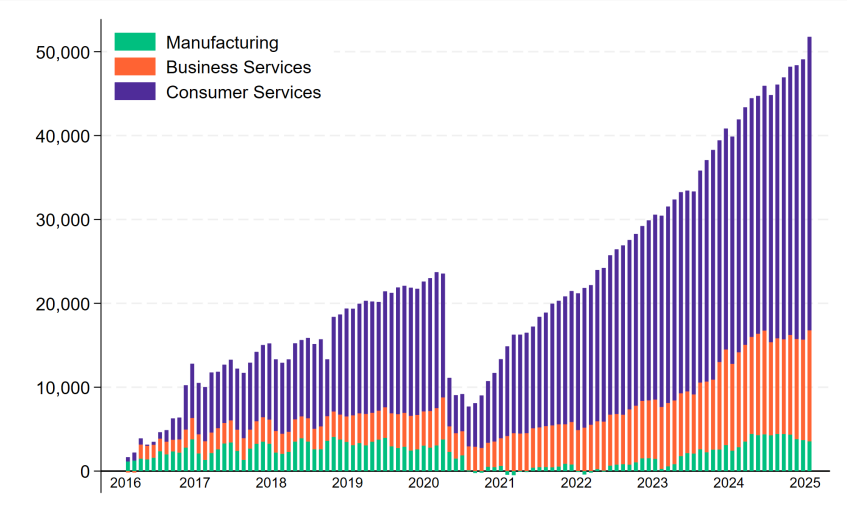
2024



Service sector firms spread across a larger number of locations

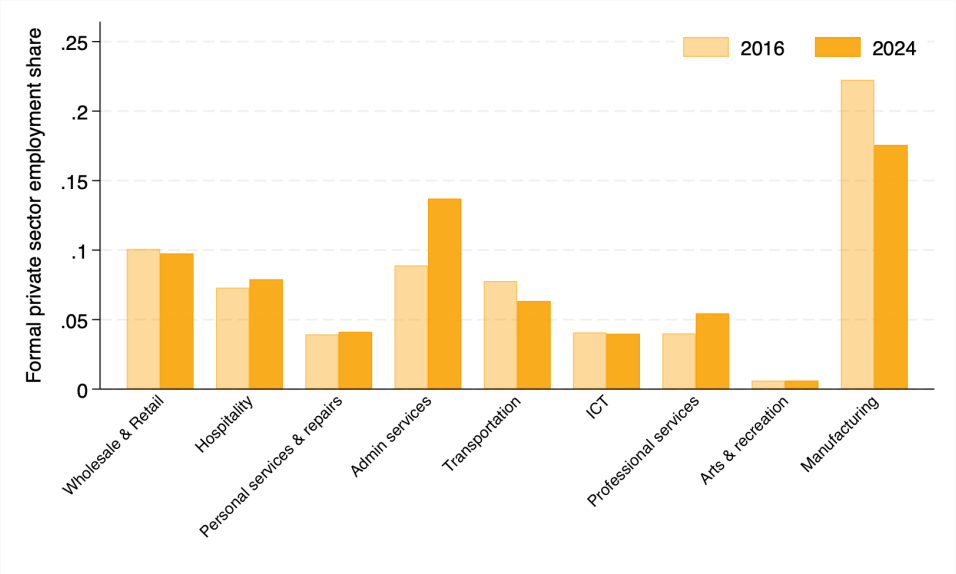


Consumer services are the largest contributor to newly added formal employment in small towns and rural areas. shares wages

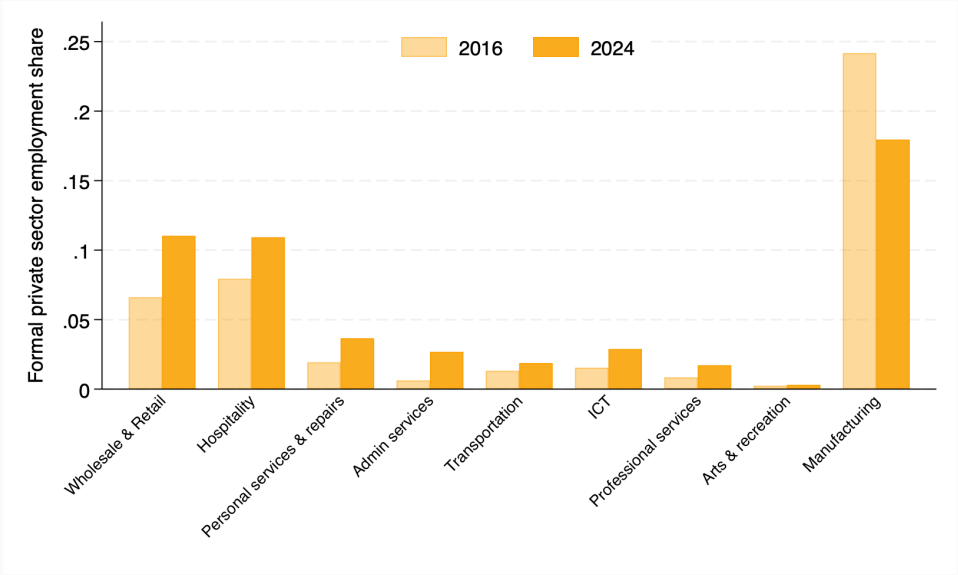


Net number of jobs added relative to December 2015.

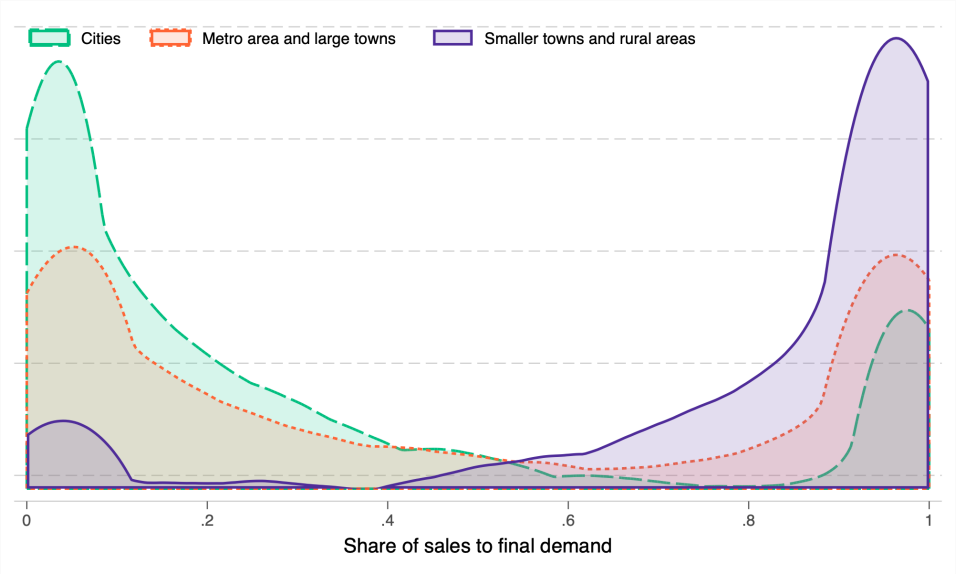
Employment shares shift towards services...



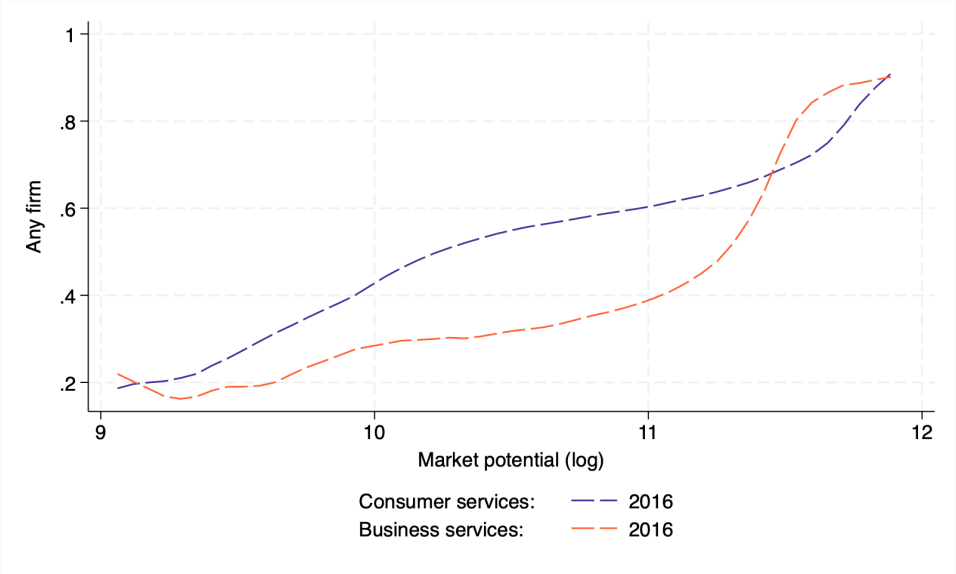
... especially so in small towns and rural areas.



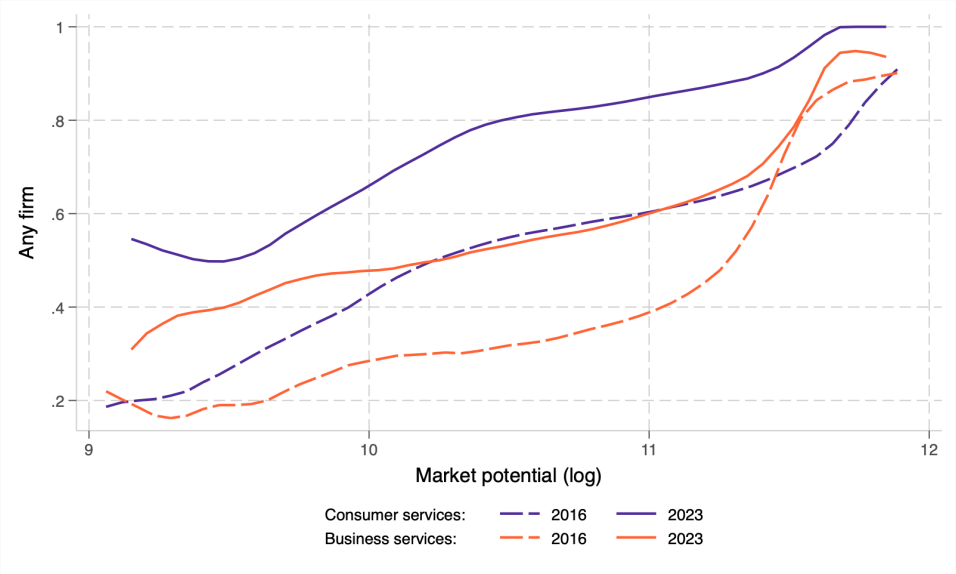
Sales to final demand dominate the demand of services in small towns and rural areas.



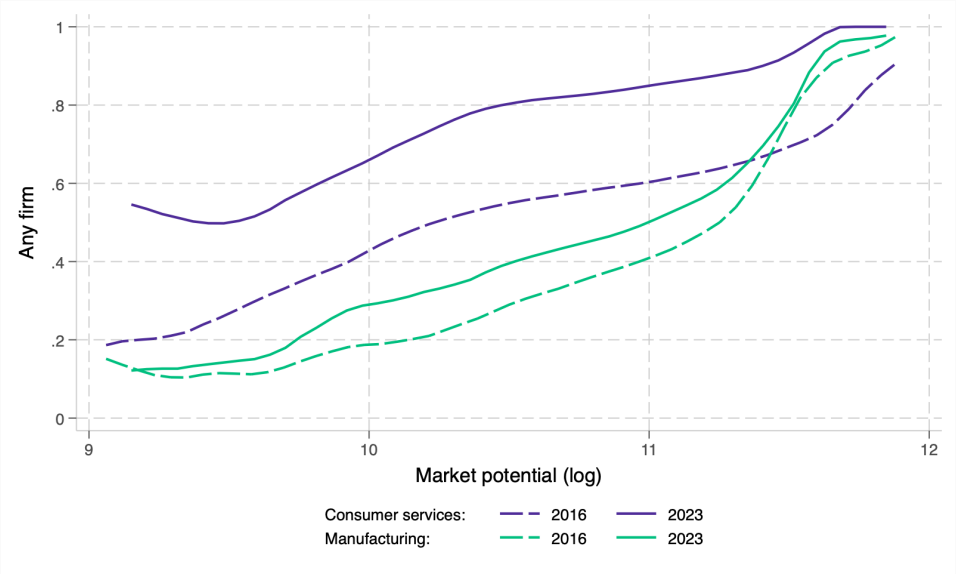
Number of consumer service firms and local market access



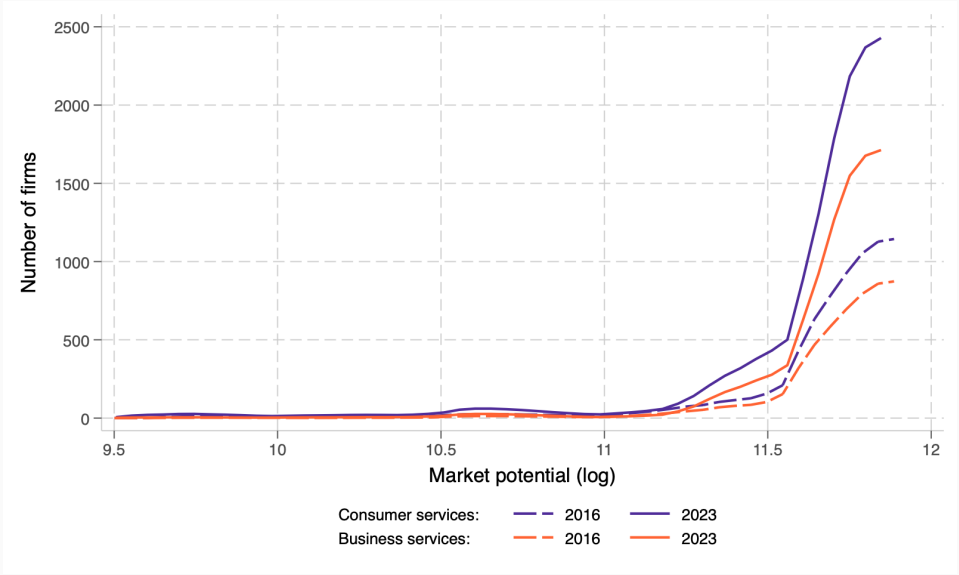
Number of consumer service firms and local market access with CI, intensive margin, income levels



Manufacturing firms and market access



Number of firms and market access



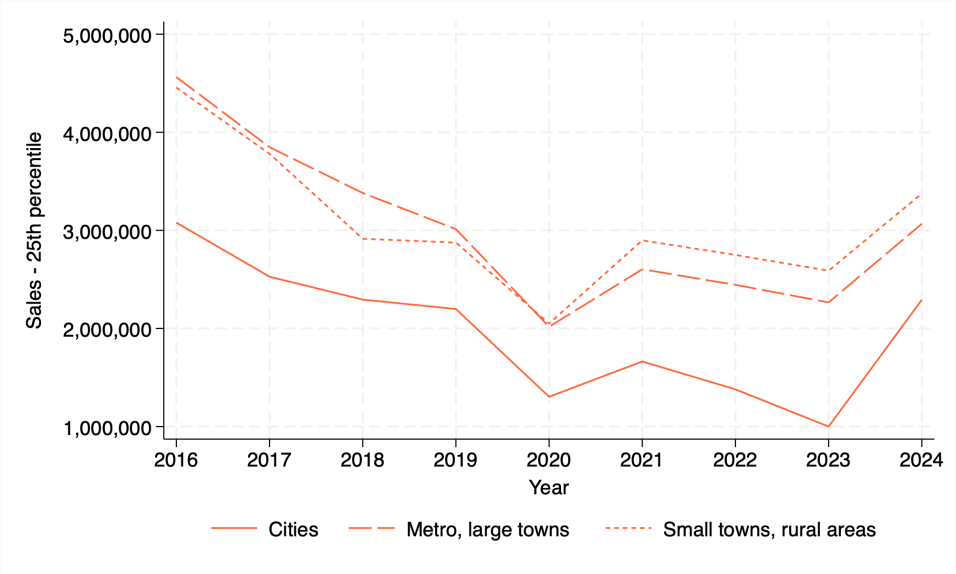
Beyond demand

1. Fixed cost

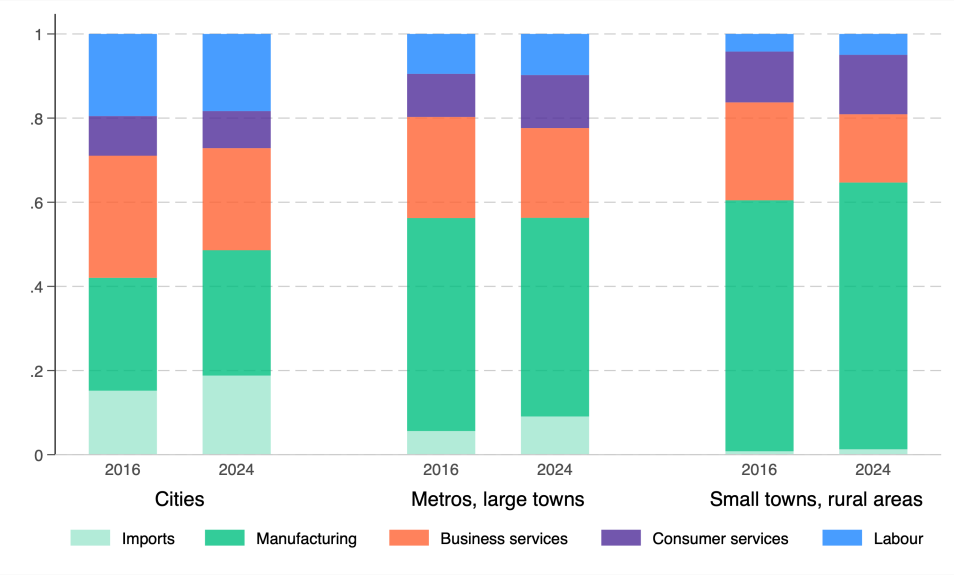
2. Intermediate inputs

3. Productivity

The size of the smallest quartile of consumer service firms has been declining.



Input shares for consumer services by region wages



Takeaways thus far

1. Service sector firms spread across a larger number of locations.

2. Demand matters, but potentially is not the entire story.

Model and results

Purpose of the model

1. Formalise mechanisms and provide a theory-consistent expression we can take to the data.

2. Leverage the logic of the model to back out *hard-to-measure* quantities, e.g. sector-location prices.

3. *Quantify the relative contribution of each mechanism.*

4. *Trace out productivity and utility implications.*

Model: Intuition

1. Households
   - consume consumer services and manufacturing goods.
   - decide on whether to home-produce (spend time on production) or market purchase consumer services (spend time on wage work).
   - decide on where and how much to buy of consumer services and manufacturing goods.

2. Firms
   - operate in three sectors: consumer services, manufacturing, business services.
   - decide on entry in a given location (pay fixed cost) as well as how much to produce conditional on
     - observed demand potential, productivity, costs of labor and intermediate inputs.
   - All sectors use manufactured goods and business services as intermediate inputs.

3. Prices and wages clear the goods (and services) markets and labor market.

Model: Households.

Sectors: consumer services $s \in S$, manufacturing m, business services b.

Households.

- Households in j choose what consumer services to home produce, and what to buy on the market.
- Households buy goods in consumer service sector s if $P_{js} < \frac{w_j}{v_s}$ and spend T_j^W time working.
- Nested CES preferences. EoS σ over sectors $\{\mathcal{S}, m\}$. EoS η_r over locations, j, within sector r.
- Quantity demanded from sector s in location j is given by Ω_{js}.

$$\Omega_{js} = \sum_i \text{Income}_i \times \text{Fraction Spent on s if bought}_{is}$$
$$\times \text{If bought dummy}_{is} \times \text{CES translation into quantities}_{is}$$
$$\Omega_{js} = \sum_i \left(L_i w_i T_i^W\right) \times \left(\frac{P_{is}}{P_i}\right)^{1-\sigma} \times \left(\mathbb{1}_{[P_{is} < w_i / v_s]}\right) \times \left(P_{is}^{\eta_s - 1} \tau_{ijs}^{-\eta_s}\right)$$

Model: Firms.

- Produce location-specific differentiated goods in sectors $r \in \{\mathcal{S}, m, b\}$.
- Production is Cobb-Douglas over labor (share$= \gamma_r$), m goods (share$= \delta_r$) and b services.
- Trade costs are iceberg τ_{ijr}, and marginal cost is denoted by c_{js}.
- Firms face fixed cost of entry $\bar{f}_r$ and productivity, A_{jr} experiences sector-specific agglomeration forces: $A_{jr} = \bar{A}_{jr} N_{jr}^{\phi_r}$.

- Free entry pins down the size of each firm: $(\mu_s - 1) c_{js} q_{js} = w_j \bar{f}_s$

- CES gravity demand structure pins down the total size of the market: $Q_{js} = (\mu_s c_{js})^{-\eta_s} \Omega_{js}$

Main specification - number of consumer service firms

$$
\begin{aligned}
\ln(N_{jst}) = \frac{1}{1-\phi_s(\eta_s-1)} \times \Bigg[& && \textit{Agglomeration feedback} \\
& - \ln\left(\bar{f}_{st}\right) && \textit{Fixed cost} \\
& + (\eta_s - 1)\ln\left(\bar{A}_{jst}\right) && \textit{Productivity} \\
& + (\gamma_s(1-\eta_s) - 1)\ln\left(w_{jt}\right) && \textit{Wage costs} \\
& + \delta_s(1-\eta_s)\ln\left(P_{jmt}\right) && \textit{Manu. input costs} \\
& + (1-\gamma_s-\delta_s)(1-\eta_s)\ln(P_{jbt}) && \textit{Bus. Serv. input costs} \\
& + \ln\left(\Omega_{jst}\right) \Bigg] && \textit{Demand shifter}
\end{aligned}
$$

Implied regression:

$$
\ln(N_{jst}) = \beta_1 \cdot \ln(mc_{jst}) + \beta_2 \cdot \ln(\Omega_{jt}) + \alpha_{st} + \varepsilon_{jst}
$$

Model captures four channels

$$\ln(N_{jst}) = \beta_1 \cdot \ln(mc_{jst}) + \beta_2 \cdot \ln(\Omega_{jt}) + \alpha_{st} + \varepsilon_{jst}$$

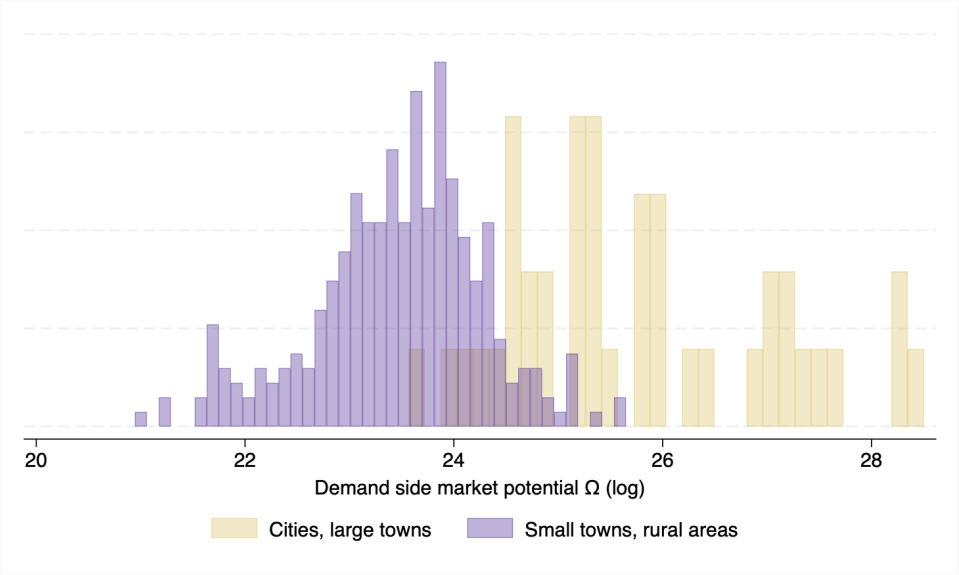
1. Marginal cost falling.
   - Manufacturing and/or business service input cost falling.
     - Trade frictions decreasing (road building).
     - Manufacturing productivity increasing.
   - Labor costs falling.
2. Demand rising.
   - Population (density) increasing.
   - Income rising.
   - Marketisation.
   - Transport frictions falling.
3. Fixed costs falling.
4. Productivity increasing.

Measuring demand for consumer services

$$\Omega_{jt} = \sum_i L_{it} w_{it} T_{it}^{W} \chi_{it} P_{ist}^{\eta_s - \sigma} P_{it}^{\sigma - 1} \tau_{ijt}^{-\eta_s}$$

- η elasticity of substitution across locations: $= 4$
- $w_{it} T_{it}^{W}$ average income $\times$ marketisation: Gross County Product per capita (KNBS)
- L_{it} population: subcounty-level population estimates (WorldPop)
- χ_i formal consumption share: consumption expenditures at formal establishments (Bachas et al., 2023) (KHIBS 2015/16)
- τ_{ijt} iceberg trade cost: $t_{ij}^{-\theta}$ with t = travel time and $\theta = -1$

Market-level demand potential by region



Measuring marginal cost

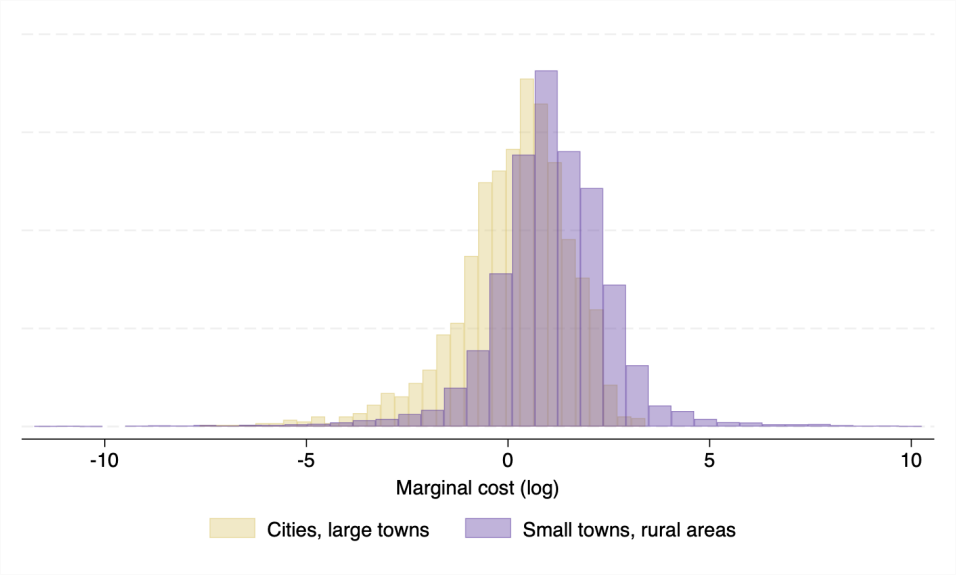
$$\ln(mc_{jst}) = \gamma_s(1-\eta_s) - 1)\ln(w_{jt}) + \delta_s(1-\eta_s)\ln(P_{jmt}) + (1-\gamma_s-\delta_s)(1-\eta_s)\ln(P_{jbt})$$

- η elasticity of substitution across locations: $= 4$
- γ_s labor share: $\frac{payroll}{total\ \ inputs}$
- w_{jt} wages: median formal sector wage in j
- δ_s manufacturing share: $\frac{domestic\ \ manufacturing\ \ inputs+imports}{total\ \ inputs}$
- $ln(P_{jrt})$ price vectors for manufacturing and business service inputs: recovered from firm-to-firm trade gravity equation.

$$\ln(X^F_{ijrt}) = \rho_{irt} + \psi_{jrt} + \theta_r \ln(t_{ijt}) + v_{ijrt}$$

Then as $\psi_{jrt} = \ln((\mu_r c_{jr})^{1-\eta_r})$ captures prices we have $(1-\eta_r) \times \ln\left(\hat{P}_{jrt}\right) = \ln\left(\sum_i e^{\hat{\psi}_{irt}} \cdot t_{ijt}^{\hat{\theta}_r}\right)$

Marginal cost by region



Entry into consumer services is increasing in market-level demand shifters and decreasing in marginal cost.

	All regions		Cities, large towns		Small towns, rural	
	Any	No.	Any	No.	Any	No.
Demand Ω	0.146***	0.492***	0.120***	0.396***	0.048***	0.274***
	(0.004)	(0.023)	(0.009)	(0.036)	(0.006)	(0.042)
Marginal cost	-0.018***	-0.139***	-0.041***	-0.131***	-0.006***	-0.123***
	(0.001)	(0.023)	(0.008)	(0.045)	(0.001)	(0.024)
Mean	0.19	1.05	0.53	1.55	0.13	0.69
No. observations	53,970	10,415	8,421	4,451	45,549	5,947
Sector-year FE	Yes	Yes	Yes	Yes	Yes	Yes

Number of firms in logs. Ω and *mc* are both logged and standardized. Standard errors are clustered at the subcounty x 2-digit sector level.

$$\ln(N_{jst}) = \beta_1 \cdot \ln(mc_{jst}) + \beta_2 \cdot \ln(\Omega_{jt}) + \alpha_{st} + \varepsilon_{jst}$$

Alternative drivers

Alternative explanations

1. Rising tourism. No evidence of different trends in tourist areas.

2. Decentralisation. No evidence County HQs grow differently, local public sector expansion or quasi-random variation in local funds cause shifts.

3. Cost of formal hiring is falling. Being closer to a tax office does not increase formalisation rates.

Tax offices. Return.

- We find no evidence of greater formalisation closer to new tax offices.

	Firms		Sales		Employment	
	Any	No.	Any	KES	Any	No.
Distance to tax office (log, km)	0.019	0.017	0.028	-0.239	-0.010	-0.067
	(0.063)	(0.078)	(0.066)	(0.415)	(0.067)	(0.181)
Tax office within 10km	-0.103***	-0.242***	-0.096***	-0.659***	-0.123***	-0.167***
	(0.017)	(0.027)	(0.016)	(0.078)	(0.017)	(0.063)
Tax office in subcounty	-0.100***	-0.213***	-0.093***	-0.689***	-0.118***	-0.103
	(0.017)	(0.037)	(0.016)	(0.077)	(0.017)	(0.084)
Mean 2016	0.54	1.61	0.54	18.91	0.39	3.36
No. subcounties	293	203	293	199	293	164
No. observations	2,051	1,264	2,051	1,240	2,051	987

All regressions include subcounty and year fixed effects.

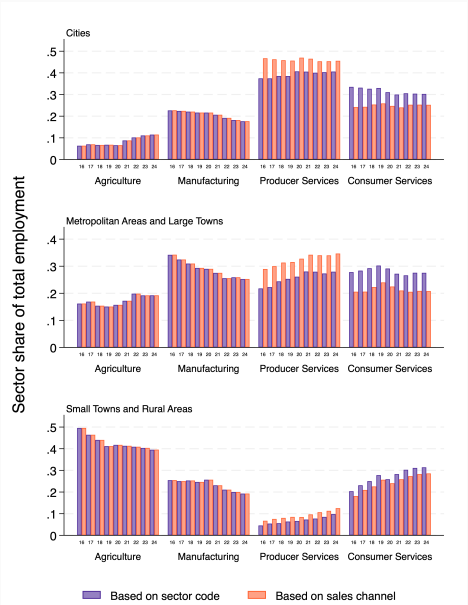
What are the features and drivers of service sector growth in Kenya?

- Both consumer and business services gradually diffuse across space due to
  - Demand rising
  - Cheaper access to inputs

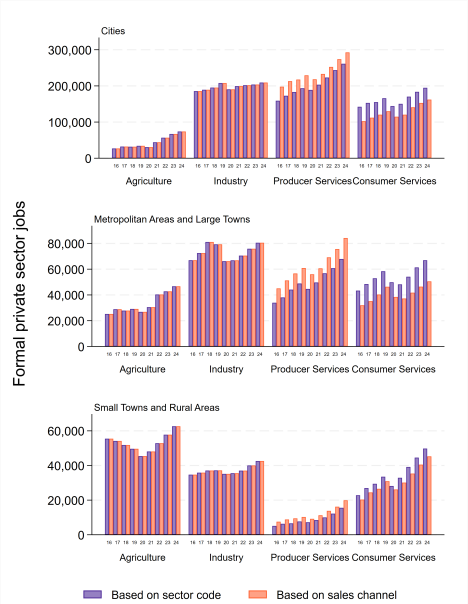
- Next steps:
  - Replicate for business services
  - Introduce IVs for demand and supply side components
  - Quantify relative importance of individual channels

Appendix

Services account for a smaller share of formal sector employment outside cities. Return.



Absolute employment growth across regions.



Decentralisation — County HQ. Return.

All small town and rural areas

Not including tourist destinations

Decentralisation? Return.

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  In 2013 the Government of Kenya amended the constitution to devolve power to county governments ($\sim$ 20% of overall spending).

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- Regression:
  $share_{its} = \beta_s \cdot GovSpendingPop09_{it} + \gamma_s \cdot Pop_{it} + \alpha_i + \phi_{ts} + \varepsilon_{its}$

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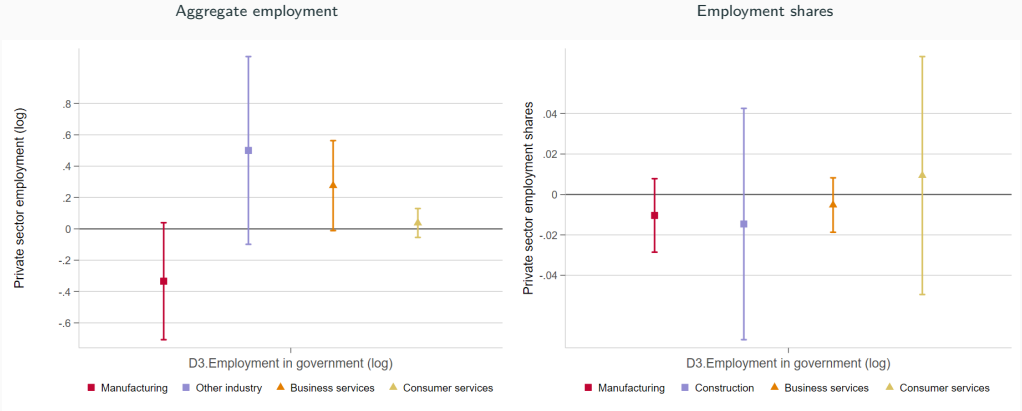
- Quasi-random variation:
  Allocations are based on a known formula that uses populations from the 2009 census and varies over time $\Rightarrow$ conditional on the actual population have random variation within-location in per-capita spending using variation in the formula over time.

- Regression:
  $share_{its} = \beta_s \cdot GovSpendingPop09_{it} + \gamma_s \cdot Pop_{it} + \alpha_i + \phi_{ts} + \varepsilon_{its}$

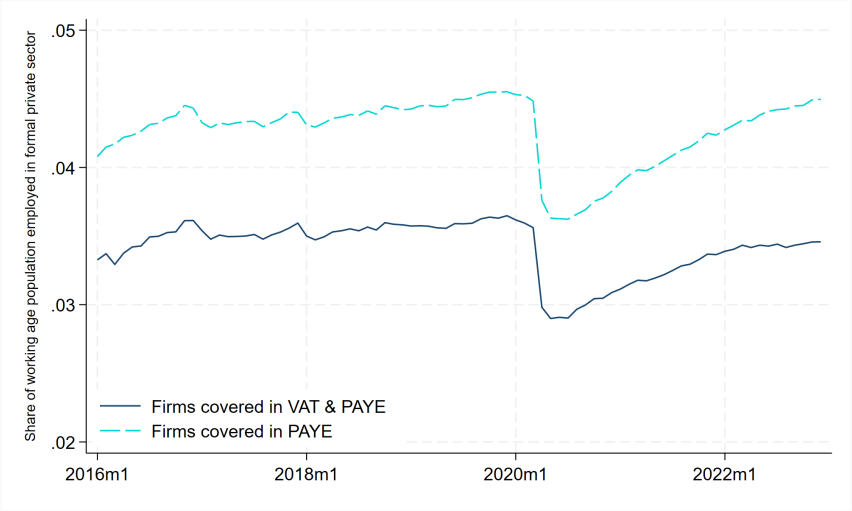
- Results:
  Zero or if anything negative coefficient. Rule out effects larger than 10% of the overall change in consumer service employment proportion in "more rural areas" with 95% confidence.

Decentralisation? Return.



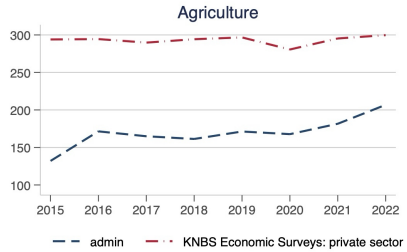
Tourism. Return.

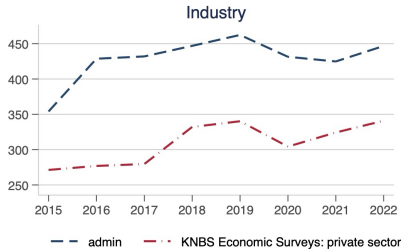
We do not document any rise in formal employment shares.

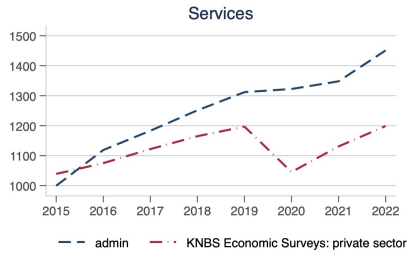


Formal private sector employment as a proportion of the working age population.

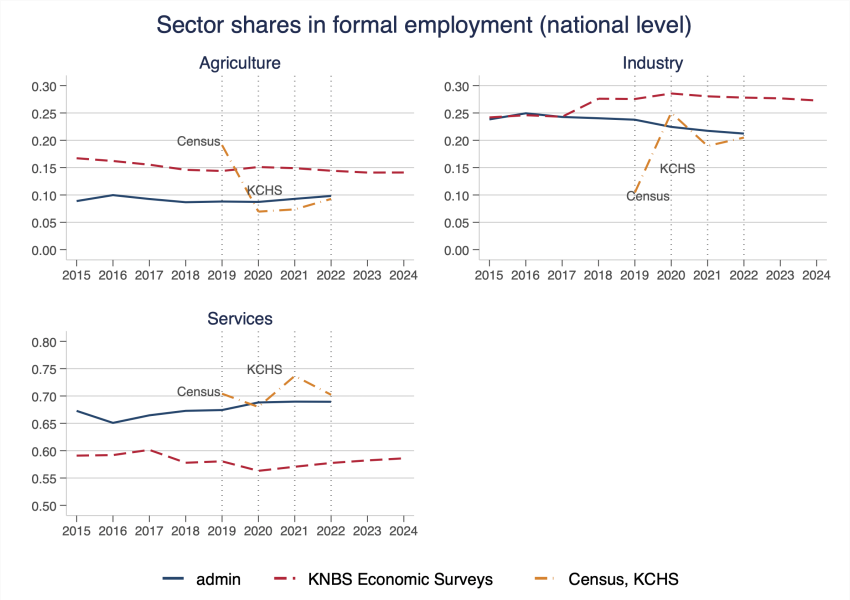
Employment recorded in the administrative data vs by KNBS Return.



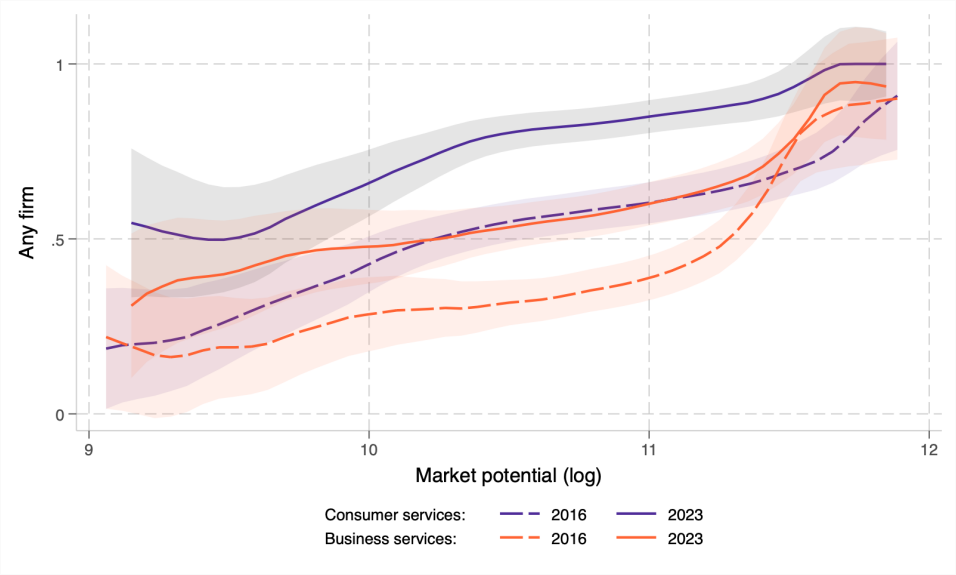




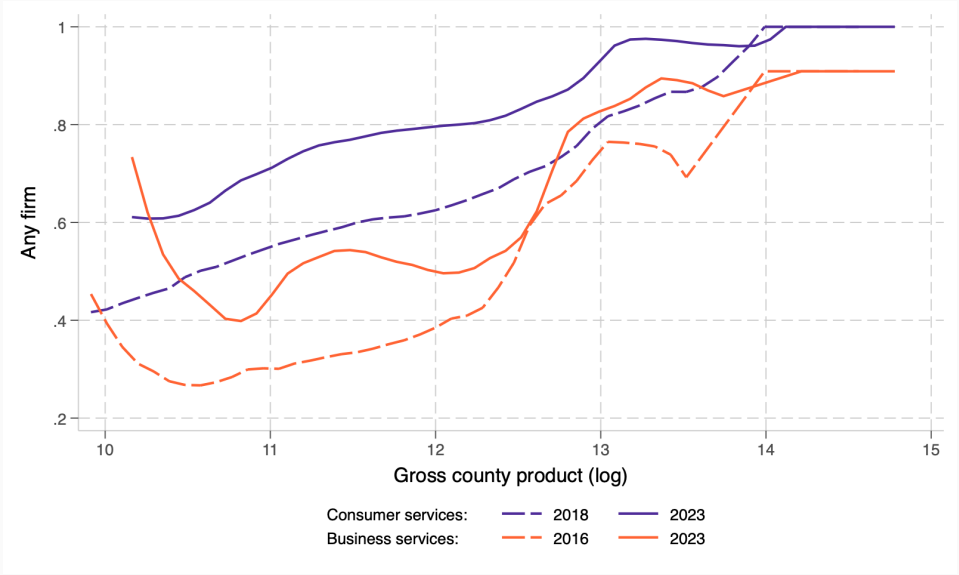
Sector shares admin data vs KNBS economic survey vs KNBS household surveys Return.



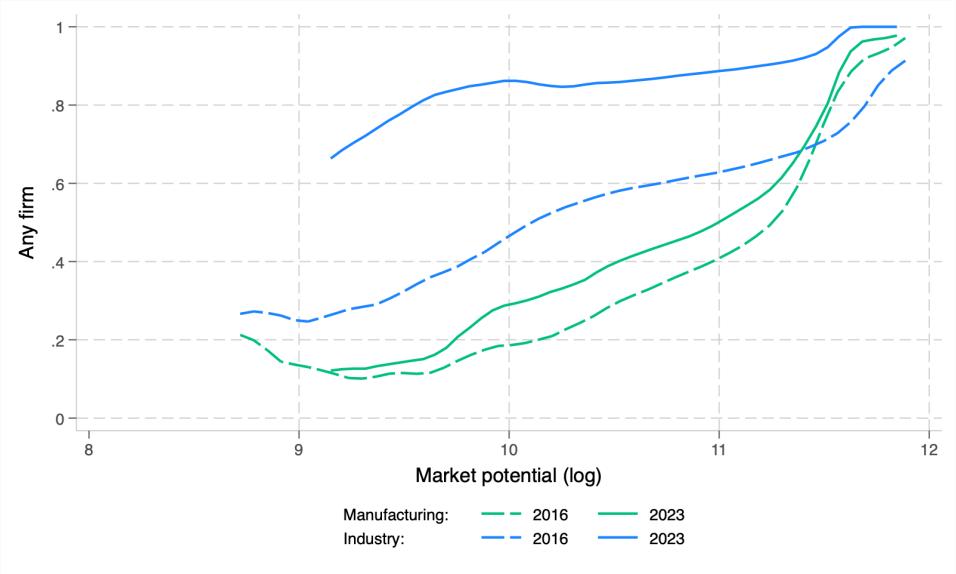
Number of services firms and local market access Return.



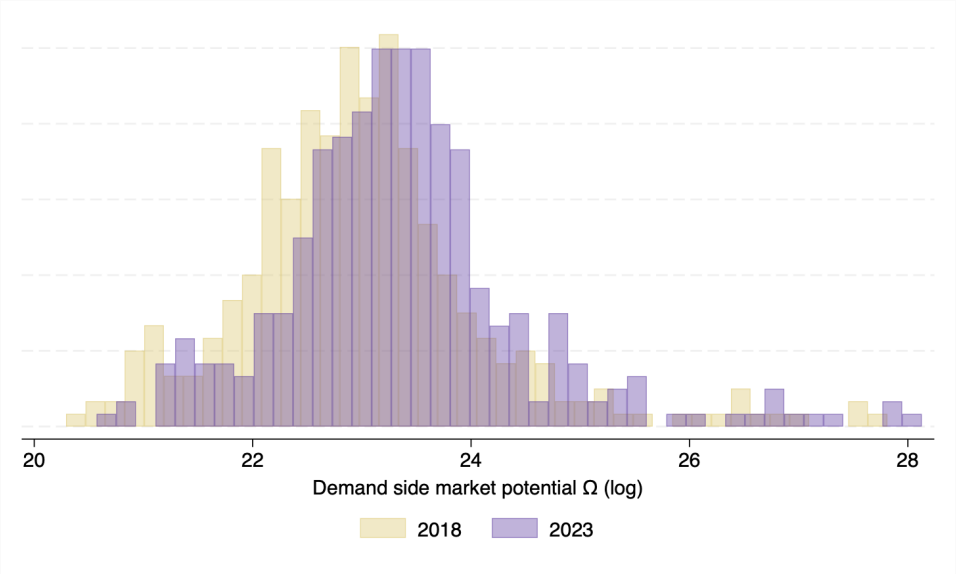
Number of services firms and county-level GDP Return.



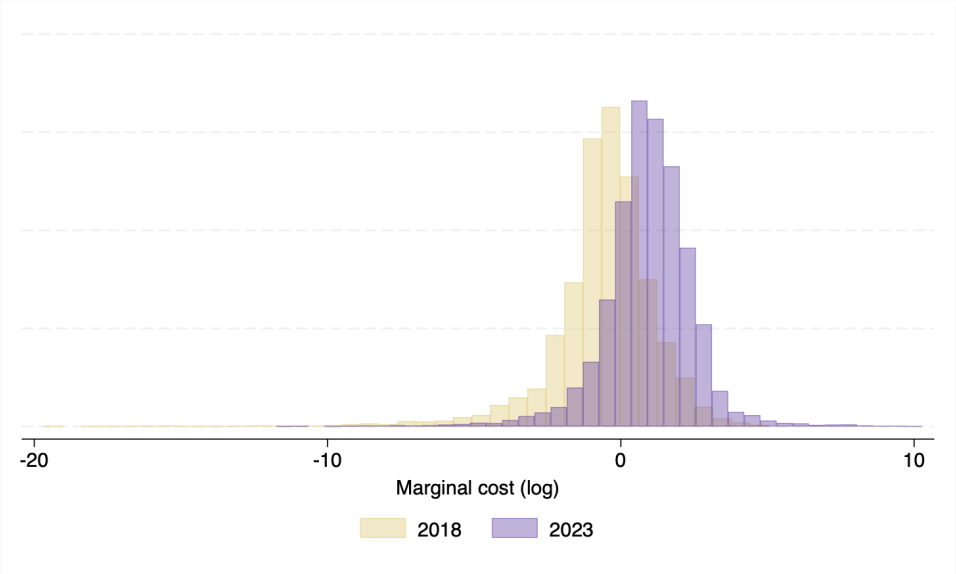
Manufacturing and industry Return.



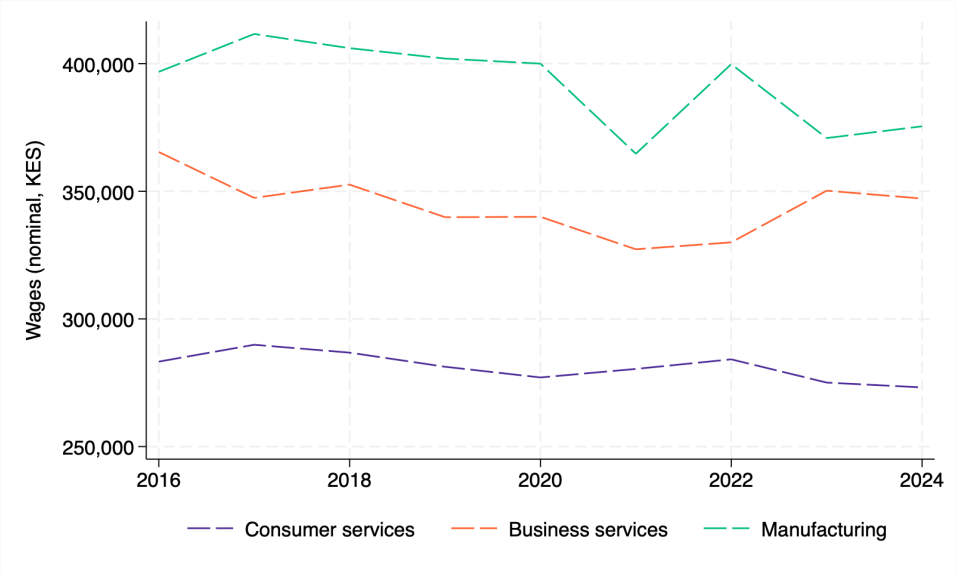
Market-level demand potential over time



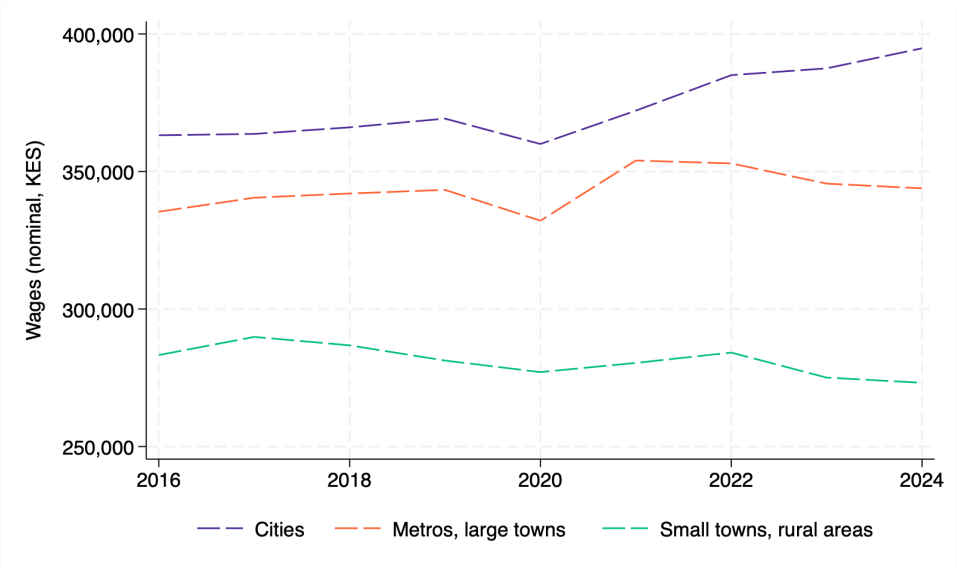
Marginal cost over time



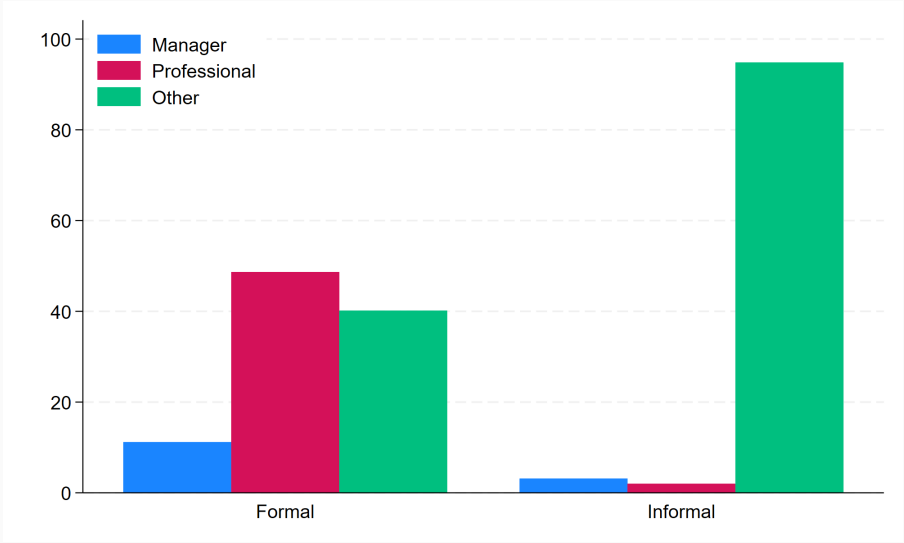
Sectoral median wage in small towns and rural areas return



Regional median wage in consumer services return



Formal jobs are more managerial and professional



Based on labour force module in 2021 Kenya Continuous Household Survey.

More people work as managers and professionals