Consumption Cities vs. Production Cities: New Considerations and Evidence

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December 5, 2021

Abstract

Cities dramatically vary in their sectoral composition across the world, possibly lending credence to the theory that some cities are *production cities* with high employment shares of *urban tradables* while others are *consumption cities* with high employment shares of *urban non-tradables*. A model of structural change highlights three paths through which countries can urbanize via the rise of consumption cities: through resource rents from exporting fuels and mining products, thanks to agricultural exports, and due to deindustrialization. These findings appear to be corroborated when using both country- and city-level data. Compared to industrialized countries, resource-rich and deindustrializing countries have lower shares of urban employment in manufacturing, tradable services and the formal sector, and higher shares of urban employment in non-tradables and the informal sector, especially for larger cities. Results on urban primacy measured in terms of tall and "vanitous" buildings provides additional evidence on the relationship between natural resource exports and the rise of consumption cities.

JEL Codes: E24; E26; O11; O13; O14; O18; R1; R12

Keywords: Structural Change; Urbanization; Consumption Cities; Production Cities; Industrialization; Natural Resource Exports; Deindustrialization; Construction; Primacy

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The period since the early 1960s has been one of rapid urbanization in developing countries (World Bank, 2009; United Nations, 2018). This process has been linked to a virtuous circle between economic development and urbanization (Henderson, 2010; Duranton, 2015). However, urbanization can also proceed without growth (Bairoch, 1988; Fay and Opal, 2000; Glaeser, 2014; Jedwab and Vollrath, 2015; Castells-Quintana, 2017).

In the macro-development literature, urbanization is often a by-product of structural change. As countries develop, people move out of agriculture and engage in urban-based manufacturing and service activities. Structural change occurs due to *Green Revolutions*, i.e. increases in food productivity that solve the food problem and push labor out of agriculture (Matsuyama, 1992; Gollin et al., 2002, 2007; Restuccia et al., 2008; Yang and Zhu, 2013; Gollin et al., 2018). Alternatively, countries experience *Industrial* or *Service Revolutions*, i.e. increases in manufacturing or service productivity that pull labor out of agriculture (Hansen and Prescott, 2002; Lucas, 2004; Alvarez-Cuadrado and Poschke, 2011). Ultimately, the labor share of urban activities increases (Herrendorf et al., 2014).[1]

Relatedly, Gollin et al. (2016) (henceforth GJV16) showed that only in some developing countries rapid urbanization has been accompanied by industrialization, thus following the historical patterns observed in Europe or North America. Manufacturing and tradable services agglomerated in *production cities*, implying their growth was driven by the countries' increased *production* capacity. In others, urbanization occurred differently as the spending of resource rents on urban goods and services led to growing *consumption cities*, implying their growth was driven by increased *consumption* capacity. In these cities, since manufactured goods and tradable services – *urban tradables* – are often imported, non-tradable services – *urban non-tradables* – dominate their sectoral composition.

Whether a country has mostly production cities or consumption cities could matter for economic growth. First of all, productivity in manufacturing and tradable services varies little across countries (Duarte and Restuccia, 2020). Hence, there are possibly large losses from having lower employment shares of urban tradables. Second, within a same country, productivity and wages may be higher in urban tradables than in urban non-tradables. Finally, returns to experience are higher, and human capital accumulation

[1] Other mechanisms include quality-of-life amenities (Jedwab and Vollrath, 2019; Gollin, Kirchberger and Lagakos, 2021), demographic growth (Jedwab et al., 2017, 2021a), urban-biased policies (Lipton, 1977; Ades and Glaeser, 1995; Davis and Henderson, 2003), food imports (Glaeser, 2014), urban technology (Jedwab et al., 2021c), and natural disasters (Barrios et al., 2006; Henderson et al., 2017; Jedwab et al., 2021b).

faster, in urban tradables than in urban non-tradables (Islam et al., 2019). Agglomeration economies might also be weaker in urban non-tradables (Burger et al., 2021).

This paper provides additional evidence that the "origin" of a country's urbanization process matters for the "type" of cities that emerge in that country, and possibly their productivity potential. We first establish that, for a given population size and a given level of urban economic development, cities dramatically vary in their sectoral composition across the world today. Using census data for about 65 countries, we obtain the sectoral composition of almost 7,000 agglomerations comprising three fourths of the world's urban population today. We then classify them as "production cities" or "consumption cities", depending on their relative employment share of manufacturing and tradable services. We also use our classification to highlight novel stylized facts related to the global distribution of urban employment and uncover a puzzle: How to explain that cities, not just countries, can experience different patterns of structural change?

We extend the theoretical analysis of GJV16, who show that countries can urbanize because of *industrialization* broadly defined (which includes tradable, or "industrialized", services) or because they export *natural resources*. In their model, an increase in resource export earnings raises incomes and consumption. The resource export earnings are used to import food and other tradable goods whereas the higher demand for urban non-tradables is met by an increase in labor in that sector. Since the rural sector contracts, the country urbanizes. However, urbanization generated by resource rents differs from industrialization-led urbanization in that cities will have different employment shares of urban tradables and urban non-tradables. We consider two other paths of urbanization. In GJV16, resources only include fuels, mineral products, and a few high-rent cash crops, which require little labor.[2] Yet, many countries export *agricultural products*, including food crops. Their production generates rents, however, it also requires rural labor. As such, the urbanization effects of an increase in agricultural export earnings are ambiguous. We show that, under a reasonable set of assumptions, the urbanization rate should still increase. The agricultural export earnings can indeed be used to import additional food and other tradable goods. Much like what can be observed for non-agricultural resources, cities in these countries will also have relatively high employment shares of urban non-tradables. However, the effects should be weaker than for fuels and mineral products.

[2] They only consider cocoa, coffee, cotton, groundnuts, rubber, sugar, and wood.

Next, many countries have experienced "premature" *deindustrialization* (Rodrik, 2016), whether due to the removal of import substitution industrialization policies that were adopted by many nations from the 1950s to the 1980s, or increased trade competition due to trade agreements or rising industrial productivity in competing nations (due to reforms or automation). We discuss why such cases may not lead to de-urbanization. However, since the country experiences deindustrialization, its cities do so as well.

Thus, we highlight *three* different paths leading to consumption cities: exporting fuel & mining products, exporting agricultural products, and deindustrializing. Using GJV16's sample of 116 developing countries (as of 1960) and long-difference and panel regressions for the period 1960-2020, we show that: (i) higher urban shares are found in countries with higher GDP shares of manufacturing & services, a proxy for industrialization broadly defined (including tradable services); (ii) countries exporting natural resources, whether fuel & mining products *or* agricultural products, are also more urbanized; and (iii) urban shares are unchanged in deindustrializing countries.

Second, we take advantage of newly available data, including IPUMS census microdata for about 60 countries over time and I2D2 household and labor force survey data for about 90 countries over time, to examine the correlations between the sectoral structure of urban areas and industrialization, resource exports, and de-industrialization.[3] We study sectors not covered in GJV16, use panel regressions, and identify which parts of the city size distribution (i.e., small or large cities) are affected. We also consider gender-specific employment and informality. Cities in industrialized countries have more employment in urban tradables and more wage employment, while cities in resource-rich or de-industrializing countries have higher employment shares of urban non-tradables and higher self-employment shares. The difference between the employment shares of non-tradables in industrialized countries vis-a-vis those in resource-rich or de-industrializing countries grows with city size. Thus, the urbanization process' origin may impact the largest cities, hence countries' "engines of growth" (World Bank, 1999, 2009).

Third, we study the global spatial structure of cities, not just their economic structure. We take advantage of novel data on urban construction across countries to shed light on the "quality" of the spending of resource rents in cities, for example whether they lead

[3]The *International Income Distribution Database* (I2D2) of the World Bank's *World Development Report* unit consists of 1,500 individual-level household/labor force surveys. Details will be provided in Section 4..

to “white elephant” projects. We make use of a remarkable data set that inventories all the world’s tall buildings (buildings above 80 meters), with information on their year of construction and height. Long-difference and panel regressions suggest that exporting natural resources correlates with the construction of tall buildings whose economic rationale is questionable. For example, the distribution of tall buildings in resource-rich countries is skewed towards very tall buildings. In addition, various “vanity” measures suggest they use more space for a given square footage of floor area. Relatedly, resource-rich countries do not have a larger (overall) construction sector, as measured by cement consumption or construction GDP or employment. Thus, it might be that the expansion of their tall building sector came at the expense of construction in the non-tall sector.

Fourth, an important theme in the literature is the fact that urban-biased policies causes urban primacy (Ades and Glaeser, 1995). In particular, governments use resource rents to implement policies that disproportionately favor the largest city (Bates, 1981). However, using both country- and city-level data, we do not find that resource-rich countries have relatively larger primate cities. Indeed, mining and agricultural exports may lead to the relative growth of mining towns and agro-towns. In addition, the construction results may explain why we do not find higher primacy rates, since urban primacy captures the relative number of residents of the largest city instead of their relative stock of physical capital (of which tall buildings are an important component).

In addition to the structural change literature, we contribute to the macro-development literature on the determinants and characteristics of urbanization across countries (Gollin, Lagakos and Waugh, 2014; Gollin, Jedwab and Vollrath, 2016; Jedwab and Vollrath, 2019; Gollin, Kirchberger and Lagakos, 2021). We study the links between changes in economic and export structures and the nature of the urbanization process, as well as urban structural change at the city level, not just country level.

Our results are not causal. Much like the macro-development literature, we use a model of structural change and data to establish new stylized facts regarding the development process (in this case, how it interacts with the urbanization process). We consider the potential effects of various factors rather than focusing on identifying a clean effect for one of them, which would not be credible anyway since we compare countries. Instead, our methodology is to generate a number of theoretical predictions and empirical results that collectively contribute to corroborating, but not proving, our main messages.

Consumption cities differ from the *consumer cities* in the literature on amenities. In our case, resource-rich countries experience the rise of consumption cities due to their increased consumption capacity. Deindustrializing countries see their consumption cities grow because their production cities lose their production capacity. Analyses on consumer cities do not compare the urbanization process *across* countries. They rely on the Rosen-Roback model to show that, *within* a country, cities with better amenities attract residents that accept lower wages and/or higher rents to live there (Glaeser et al., 2001; Glaeser and Gottlieb, 2009). See Gollin, Kirchberger and Lagakos (2021) for an exception.

The paper is structured as follows. Section 1. discusses the data and methodology used to classify world cities into production cities or consumption cities. Section 2. presents a model of structural change and urbanization and four propositions that guide our empirical analysis in Section 3. on the respective roles of natural resources, industrialization, and de-industrialization in urbanization. Section 4., 5. and 6. turn to the role of these mechanisms for urban employment, construction, and urban primacy, respectively. Section 7. discuss the role of consumption cities in aggregate growth.

1. The Global Sectoral Composition of Cities

It is not obvious how cities of the same population size and located in countries with similar levels of economic development differ globally. Using cross-sectional data on the urban sectoral composition of selected countries, GJV16 find examples of countries where urban areas have high shares of *urban tradables*, in which they include manufacturing (MFG) and FIRE (FIRE stands for "finance, insurance, and real estate" and also comprises business services). They also find examples of countries where urban areas have high shares of *urban non-tradables*, for example in the (non-tradable) wholesale and retail sector.

Their analysis is cross-sectional and focuses on the urban sector as a whole. In particular, GVJ16 rely on IPUMS census microdata (Minnesota Population Center, 2020) and census and survey reports. Many countries have since added censuses to the IPUMS repository and consistent GIS files corresponding to the second level administrative units in which the household was enumerated have also been released[4]. In addition, the GHSL-OECD database of the OECD and the European Union provides geocoded polygons of urban extent boundaries for the whole world c. 2015 (Schiavina et al., 2019). More precisely, this database uses satellite data on built-up area to identify "Functional Urban

[4]These would correspond to *counties* in the U.S. and *municipalities* in most Latin American countries.

Areas" (FUAs), i.e. commuting zones of at least 50,000 inhabitants today. Combining the two data sets, we obtain the sectoral composition of a very high share of world cities. Using a simple methodology, we then classify each city as being a *production city* – a city with a disproportionately high share of employment in urban tradables – or a *consumption city* – a city with a disproportionately low share of employment in urban tradables.[5]

Data. For 66 countries and 154 country-years (1960-2015), we have IPUMS census micro-data with information on the administrative unit in which the respondent lives *and* whether the respondent lives in an "urban" area as well as the respondent's sector.

First, we only select "urban" observations.[6] Second, we have information on the resident's second level administrative unit, and such units are typically smaller than FUAs. In some cases, information is only available for third or first level administrative units.[7] Third, IPUMS classifies employment into "twelve groups that can be fairly consistently identified across all available samples. The groupings roughly conform to the International Standard Industrial Classification." We focus on the employment share of urban tradables, hence manufacturing (MFG) and FIRE. We could have alternatively focused on urban non-tradables but it is not yet clear which sectors should be included. Having obtained urban employment data for each administrative unit (1960-2015), our next step is to use these data to obtain the desired employment shares for each FUA.[8]

Next, we focus on the global distribution of urban employment c. 2000. Indeed, censuses only take place every 10-15 years. To ensure that we have enough countries for our comparison, we select for each country-FUA the closest observation to the year 2000 (within the 1990-2015 period). Doing so, we are left with 6,812 FUAs in 63 countries.

Finally, we need data on the population size of each FUA c. 2000. GHSL-OECD reports their population for the "epoch 2015". However, population is almost always estimated for earlier years. In many cases, the last census indeed took place in the 2000s.

Sampling. The 6,812 FUAs include 3 billion people and represent 75% of the 9,031 world

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[5] We interchangeably use the words "FUAs", "agglomerations" and "cities" in the rest of the analysis.

[6] In a few cases, the urban variable is not available. We then identify urban observations by using information on the metropolitan area or information on the population size of the respondent's locality.

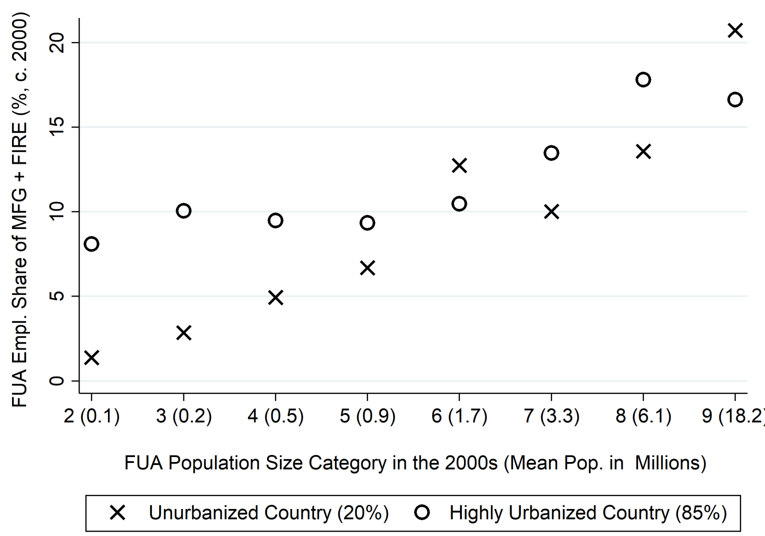
[7] While using third level administrative units improves precision, using first level administrative units leads to coarser estimates of sectoral shares, especially if there are several FUAs within the same unit. In that case, all FUAs in the same first-level unit have the same composition in our data.

[8] Most administrative units are contained within a FUA. However, units located at the edge of a FUA only partially overlap with it, and units are sometimes bigger than FUAs. We then make small adjustments.

FUAs. Kolmogorov–Smirnov tests confirm that the distribution of city population sizes is not significantly different between our sample and the world. However, a few large developed countries are missing in IPUMS. To increase our sample's representativeness, we divide all the countries in the world in ten deciles based on their log per capita GDP c. 2000 (in PPP terms).[9] We then obtain the share of each decile in the world's total urban population and compare these shares to the shares in our sample. Based on the differences, we create weights that over-sample developed countries in our data.

Methodology. We aim to identify which cities have high shares of MFG+FIRE relative to other cities of the same population size and for a given level of urban economic development. We categorize the FUAs in 10 bins. Since log population goes from 10.8 (50K) to 17.2 (30 million), the bins are created using 9 thresholds: 11.5 (95K), 12.1 (180K), 12.7 (341K), 13.4 (648K), 14.0 (1,227K), 14.7 (2,306K), 15.3 (4.377K), 15.9 (8,351K), 16.6 (15,570K). Since the top two bins have few FUAs, we aggregate them together.

Figure 1: Employment Share of Urban Tradables by City Size, Cross-Section, c. 2000



Notes: This figure shows the implied relative employment share of MFGFIRE for the various population size categories in mostly unurbanized countries (urbanization rate = 20%) and highly urbanized countries (85%). In both countries, the shares are estimated relative to the omitted category (50K-95K).

For the 6,812 FUAs, we then run a simple regression relating their employment share in MFG+FIRE (%) c. 2000 to 8 population size category (CAT) dummies (omitting the lowest size category, hence 50-95K) and their interactions with the 2000 urbanization rate (URB) of the FUA's country. We also add a dummy if the FUA is the capital city of the

[9] The main source used for GDP is the *World Development Indicators* database of the World Bank.

FUA's country in 2000 (CAP), since capital cities have skewed employment shares. More specifically, for FUA a in country c and population size category p, the model is:

$$\text{MFGFIRE}_{a,c,2000} = \alpha + \Sigma_{p=2}^{9}\beta_p \mathbb{1}(\text{CAT}_a = p) + \Sigma_{p=2}^{9}\gamma_p \mathbb{1}(\text{CAT}_a = p) * \text{URB}_c + \delta\text{URB}_c + \zeta\text{CAP}_a + \mu_a$$

Finally, we use as weights the populations of each FUA. However, to ensure sample representativeness, we modify the weights so as to oversample richer countries.

While Web Appx. Table D.1 reports the estimated coefficients, Figure 1 above shows the implied relative employment share of each population size category for a mostly unurbanized country (urban share = 20%) and a highly urbanized country (85%). More urbanized countries have higher urban shares of MFG+FIRE. The share is higher for smaller cities, consistent with MFG moving away from larger cities as countries develop.

Next, we interpret the regression residuals as measuring to what extent the FUA has a disproportionately high, or low, MFG+FIRE share (%) given its population size and its country's level of economic development. The 5th, 10th, 25th, 75th, 90th and 95th percentile values in the residuals are about -15, -10, -5, 5, 10 and 15.

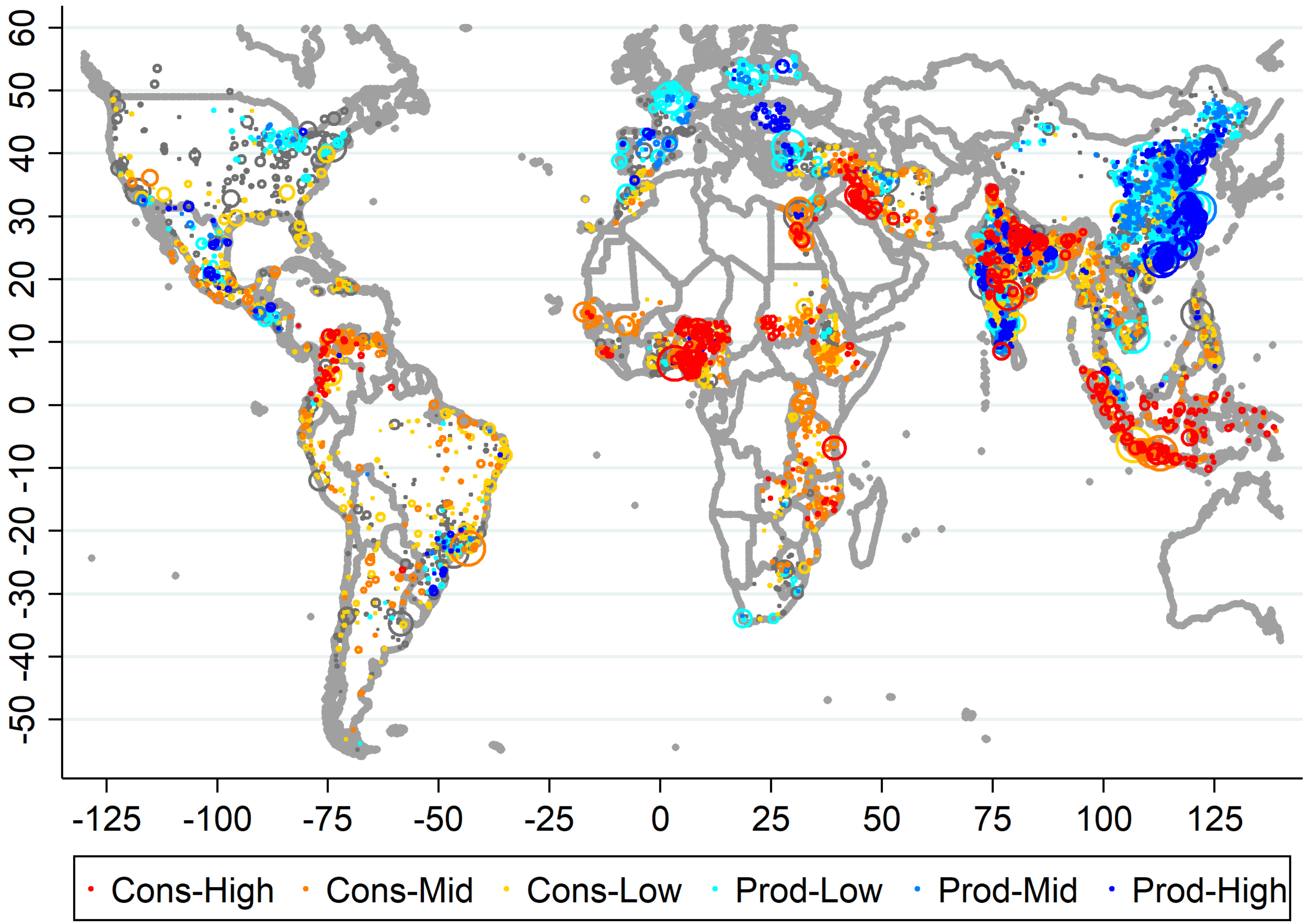
Classification. In our classification, a *production city* is any FUA with a residual value above 5, indicating a city with a disproportionately *high* share of employment in urban tradables. Our definition further distinguishes production cities with a "low" (5-10), "medium" (10-15) or "high" (15+) value. A *consumption city* is any FUA with a residual value below -5, also distinguishing consumption cities with a "low" (-5;-10), "medium" (-10;-15) or "high" (-15+) value. Cities in the [-5; 5] range are *neutral*.

Mapping. Fig. 2 below shows production (in blue), consumption (red), and neutral cities (grey) c. 2000. The size of each bubble is proportional to the FUA's size and paler shades of the blue and red colors indicate lower values for the extent to which a city can be classified as a production or consumption city. Production cities are located in China and Europe, and parts of the U.S., Mexico, Brazil and India, while consumption cities are located in Africa, the MENA, South America, and parts of South-East Asia. Theil decompositions then shows that 45% of the global variation comes from differences *across* countries[10]

The patterns for Asia, Africa, Europe and North and South America are shown in Web Appx. Fig. D.1-D.5. As discussed in Web Appx. Section A, they conform with our priors.

[10]Most of China's cities are classified as production cities (Web Appx. Fig. D.1) whereas India has a mix of cities (Ibid.). Different configurations within a same country are thus possible and frequent.

Figure 2: World Map of Production Cities and Consumption Cities, Data for 63 Countries, c. 2000

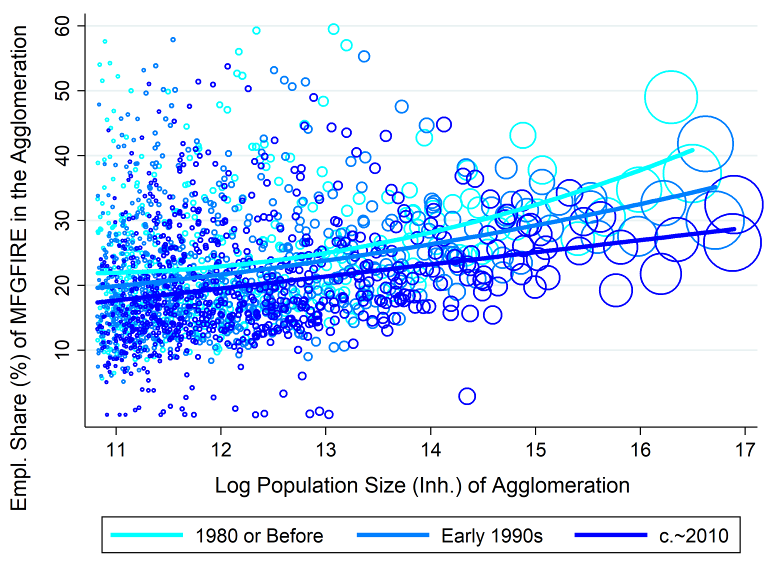


Notes: This figure shows for 63 countries in the world the location of production cities (Prod.; in blue), neutral cities (in grey), and consumption cities (Cons.; in red), based on our analysis and our arbitrary definitions. High, Mid and Low correspond to high, medium and low values.

We also compare FUAs whose population exceeds 10 million people. The list shown in Table 1 below includes only the FUAs for which we have employment data ("Residual" is the value used to classify cities). Mega production cities include Ho Chi Minh, Bangalore, Istanbul and Paris as well as all Chinese megacities. Mega consumption cities include Kolkata and Chennai, two historically important Indian cities that have been growing slower than Bangalore or Delhi, as well as Lagos, Jakarta, Rio de Janeiro and Surabaya.[11]

Finally, we show how, for a given population size, cities in Latin America and the Caribbean (LAC) have experienced sectoral employment changes over time. We use FUA data for 8 countries to estimate the mean population-weighted urban employment share of urban tradables for the whole region and the periods "pre-1980" (observations from 1962 to 1982; mean = 1978), "early 1990s" (1990-1994; 1991) and "c. 2010" (2001-2012;2009). As seen in Figure 3 below, MFG+FIRE employment has been declining over time. The evolution of LAC's urban system was then driven by its largest cities, as the decline at the "top" is 15 percentage points while the decline at the "bottom" is 5 percentage points. Large LAC cities have thus increasingly become consumption cities.[12]

Figure 3: MFGFIRE Employment in Cities, Latin America & the Caribbean 1960s-2010s



Notes: Figure created using FUA-specific data for 8 countries covering 85% of LAC's population today: Argentina (1980, 1991, 2001), Bolivia (1976, 1992, 2012), Brazil (1980, 1991, 2010), Chile (1982, 1992, 2002), Colombia (1973, 1993, 2005), Ecuador (1962, 1990, 2006), Guatemala (1981, 1994, 2002), Mexico (1970, 1990, 2010), Panama (1980, 2010), Paraguay (1982, 1992, 2002), Peru (1993, 2017), Venezuela (1981, 1990, 2001).

[11]Web Appx. Fig. D.6 separately considers MFG and FIRE, classifying cities according to their "best" sector. While some cities are production cities because of their high MFG shares (e.g., Guangzhou and Ho Chi Minh), other cities have high shares of FIRE (e.g., Bangalore and Paris).

[12]Web Appx. Fig. D.7 shows how this evolution was driven by declines in the employment share of MFG.

Table 1: Production/Consumption City Classification for the Largest World Cities, c. 2000

Rank	Name	Category	Residual (Pct)	Pop. 2000s (Mil.)	Country
1	Delhi	Neutral	-1.7	30.1	India
2	Jakarta	Cons-Low	-5.3	29.8	Indonesia
3	Shanghai	Prod-Mid	10.2	26.9	China
4	Manila	Neutral	1.6	25	Philippines
5	Cairo	Neutral	-0.8	23.5	Egypt
6	Kolkata	Cons-Low	-5.8	23.1	India
7	Mumbai	Neutral	-2.1	22.3	India
8	Sao Paulo	Neutral	0.5	21.7	Brazil
9	Mexico City	Neutral	1.6	21.4	Mexico
10	Beijing	Neutral	3	21.3	China
11	New York	Neutral	-4.4	19.5	USA
12	Guangzhou	Prod-High	15.7	16.7	China
13	Bangkok	Neutral	1.3	16.3	Thailand
14	Los Angeles	Neutral	-2.5	15.7	USA
15	Buenos Aires	Neutral	0.3	15	Argentina
16	Istanbul	Prod-Low	6.3	14.8	Turkey
17	Tehran	Neutral	1.2	13.4	Iran
18	Ho Chi Minh	Prod-Low	6.6	12.8	Vietnam
19	Jieyang	Neutral	-3.1	12.7	China
20	Lagos	Cons-High	-18.1	12.3	Nigeria
21	Bangalore	Prod-Low	5.3	11.9	India
22	Chengdu	Cons-Low	-6.7	11.7	China
23	Suzhou	Prod-Low	9.9	11.4	China
24	Paris	Prod-Low	7.7	11.2	France
25	Rio de Janeiro	Cons-Mid	-10.2	10.8	Brazil
26	Surabaya	Cons-Mid	-11.7	10.8	Indonesia
27	Chennai	Cons-Low	-8.8	10.6	India

Notes: This table classifies 27 ten million plus cities into production cities or consumption cities.

Robustness. We obtain similar results if we (Web Appx. Section B): (i) include the square, cube and perfect fourth of the urban share, and their interactions with the population dummies, in case there are non-linearities; (ii) use log per capita GDP instead of the urban share or control for the urban definition used by each country;[13] (iii) compare the raw (i.e. non-residualized) employment shares; (iv) use alternative weights or ignore the weights; (v) consider other classifications for the population dummies; and (vi) study urban non-tradables. Since our residuals are estimated relative to similar cities in the world, we may worry that adding more countries to the analysis could change the results. However, our sample captures close to three fourths of the world's urban population, which limits such possibility. In addition, results are very similar if we use the raw employment shares.

To conclude, *ceteris paribus* cities dramatically vary in their sectoral composition across the world. Half of the variation comes from differences across countries, suggesting an important role for aggregate structural change. Important cross-sectional differences and evolutions are then observed for the largest cities in the world. To better understand why

[13] We also discuss why results should not depend on countries using various urban definitions.

consumption cities may grow, in the next section we discuss a model of structural change.

2. Theoretical Insights: Paths to Consumption Cities

As in GJV16, we consider four sectors. The urban economy has a *tradable sector* (e.g., MFG + FIRE) and a *non-tradable sector* (e.g., wholesale and retail trade). The rural economy has an *agricultural sector*, which produces a tradable agricultural good (mostly crops, but also livestock). A *natural resource* R is an endowment that is internationally traded and is a source of foreign exchange earnings. Natural resources include fuels and mining products but also, for the sake of simplicity, cash crops characterized by high rents.

The model offers several paths to consumption cities. A commodity boom due to a resource discovery or a boost to commodity prices on account of strong external demand boosts resource revenues R and influences urbanization/cities through two channels: (i) an income effect, which through non-homotheticicities in the domestic demand for food pulls workers into urban sectors; and (ii) export earnings increase domestic demand for non-tradable services and pull workers away from agriculture and manufacturing.

Unlike GJV16, we also consider faster productivity growth in agriculture, which has an income effect and a foreign earnings effect if the country exports agricultural products, which increases demand for, and employment in, urban non-tradables. However, if the level of agricultural productivity is not high enough, this increase may pull workers back to agriculture in order to meet the food sufficiency requirement. Some crops then "behave" as a pure natural resource, in which case their effects go through R. Whether the country urbanizes on account of fuels/mining or agricultural exports, its employment shares of urban non-tradables is high and its cities become consumption cities.

De-industrialization is another path not considered in GJV16. De-industrialization can occur due to the removal of ISI policies or due to increased trade competition from nations with a comparative advantage in industry. Likewise, trade competition might lead a country to experience a relative decline in its tradable sector. We discuss why such cases may not lead to de-urbanization, but "consumption" cities in urbanized nations.

2.1. Set-Up

We assume a log-linear utility function over the consumption of rural agricultural products (c_f), urban tradables (c_m), and urban non-tradables (c_n):

$$U = \beta_f ln(c_f - \underline{c}_f) + \beta_m ln(c_m) + \beta_n ln(c_n) \quad (1)$$

where expenditures shares β_f, β_m, and β_n are between 0 and 1 and sum up to 1, and $\underline{c}_f$ is the subsistence level of agricultural consumption. With income elasticity for agriculture less than one, any income increase drives up the budget shares of urban tradables and non-tradables. For the sake of simplicity, production in each sector only requires labor:

$$Q_j = A_j L_j^{1-\alpha}. \tag{2}$$

L_j is the share of workers in each sector $j \in \{f, m, n\}$, and A_j is sector-specific productivity. Agricultural commodities produced mostly for export and mostly with land or capital and little labor are included in resource endowments R. Thus, the agricultural sector comprises other agricultural subsectors, including subsistence food crops. The prices of urban tradables and agricultural products are assumed to be exogenous (*) and the budget constraint of the individual is: $z = p_f^* c_f + p_m^* c_m + p_n c_n$.

Since the household first covers its agricultural subsistence requirement and urban non-tradables are produced only domestically, the total expenditure on urban non-tradables equals the value of their production:

$$\beta_n(z - p_f^* \underline{c}_f) = p_n Q_n \tag{3}$$

Assuming balanced trade, the following accounting relationship must hold, where R is the revenue from exporting natural resources and both agricultural products and urban tradables can be produced domestically, imported from the rest of the world, or exported:

$$(\beta_f + \beta_m)(z - p_f^* \underline{c}_f) + p_f^* \underline{c}_f = R + p_f^* Q_f + p_m^* Q_m \tag{4}$$

With perfect labor mobility, wages equalize across any two sectors j and $k \in \{f, m\}$:

$$(1-\alpha) p_j^* A_j L_j^{-\alpha} = (1-\alpha) p_k^* A_k L_k^{-\alpha} \tag{5}$$

The above relationships are used to determine the implicit function for the allocation of labor in the non-tradable urban sector:

$$L_n = \beta_n \left(1 + \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(R - p_f^* \underline{c}_f \right) \right). \tag{6}$$

$\underline{A} = \left[(p_m^* A_m)^{\frac{1}{\alpha}} + \left(p_f^* A_f \right)^{\frac{1}{\alpha}} \right]^{\alpha}$ is a composite measure of agricultural productivity and productivity in urban tradables. Given L_n, the rest of labor is allocated to the tradable sectors in proportion to the relative productivity in agriculture and tradable non-agriculture:

$$L_m = (1 - L_n) \left(\frac{p_m^* A_m}{\underline{A}} \right)^{\frac{1}{\alpha}} \tag{7a}$$

$$L_f = (1 - L_n)\left(\frac{p_f^* A_f}{\underline{A}}\right)^{\frac{1}{\alpha}} \tag{7b}$$

The urbanization rate, U, is then simply $U = L_m + L_n$.

2.2. Main Predictions

We obtain four predictions (Web Theory Appendix C provide details and proofs):

Proposition 1 (Urbanization through commodity rents and "consumption cities")

$$\frac{\partial U}{\partial R} > 0, \frac{\partial L_n}{\partial R} > 0, \frac{\partial L_m}{\partial R} < 0, \frac{\partial L_f}{\partial R} < 0$$

Proposition 1 reiterates GJV16's result that resource revenues R offer a path to urbanization U and the emergence of "consumption cities" (see Web Theory Appx. C1. for details). Indeed, employment in urban non-tradables L_n is increasing in R whereas employment in manufacturing and tradable services L_m is decreasing in R. In other words, a positive shock to R (e.g., a resource windfall) leads to the emergence of "consumption cities". The overall effect on urbanization U is also positive.

Proposition 2 (Productivity growth in agriculture and "consumption cities")

So long as $R < p_f^* \underline{c}_f$, given $y = p_f^* A_f$, it follows that:

$$\frac{\partial L_n}{\partial y} > 0,\ \frac{\partial L_m}{\partial y} < 0$$
$$\frac{\partial U}{\partial y} < 0,\ \frac{\partial L_f}{\partial y} > 0,\ if\ \alpha(p_f^* A_f)^{\frac{1}{\alpha}} < (p_m^* A_m)^{\frac{1}{\alpha}}$$
$$\frac{\partial U}{\partial y} > 0,\ \frac{\partial L_f}{\partial y} < 0,\ if\ \alpha(p_f^* A_f)^{\frac{1}{\alpha}} > (p_m^* A_m)^{\frac{1}{\alpha}}$$

Thus, agricultural growth can generate consumption cities (see Web Theory Appx. C2. for details). Faster productivity growth in agriculture has an income effect *and* a foreign earnings effect if the country exports agricultural products. Both result in a disproportionate increase of urban non-tradables, while the increase in foreign earnings enables the importing of urban tradables, whose share in employment decreases. If the level of agricultural productivity is high enough, the urban share increases as the urban non-tradable effect dominates the urban tradable effect. However, if the level of agricultural productivity is not high enough, an increase in agricultural productivity pulls resources back to agriculture in order to meet the subsistence requirement. Then the urban share decreases. However, we will show that urban shares almost never decrease.

Proposition 3 (Urbanization through industrialization and "production cities")

$$\frac{\partial U}{\partial p_m^* A_m} > 0, \frac{\partial L_n}{\partial p_m^* A_m} > 0, \ \frac{\partial L_m}{\partial p_m^* A_m} > 0, \ \frac{\partial L_f}{\partial p_m^* A_m} < 0$$

so long as R-$p_f^* \underline{c}_f$<0 and agricultural productivity is high enough: $\alpha(p_m^* A_m)^{\frac{1}{\alpha}} < (p_f^* A_f)^{\frac{1}{\alpha}}$.

Proposition 3 says that a positive productivity shock in manufacturing / FIRE leads to an expansion of urban tradable employment. Thus, a manufacturing or FIRE revolution leads to urbanization and production cities (see Web Theory Appx. C3. for details).

Proposition 4 (de-industrialization without de-urbanization and the transformation of production cities into consumption cities)

When $\underline{L_f}$ is fixed, by definition $\underline{U} = 1 - \underline{L_f}$ is also fixed, implying that a productivity shock that decreases (increases) employment in manufacturing would lead to a corresponding increase (decrease) in employment in non-tradables.

Proposition 4 says that shocks to the manufacturing or FIRE sector can cause existing production cities to become consumption cities when de-urbanization is unlikely. In the empirical section, we will show that urbanization rates actually almost never decrease.

Empirics. The urban share and the employment composition of urban areas should depend on the resource windfall R, (tradable) agricultural productivity ($p_f^* A_f$), and urban tradable productivity ($p_m^* A_m$). In our econometric analysis, we focus on the period 1960-2020 and 116 countries that were still "developing" countries in 1960.[14]

We do not have reliable historical measures of A_m. It is also not obvious which price levels should be used for p_m^*. FIRE GDP is only reported for some countries and recent years (previous ISIC classifications did not separate FIRE). MFG and FIRE employment is likewise only measured for some countries and years when there is a census or a labor force survey (surveys were rare before 1990). Productivity could then be high because employment is low and/or "selected", for example if a country only has a few MFG/FIRE firms and these belong to high-productivity subsectors or are politically connected. Given such issues, we use the GDP share of MFG+services. Web Appx Fig. D.8 shows that countries with a high GDP share of MFG+services today are countries with a high GDP share of MFG+FIRE today, thus validating this proxy (correlation of 0.78; N = 78).

Next, another issue is how to distinguish agricultural products belonging to R (those

[14]The sample excludes a few ex-communist countries due to the lack of pre-1989 data.

generating high rents) vs. agricultural products belonging to $p_f^* A_f$. In addition, for the latter, productivity and yields are typically poorly measured and it is not obvious which price level should be used. Since we aim to measure the fact that a country is urbanizing because it is exporting fuels and mining products or agricultural products, and given the difficulty in separating agricultural products in different categories, we aggregate them together and use as a proxy the ratio of natural resource exports (NRX) to GDP.[15]

Finally, for deindustrialization, we use as a proxy the decline in the GDP share of MFG over time. Indeed, if MFG productivity decreases relative to the world, MFG employment should decrease. The GDP share combines information on productivity and employment.

3. Resources, (De-)Industrialization, and Urbanization

Data. We study 116 relatively large countries, with a developing status as of 1960, and for which data on urbanization, natural resource exports, and the GDP shares of MFG and services are available every 5 years between 1960 and 2020. Urbanization rates (%) come from the United Nations (2018). The share of fuel and mining exports in total exports for the period 1960-2010 is obtained from GJV16 who rely on data from the World Development Indicators (WDI) database of the World Bank (2020b) as well as the *Mineral Industry Surveys* of USGS (2020). We extend their data up to 2020 and we modify them when needed. The USGS data are important due to the fact that the World Bank data are incomplete or simply wrong in many cases.[16] Measurement error, if classical, would make us under-estimate their contribution to urbanization. From FAO (2020), we obtain the export share of all agricultural products (incl. logging) (GJV16 only consider a few crops). Next, knowing from World Bank (2020b) the export-to-GDP ratio of each country in each year, we calculate NRX/GDP (%) as in Sachs and Warner (1995, 1997). Next, we obtain the time series of the GDP share of MFG+services by relying on the following sources: World Bank (2020b), Central Intelligence Agency (2021) and United Nations (1960-1980, 2020c). Lastly, we obtain from United Nations (2020a) the GDP share of FIRE c. 2020. More details on the data sources can be found in the Web Data Appx. Section D.

[15]NRX/GDP differs from the GDP share of natural resources, missing for too many countries in the past. Furthermore, NRX/GDP attributes to NRX the "value" of any input used in producing the resources.

[16]For example, according to the WDI, fuel and mining exports accounted for 8% of Botswana's exports in 2015. According to USGS: "Botswana's exports were $6.33 billion, of which diamonds accounted for 82.9%; copper and nickel, 5.9%; and soda ash, 1.4%." Likewise, according to the WDI, fuel and mining exports accounted for 6% of Burkina-Faso's exports in 2013. According to USGS: "The International Monetary Fund estimated that gold production [...] accounted for about 71% of the country's total exports [...]."

Main Results. For 116 countries c, we estimate the following model:

$$\text{URB}_{c,20} = \alpha + \beta\text{NRXGDP}_{c,60-20} + \gamma\text{MFGSERV}_{c,20} + \delta\text{DEINDU}_{c,80-20} + X_c\pi' + \mu_c. \quad (8)$$

URB is the urban share (%) in 2020, NRXGDP the mean export-to-GDP ratio of natural resources (%) in 1960-2020, MFGSERV the GDP share of MFG+SERV (%) in 2020 (capturing structural change due to manufacturing or tradable services), and DEINDU the absolute decline in the GDP share of manufacturing (%) between 1980 and 2020 transformed so that a positive value indicates *more* deindustrialization (= 0 if no decline is observed). Summary statistics are provided in the notes of Table 2.[17]

X is a set of controls that includes: (i) controls for country size: log area and log population in 2020 and their squares and a dummy if the country is a small island country because such countries are mechanically more urbanized; (ii) controls for the urban definition used by the country c. 2010;[18] and (iii) controls for initial conditions, i.e. URB, NRXGDP and MFGSERV c. 1960 (our regression is thus a long-difference regression).[19]

Col. (1) of Table 2 Panel A below shows similar coefficients for NRXGDP and MFGSERV. A one standard deviation in MFGSERV is associated with a 0.57 standard deviation in urbanization (Proposition 3) vs. 0.49 for NRXGDP (Propositions 1-2). No correlation is observed for DEINDU (Proposition 4). Indeed, cases of de-urbanization are rare. In a sample of 116 countries x 13 years (1960, 1965...) = 1,508 obs., 94% of country-years showing an economic decline do not show a decline in their urban share.[20]

In cols. (2)-(4), we examine the correlations in a panel framework with country and year fixed effects (FE). More precisely, for countries c and years t, we estimate:

$$\text{URB}_{c,t} = \alpha + \beta\text{NRXGDP}_{c,t-1} + \gamma\text{MFGSERV}_{c,t} + \delta\text{DEINDU}_{c,1980-t} + \kappa_c + \theta_t + X_{c,t}\pi' + \mu_{c,t}. \quad (9)$$

NRXGDP is defined in t-1, as we expect NRXGDP to have a lagged effect on urbanization (cities take time to be built). MFGSERV is defined in t. Since MFGSERV activites mostly take place in cities, a higher share of MFGSERV implies a higher urban

[17]NRXGDP, MFGSERV and DEINDU are not correlated with each other. Countries with high NRXGDP values include Angola, Kuwait, Nigeria, Saudi Arabia and Venezuela. Countries with high DEINDU values (conditional on MFGSERV) include Argentina, Brazil, Colombia, the Philippines and South Africa.

[18]We include dummies identifying whether the definition is based on a population threshold, another condition, an administrative function, or a combination of these, and the log of the threshold (U.N., 2011).

[19]Since the world's urbanization depends on the urbanization of countries with large populations, we use as regression weights the population of each country in 2020.

[20]In addition, while (annualized) economic declines can be large (mean = -2.6%; 10th percentile = -5.5%), urbanization declines are very small (mean = -0.16 percentage points; 10th percentile = -0.24).

share "right away". DEINDU is the absolute decline in the GDP share of manufacturing between 1980 and t transformed so that a positive value indicates *more* deindustrialization (= 0 if no decline is observed or if $t \leq 1980$). Finally, we include the time-varying controls (log population and its square) and SEs are clustered at the country level.

Table 2: Resources, Industrialization, Deindustrialization & Urbanization, 1960-2020

Specification:	**Long-Diff.**	**Panel Analysis (Country FE & Year FE)**		
Dep. Var. : Urban Share URB (%) in ...	2020	Year t (Period: 1960-2020)		
Timing for the Panel: Every ...		20 Years	10 years	5 years
Panel A:	(1)	(2)	(3)	(4)
NRXGDP (%) (1): 2020; (2)-(4): t-1	1.02***	0.28**	0.19**	0.14*
	[0.239]	[0.106]	[0.089]	[0.072]
MFGSERV (%) (1): 2020; (2)-(4): t	1.09***	0.44**	0.43***	0.38***
	[0.195]	[0.179]	[0.141]	[0.121]
DEINDU (%) (1): 1980-2020; (2)-(4): 1980-t	0.04	0.53	0.42	0.41*
	[0.343]	[0.402]	[0.266]	[0.238]
Beta Coef. NRXGDP	0.49	0.16	0.10	0.07
Beta Coef. MFGSERV	0.57	0.26	0.26	0.24
Beta Coef. DEINDU	0.01	0.10	0.07	0.07
Panel B:	(1)	(2)	(3)	(4)
FMXGDP (%) (1): 2020; (2)-(4): t-1	0.91***	0.29***	0.22**	0.17**
	[0.235]	[0.101]	[0.090]	[0.076]
AGXGDP (%) (1): 2020; (2)-(4): t-1	1.22**	0.20	0.02	-0.03
	[0.610]	[0.254]	[0.175]	[0.070]
Beta Coef. FMXGDP	0.40	0.15	0.11	0.08
Beta Coef. AGXGDP	0.22	0.05	0.00	0.00
Obs.; Controls; Country FE, Year FE	115; Y; N	347; Y; Y	693; Y; Y	1,387; Y; Y

Notes: Robust SE (clust. at the country level in Cols. (2)-(4)) in parentheses. The six variables have the following summary statistics in Col. (1): URB: mean = 52.1; SD = 19.0; min = 13.3; max = 100.0; NRXGDP: mean = 7.9; SD = 9.0; min = 0.4; max = 63.9; MFGSERV: mean = 70.5; SD = 9.9; min = 34.2; max = 93.6; DEINDU: mean = 4.6; SD = 5.0; min = 0.0; max = 21.3; FMXGDP: mean = 4.4; SD = 7.5; min = 0.0; max = 59.8; and AGXGDP: mean = 2.2; SD = 2.7; min = 0.0; max = 37.1. * p<0.10, ** p<0.05, *** p<0.01.

In col. (2), we use data every 20 years (116 x 4 = 464 obs.). Since NRXGDP is defined in t-1, we lose one round of data. In col. (3) and (4), we consider data every 10 years and 5 years, respectively. As seen in Panel A, the panel estimates of NRXGDP and MFGSERV are smaller than the long-difference estimates of col. (1). The point estimates of NRXGDP are then larger when considering 20 years rather than 5 years, but in all cases they are smaller in magnitude than the point estimates for MFGSERV. It is logical since increases in NRXGDP should have more limited effects right away. Lastly, DEINDU has a small positive impact. DEINDU countries are countries that saw their MFGSERV share increase in the past, which might still generate urbanization in the shorter run as urbanization begets urbanization. Once we control for the urban share in t-1, DEINDU's coefficient is close to 0 (0.01 with the 5-year panel; not shown). Lastly, our estimates are not causal.

Timing. With country fixed effects, identification comes from *within-country* changes in NRXGDP, MFGSERV and DEINDU. Web Appx. Table D.3 further examines how urbanization correlates with the timing of such changes. We use the 10-year panel specification. The table shows that leads of the variables are small and not significant. In contrast, some lags are significant. For MFGSERV, all lags have significant coefficients. For NRXGDP, the second and third lags have larger and more significant coefficients, suggesting that urban shares increase 20-30 years after resource booms. Urbanization thus seems to follow industrialization/FIRE-ization and resource export booms, not the other way around. No significant correlation is observed for DEINDU.

NRX. In Panel B of Table 2 above, we decompose NRXGDP into the export-to-GDP ratio of fuel & mining (FMXGDP) and agricultural products (AGXGDP). The long-difference regression of Col. (1) where we control for initial conditions suggests that urbanization correlates with both. The Beta coefficient is twice higher for FMXGDP than for AGXGDP, likely due to agricultural exports requiring rural labor. In the panel specifications (Cols. (2)-(4)), only FMXGDP survives. Likewise, lags of AGXGDP have positive but insignificant coefficients (Web Appx. Table D.3). Indeed, not all agricultural exports may be associated with urbanization. Some crops require large amounts of labor and cities may develop too slowly for the correlations to appear with panel regressions.

Additional Results. Web Appx. Table D.2 shows stronger correlations for MFG than for services. We then find positive correlations for services, and FIRE or non-FIRE services.

The results shown so far are aligned with Propositions 1-4. In the next section, we further test these propositions, in particular the fact that the "origin" of the urbanization process might also influence the employment composition of urban areas.

4. Resources, (De-)Industrialization, and Urban Employment

Using aggregate census and survey data, GJV16 show using a few cross-sectional regressions that resource-rich countries have low urban employment shares of MFG + FIRE. Taking advantage of newly available data, we thoroughly examine these correlations. We explore sectors not covered in GJV16, use panel regressions, and identify which parts of the city size distribution (i.e., smaller or larger cities) are concerned. Lastly, we study how deindustrialization since 1980 has been associated with changes in urban economic structures, as well as gender-specific employment and informality.

Data. We rely on IPUMS census microdata for 61 sample countries accounting for 62% of the world's total urban population, which is high considering that we ignore most developed countries. At the time of GJV16's analysis, few countries had data in IPUMS so GJV16 mostly used census and survey reports which were rarely consistent across countries. Access to IPUMS is also necessary to explore other dimensions, such as how sectoral employment varies across genders or city sizes, as well as types of employment.

Model. For our cross-sectional country (c)-level analyses, we estimate:

$$\text{EMP}_{c,00} = \alpha + \beta\text{MFGSERV}_{c,00} + \gamma\text{NRXGDP}_{c,60-00} + \delta\text{DEINDU}_{c,80-00} + \epsilon\text{URB}_{c,00} + X_c\kappa + \mu_c. \quad (10)$$

EMP is a sector's labor share in urban areas c. 2000. Indeed, for the 61 countries, we obtain 156 census samples during the period 1990-2015. Most censuses are centered around the year 2000.[21] As a result, we use 2000 for MFGSERV, mean NRXGDP in 1960-2000, and DEINDU between 1980 and 2000 (a positive value indicates deindustrialization).

We control for the urban share (URB) in 2000 so as to compare countries with *similar* levels of urban economic development. Since we control for urbanization, we ignore the initial conditions in 1960 but still add the controls for area (2000), population (2000), small islands, and urban definitions. We use country populations in 2000 as weights. Finally, we examine the difference between coefficients β and γ, and then between β and δ.

Sectors. IPUMS groups jobs into 16 industries. We construct 10 sectors based on these. As seen in Table 3 below, for a given urbanization rate, urban areas in countries with higher GDP shares of MFGSERV have more employment in urban tradables (MFG, FIRE and SUM = MFG + FIRE) and less employment in urban non-tradables (NTR, NTR2 and NTR3) than (resource-rich) NRXGDP countries or DEINDU countries (countries that

[21] The median year and mean year across countries are 1999 and 2001, respectively.

deindustrialized post-1980). Note that NTR is a non-tradable sector corresponding in this analysis to domestic *Wholesale and retail trade*. NTR2 also includes *Other services* that correspond to domestic commerce-related activities not included for some countries in NTR. NTR3 additionally includes *Household services*, a low-skilled service sector.

We find, if anything, more government workers (GOVT) in MFGSERV. However, differences are not significant when GOVT includes education and health (GOVT2). This result is not surprising since structural adjustment programs were implemented in NRXGDP and DEINDU countries in the 1990s. We see more NRX workers in both NRXGDP and DEINDU countries, but the differences are not significant. Yet, we find significantly more fuel & mining workers in NRXGDP countries (not shown). Finally, we find fewer construction workers (CONST) in NRXGDP and DEINDU countries.

Table 3: Resources, (De-)Industrialization & Urban Employment, Cross-Section, c. 2000

Dep.Var. =	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Empl. Sh. of:	MFG	FIRE	SUM	NTR	NTR2	NTR3	GOVT	GOVT2	NRX	CONST
MFGSERV	0.18**	0.10**	0.28**	-0.21*	-0.29*	-0.23	-0.02	-0.01	0.05	-0.02
	[0.09]	[0.05]	[0.11]	[0.12]	[0.14]	[0.15]	[0.03]	[0.06]	[0.10]	[0.04]
NRXGDP	-0.02	0.03	0.01	0.09	0.16	0.22	-0.13**	-0.09	0.11	-0.17**
	[0.11]	[0.07]	[0.15]	[0.15]	[0.20]	[0.26]	[0.06]	[0.13]	[0.16]	[0.07]
DEINDU	-0.73*	0.09	-0.64*	0.38	0.88*	1.15*	-0.23	-0.20	0.20	-0.40*
	[0.37]	[0.11]	[0.36]	[0.36]	[0.50]	[0.63]	[0.15]	[0.29]	[0.29]	[0.21]
MFGSERV	0.20**	0.07*	0.27**	-0.29*	-0.45***	-0.44**	0.11**	0.08	-0.06	0.15**
- NRXGDP	[0.10]	[0.04]	[0.11]	[0.15]	[0.15]	[0.20]	[0.05]	[0.10]	[0.14]	[0.06]
MFGSERV	0.91**	0.01	0.92**	-0.58	-1.17**	-1.38**	0.22	0.18	-0.15	0.37*
- DEINDU	[0.35]	[0.10]	[0.35]	[0.38]	[0.48]	[0.61]	[0.14]	[0.28]	[0.28]	[0.21]
Mean; Ctrls	20.7; Y	5.0; Y	25.7; Y	20.7; Y	25.3; Y	25.4; Y	6.5; Y	13.9; Y	13.0; Y	6.8; Y

Notes: Observations = 61 countries. This table shows the correlation between the employment share of each sector in urban areas c. 2000 and measures of natural resource exports, industrialization/FIRE-ization, and deindustrialization, also defined with respect to 2000. Robust SE. * p<0.10, ** p<0.05, *** p<0.01.

Gender. Web Appx. Table D.4 examines how the correlations of Table 3 differ for female and male workers. For a given urban share, urban areas in NRXGDP countries have less urban tradable employment than urban areas in MFGSERV countries mostly due to differences in urban male employment. For both NRXGDP and DEINDU countries, differences in urban non-tradables are then more pronounced for female workers. Thus, consumption cities from natural resources have less male employment in urban tradables and consumption cities in general have more female employment in non-tradables.

Informality. Another important question is whether urban areas are differentially informal depending on the "origin" of their urbanization. For 55 countries, we know if the worker is a wage worker, a self-employed worker, or an unpaid worker (which may include family or non-family workers). As shown in Cols. (1)-(3) of Table 4 below, the share of wage workers is lower and the share of self-employed workers is higher in both NRXGDP and DEINDU countries (relative to MFGSERV countries). However, due to sample size, differences are not significant. The result applies to both women and men. However, more significant coefficients are found for men (Web Appx. Table D.5).[22]

Table 4: Resources, (De-)Industrialization, & Urban Informality, Cross-Section, c. 2000

Dep.Var. =	Empl. Sh. in Urban Empl.			Empl. Sh. in Urban MFG			Empl. Sh. in Urban NTR		
Type of Employment:	Wage Work	Self Empl.	Unpaid Empl.	Wage Work	Self Empl.	Unpaid Empl.	Wage Work	Self Empl.	Unpaid Empl.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MFGSERV	0.54*	-0.62**	0.08	1.00***	-0.91***	-0.09	0.63*	-0.84***	0.21
	[0.28]	[0.24]	[0.07]	[0.30]	[0.25]	[0.07]	[0.31]	[0.26]	[0.14]
NRXGDP	0.06	-0.22	0.16	0.56	-0.52	-0.05	-0.14	0.00	0.14
	[0.37]	[0.28]	[0.12]	[0.37]	[0.32]	[0.09]	[0.43]	[0.40]	[0.13]
DEINDU	-0.33	0.19	0.15	-0.47	0.31	0.16	0.52	-0.88	0.36*
	[0.69]	[0.57]	[0.17]	[1.08]	[0.90]	[0.21]	[0.88]	[0.80]	[0.21]
MFGSERV	0.48	-0.40	-0.08	0.44	-0.39	-0.05	0.77**	-0.84**	0.07
- NRXGDP	[0.31]	[0.24]	[0.09]	[0.35]	[0.29]	[0.08]	[0.33]	[0.32]	[0.11]
MFGSERV	0.88	-0.80	-0.07	1.47	-1.22	-0.25	0.10	0.05	-0.15
- DEINDU	[0.72]	[0.62]	[0.15]	[1.07]	[0.90]	[0.20]	[0.83]	[0.79]	[0.15]
Mean	58.0	34.8	7.2	61.2	33.9	5.0	35.8	58.4	5.8
Obs.; Ctrls	55; Y	55; Y	55; Y	54; Y	54; Y	54; Y	54; Y	54; Y	54; Y

Notes: This table shows the correlation between the employment share of each type of employment in urban areas or specific sectors in urban areas c. 2000 and measures of natural resource exports, industrialization/FIRE-ization, and deindustrialization, also defined with respect to 2000. NTR = non-tradables (domestic wholesale and retail trade). Robust SE. * p<0.10, ** p<0.05, *** p<0.01.

We push this further by studying whether urban tradables – proxied by MFG, the largest sector of MFG+FIRE – and urban non-tradables – proxied by NTR (domestic

[22]Self-employed workers are almost always self-employed without employees.

wholesale and retail trade) – have higher informality rates, as measured by self-employment. As seen in Cols. (4)-(6) and (7)-(9) of Table 4 above, both MFG and NTR are more informal in the urban areas of NRXGDP and DEINDU countries than in the urban areas of MFGSERV countries. However, differences are not always significant.

City-level results. So far, our analysis was at the country-urban sector level. We now use the city-level residualized measure of *Production/Consumption City-ness* (PCC) obtained in Section 1. to examine if sectoral patterns obtained at the country-urban sector level are driven by larger cities and/or smaller cities. For 6,187 FUAs a belonging to 53 out of the 116 sample countries c, we regress PCC c. 2000 on the three variables of interest at the country level also defined with respect to 2000 – MFGSERV (2000), NRXGDP (mean in 1960-2000) and DEINDU (change in 1980-2000) –, their interactions with the 8 population size categories p, and the controls of model (10) (except urbanization since it was used as a control in the first-step residualization procedure). Lastly, we use the FUAs' populations in 2000 as regression weights and cluster standard errors at the country level:

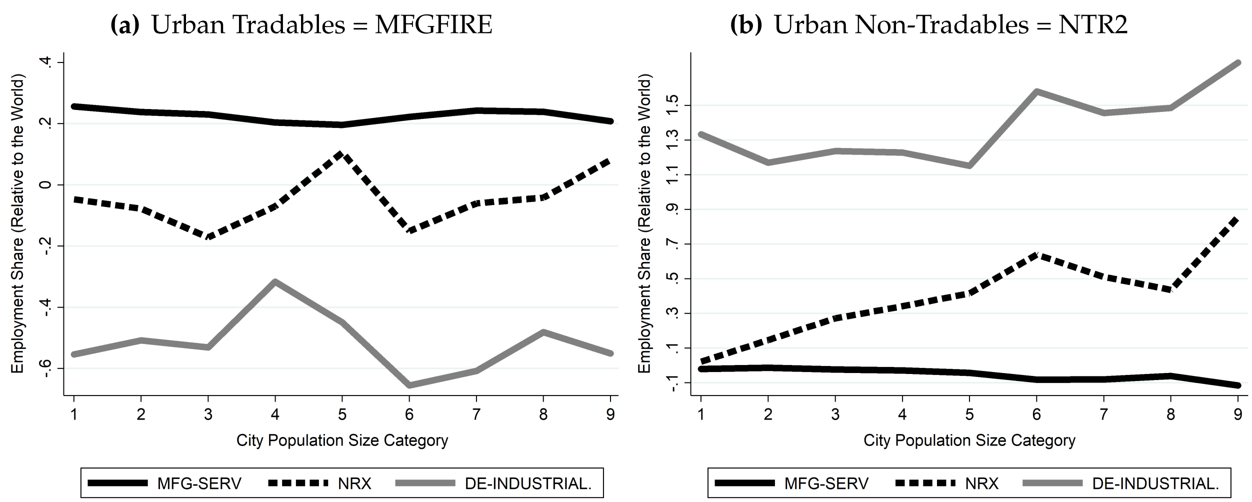
$$\text{PCC}_{a,c} = \alpha + \beta\text{MFGSERV}_c + \gamma\text{NRXGDP}_c + \delta\text{DEINDU}_c + \Sigma_{p=2}^{9}\zeta_p\text{MFGSERV}_c * \mathbb{1}(\text{CAT}_a = p) + \Sigma_{p=2}^{9}\theta_p\text{NRXGDP}_c * \mathbb{1}(\text{CAT}_a = p) + \Sigma_{p=2}^{9}\lambda_p\text{DEINDU}_c * \mathbb{1}(\text{CAT}_a = p) + X_c\kappa + \mu_a \quad (11)$$

We consider two PCC measures capturing urban tradables – MFGFIRE – and urban non-tradables – NTR2 (we include *domestic wholesale and retail trade* and *other services*) – and plot the obtained correlations for each PCC measure-size category in Figures 4(a)-4(b) below. Figure 4(a) shows that MFG-SERV countries have higher shares of MFGFIRE in their cities than NRXGDP and DEINDU countries for *all* population size categories of cities. These differences are driven by MFG, not FIRE (Web Appx. Fig. 9(a)-9(b)). The patterns for non-tradables NTR2 are unsurprisingly different, with the lowest shares in MFGSERV countries (Figure 4(b)). However, DEINDUSTR countries have higher shares of NTR2 across *all* cities whereas for NRX it is mainly the case for *larger cities*.

Therefore, the whole urban system in deindustrializing countries has experienced a shift from jobs in MFG to jobs in NTR2, while in resource-rich ones only larger cities have substantially higher shares of NTR2 services. In both cases, larger cities have much lower shares of urban tradables and much higher shares of urban non-tradables.

Robustness: Panel. Using data from IPUMS, we obtain the employment shares for 184 country-years and 62 countries. We then run panel regressions with country and year fixed effects. More precisely, we regress the selected sectoral labor share in urban areas in t on MFGSERV in t, NRXGDP in t-10, DEINDU between 1980 and t (DEINDU = 0 before 1980), the urban share in year t, as well as log population in t and its square, since population is time-varying. For each sector, we select countries with at least three years of data and cluster standard errors at the country level. Sample size is reduced to 124 observations. As such, we cannot include more lags. Some panel results are consistent with the long-difference results (Web Appx. Table D.6). We find decreasing shares of MFGFIRE in DEINDU countries. For NRXGDP countries, we do not find lower shares of MFGFIRE, unlike in the long-difference regressions. Thus, any negative impact of NRXGDP might take place over more than one decade. Next, we find higher shares of urban non-tradables and higher informality rates in both NRXGDP and DEINDU countries. However, some of the observed differences, while large, are not significant.

Figure 4: City Size & Urban Sectoral Shares for Each Group, Cross-Section, c. 2000



Notes: The figures show the obtained correlations for each production/consumption city-ness measure-pop. category. NTR2 = non-tradables (domestic *Wholesale and retail trade* & *Other services*). Mean pop. size for each category (000s): 1 = 76; 2 = 134; 3 = 250; 4 = 479; 5 = 921; 6 = 1,737; 7 = 3,268; 8 = 6,140; 9 = 18,184.

Robustness: I2D2. Another data is the *International Income Distribution Database* (I2D2) of the World Bank. The database consists of a large number of individual-level household and labor force surveys. The data was initially compiled by the World Bank's *World Development Report* (WDR) unit between 2005 and 2011. The database has since been expanded and used by members of the original WDR unit.[23] The version of I2D2 that

[23]We use the December 2017 vintage of the database that was used for the 2019 WDR.

we use includes about 1,500 survey samples for about 150 countries. The surveys are nationally representative and large enough (i.e., have more than 10,000 obs.). I2D2 then includes information on sectoral employment and self-employment in about 100 countries. We use these data to replicate the IPUMS-based results for more countries.

We obtain for each country the *mean* shares of various sectors and types of employment in 1990-2015.[24] We then use the same cross-sectional model as for IPUMS (eq. (10)). Since 2005 is the mean population-weighted year in I2D2, the variables of interest are defined relative to either 2000 or 2010. While we observe a strong correlation (about 0.9) between I2D2 and IPUMS for MFGFIRE, the correlation is weaker (0.55) for urban non-tradables NTR, which has to do with the way I2D2 was harmonized.[25]

NRXGDP and DEINDU countries have lower shares of MFGFIRE than MFGSERV countries (Web Appx. Table D.7). Differences are not always significant though. No effects are observed for NTRI (NTR in I2D2). However, DEINDU countries do have higher shares of NTRI2 (NTRI2 adds to NTRI *Other services*, which includes household/personal services). Finally, we tend to find more paid employment in MFGSERV countries and more self-employment or unpaid employment in NRXGDP and DEINDU countries. Overall, the correlations are broadly consistent with IPUMS.

To conclude, relying on different databases and various measures and specifications, the evidence suggests that cities in NRXGDP countries and DEINDU countries may be disproportionately consumption cities relative to the cities of MFGSERV countries.

5. Resources, (De-)Industrialization, and Urban Construction

The "origin" of the urbanization process may also influence construction and the spatial structure, not just economic structure, of cities. The consumption of "White elephant" projects, financed with resource rents, may become ubiquitous in the consumption cities of countries governed by regimes seeking to project prestige and power. In the absence of a reliable historical database of "white elephants", we examine whether exports of natural resources correlate with the construction of tall buildings whose economic rationale is questionable. We make use of a remarkable data set that inventories all the world's "tall

[24]Most countries had several surveys during the period. Since surveys vary in sample size across years, we use as weights the size of each survey, thus giving more weight to better measured years and shares.

[25]With surveys having different classifications, sectors were aggregated together, in this case *Wholesale & retail trade* and *Hotels & restaurants* (which we ignored in IPUMS due to lack of correlations with our variables of interest). NTR in I2D2 might then include other sectors depending on the country.

buildings", with information on their year of construction and height.[26]

The *Council on Tall Buildings and Urban Habitat* (CTBUH) maintains a publicly available online database of all tall buildings in the world.[27] For each building, we extracted information on the building's height, year of construction, usage, and other characteristics. Although CTBUH does not use a consistent definition of tall buildings, the database mostly captures buildings above 80 meters. Since some countries have no such buildings, in order to avoid having their stock of heights equal to 0 when using logs, we consider for each country buildings above 80 meters as well as their 10 tallest buildings, even if some of them are below 80 meters. In the end, we use 16,369 tall buildings.[28]

We use as our dependent variable log *urban height density*, which is the sum of tall building heights + 1 divided by urban population.[29] As shown by Jedwab et al. (2020, 2021c), there is today a strong relationship between log urban height density and log per capita income (see Web Appx. Fig. D.10).[30] We then study two questions. Do resource-rich countries have more tall buildings than equally developed non-resource-rich countries? Can we use our data on the characteristics of the buildings to show their construction is associated with the consumption of resource rents in cities? To answer the questions, we rely on long-difference and panel correlations between tall building density and our variables of interest, conditional on measures of urban economic development.

Model. For countries c, we first examine the long-difference correlation between log urban height density (LUHT) c. 2020 and MFGSERV (2020), NRXGDP (mean in 1960-2020) and DEINDU (change in 1980-2020; positive values imply deindustrialization):

$$\text{LUHT}_{c,20} = \alpha + \beta\text{MFGSERV}_{c,20} + \gamma\text{NRXGDP}_{c,60-20} + \delta\text{DEINDU}_{c,80-20} + X_c\kappa + \mu_c. \quad (12)$$

The controls (X_c) include the controls for initial conditions (including log urban height density in 1960, which makes the regression a long-difference regression) as well as the

[26]To our knowledge, the only other econometric study on white elephant projects and tall building construction is a non-economics study on autocracies and skyscrapers by Gjerlow and Knutsen (2019).

[27]The full online database can be found here: http://www.skyscrapercenter.com/. As one example, the webpage for the Burj Khalifa in Dubai is: http://www.skyscrapercenter.com/building/burj-khalifa. According to their website, the data have been "collected by the Council for more than 40 years [...] The Council relies on its extensive member network [of academics, land developers, architectural firms, builders, city administrations, and banks] to maintain" the database with the help of "an Editorial Board".

[28]As discussed in Jedwab et al. (2020, 2021c), measurement error is far more likely for smaller buildings than tall buildings above 80 m. Classical measurement error in tall buildings then only affects precision.

[29]We add +1 since a few country-years do not have any buildings in our database.

[30]Jedwab et al. (2020) use these data to examine land-use regulations in richer countries whereas Jedwab et al. (2021c) study how the physical characteristics of developed and developing country cities differ.

controls for area (2020), population (2020), small islands and urban definitions. Col. (1) of Panel A of Table 5 below shows a strong correlation between tall building construction and MFGSERV. The point estimate for NRXGDP is not negligible either, but it is not significant. In cols. (2) and (3), we consider residential and non-residential buildings only, with the latter including office towers ((4)), hotels ((5)) and retail towers ((6)). In col. (7), we consider government buildings. For MFGSERV, we observe positive and significant correlations for most types of buildings. For NRXGDP, we only see positive and significant correlations for residential and non-residential (office) towers.

In Panel B, we add as controls measures of urban economic development: the urban share and log per capita GDP (PPP and constant 2005 international dollars) in 2020 and mean log per capita GDP in 1960-2020 (since past economic development also matters and since GDP can fluctuate). We thus capture "excesses" in tall building construction for a *given* level of urban economic development. As seen, NRXGDP countries have higher stocks of non-residential towers (col. (3)), with this correlation being driven by office towers (col. (4)) and retail towers (col. (6), not significant though).[31]

Panel C examines the same correlations in a 10-year panel framework. The dependent variable is log urban height density in t and we include three lags of MFGSERV, NRXGDP and DEINDU.[32] We then control for the urban share and log per capita GDP in t as well as the time-varying controls (logged population). Lastly, the panels show the total correlations estimated when summing up the coefficients across the lags. The correlations are not as strong as found for the long-difference specification (panel B). Indeed, we do not expect urban construction to respond instantaneously to changes in the economic structure. However, by adding lags, we lose observations and degrees of freedom, making our standard errors larger. Abstracting from the lack of significance, one can see that the overall correlation for NRXGDP is always higher than for MFGSERV.

The results are not causal. Yet, we can use data on the characteristics of the tall buildings to examine if NRXGDP countries disproportionately have white elephants in their cities. We first proxy white elephants with *very tall* non-residential buildings. In Panel A of Table 6, we use the long-difference specification and consider as the dependent

[31]No differences are observed for government towers. If NRXGDP countries have disproportionately more tall buildings, this might be instead because of private companies or individuals directly or indirectly affiliated with the government and/or fuel, mining or agricultural firms using such buildings.

[32]MFGSERV t, t-10, t-20, t-30; NRXGDP t-10, t-20, t-30, t-40; DEINDU t, t-10, t-20, t-30 (relative to 1980).

Table 5: Natural Resources, Structural Change & Tall Building Construction, 1960-2020

Type of Buildings:	All (1)	Resid. (2)	Non-Res. (3)	Office (4)	Hotel (5)	Retail (6)	Gvt (7)
Panel A: **Core Controls**	**Long-Difference:** Dep. Var.: Log Urban Height Density c. 2020 ((Sum of Heights + 1) / Urban Pop.)						
$MFGSERV_{2020}$	0.08***	0.09**	0.10***	0.11***	0.07**	0.07*	0.02
	[0.024]	[0.040]	[0.029]	[0.029]	[0.034]	[0.043]	[0.029]
$NRXGDP_{1960-2020}$	0.05	0.10*	0.06**	0.06*	0.02	0.05	0.04
	[0.031]	[0.057]	[0.030]	[0.031]	[0.051]	[0.052]	[0.038]
$DEINDU_{1980-2020}$	-0.01	-0.04	-0.00	-0.05	0.04	-0.06	-0.03
	[0.028]	[0.050]	[0.035]	[0.036]	[0.039]	[0.054]	[0.047]
MFGSERV - NRXGDP	0.03	-0.01	0.04	0.05	0.04	0.02	-0.01
	[0.03]	[0.06]	[0.03]	[0.03]	[0.05]	[0.06]	[0.04]
MFGSERV - DEINDU	0.08***	0.13**	0.10**	0.16***	0.03	0.13**	0.06
	[0.03]	[0.06]	[0.04]	[0.04]	[0.05]	[0.06]	[0.05]
Obs.; Controls	115; Y	115; Y	115; Y	115; Y	115; Y	115; Y	115; Y
Panel B: **+ Urban Econ Dvt Ctrls**	**Long-Difference:** Dep. Var.: Log Urban Height Density c. 2020 ((Sum of Heights + 1) / Urban Pop.)						
$MFGSERV_{2020}$	-0.01	-0.02	0.01	0.02	-0.05	0.01	-0.02
	[0.023]	[0.043]	[0.022]	[0.024]	[0.029]	[0.040]	[0.035]
$NRXGDP_{1960-2020}$	0.02	0.03	0.05**	0.07**	-0.02	0.07	0.01
	[0.027]	[0.050]	[0.023]	[0.026]	[0.046]	[0.056]	[0.051]
$DEINDU_{1980-2020}$	-0.02	-0.04	-0.03	-0.06**	0.03	-0.09	-0.03
	[0.026]	[0.042]	[0.024]	[0.025]	[0.031]	[0.056]	[0.048]
MFGSERV - NRXGDP	-0.03	-0.05	-0.05**	-0.04*	-0.02	-0.06	-0.03
	[0.02]	[0.05]	[0.02]	[0.02]	[0.04]	[0.07]	[0.06]
MFGSERV - DEINDU	0.01	0.01	0.04	0.09***	-0.07*	0.10	0.00
	[0.04]	[0.06]	[0.03]	[0.03]	[0.04]	[0.06]	[0.06]
Obs.; Controls	115; Y	115; Y	115; Y	115; Y	115; Y	115; Y	115; Y
Panel C: **+ Urban Econ Dvt Ctrls**	**10-Year Panel (with 4 Lags):** Dep. Var.: Log Urban Height Density in Year t (Sum of Heights + 1) / Urban Pop.)						
Sum for MFGSERV Lags	0.05	0.08	-0.01	0.01	-0.03	-0.11	0.05
	[0.06]	[0.09]	[0.06]	[0.06]	[0.08]	[0.12]	[0.12]
Sum for NRXGDP Lags	0.10**	0.09	0.04	0.04	0.01	0.10	0.07
	[0.04]	[0.06]	[0.04]	[0.05]	[0.05]	[0.07]	[0.05]
Sum for DEINDU Lags	-0.08	0.09	-0.06	-0.05	-0.03	0.40*	-0.79***
	[0.07]	[0.14]	[0.07]	[0.07]	[0.15]	[0.23]	[0.30]
Country FE, Year FE	Y	Y	Y	Y	Y	Y	Y
Obs.; Controls	346; Y	346; Y	346; Y	346; Y	346; Y	346; Y	346; Y

Notes: Robust SE in parentheses (clust. at the country level in Panel C). Summary statistics for LUHT in Panels A-B: All: Mean = 4.6; SE = 1.7; Min = -2.0; Max = 9.6. Resid: Mean = 3.3; SE = 2.7; Min = -3.7; Max = 9.3. Non-Res.: Mean = 3.9; SE = 1.8; Min = -2.4; Max = 8.6. * p<0.10, ** p<0.05, *** p<0.01.

variable log urban height density constructed using only non-residential buildings above a certain threshold. Among the 16,369 tall buildings in our data, 125, 140, 160, 200 and 240 meters correspond to the median, the mean, the 75th percentile, the 90th percentile and the 95th percentile value in total height. When controlling for urban economic development, NRXGDP countries have more very tall buildings, and the difference with respect to MFGSERV countries tends to expand as we consider higher thresholds. When studying the same relationships in our 10-year panel framework, considering four lags and summing up the coefficients across the lags (Panel B), the point estimates are broadly consistent with the long-difference results. In particular, for buildings above 160 meters, the overall correlation with NRXGDP is much higher than for MFGSERV.

We perform additional tests in Panel C. We only consider the long-difference specification and include the urban economic development controls. First, in col. (1) of Panel C, the dependent variable is an index of *construction vanity*, more precisely the sum of the differences (in meters) between height at the tip and the height of the top occupied floor. Buildings constructed to project power are more likely to include space at the top. However, the height of the top occupied floor is only available for enough buildings in 38 countries. Nonetheless, we find stronger correlations for NRXGDP than for MFGSERV.

Next, we use our knowledge of the main structural material used. Steel is more resistant than concrete but also more expensive. Concrete-based buildings require higher maintenance costs in the future. For a given development level, disproportionate use of concrete suggests that developers and customers in these countries might be more present-biased, possibly at the expense of future costs and also security. Cols. (2) and (3) show the results with the dependent variable being log urban height density when only considering buildings whose structural material is steel vs. concrete, respectively. We find strong correlations between steel use and MFGSERV (but steel could be cheaper there). Col. (4) shows strong correlations between concrete use and NRXGDP.[33]

Third, we know each building's city. We thus examine if the correlations are stronger for larger cities vs. other cities. In col. (4), the dependent variable is log urban height density considering only buildings in the capital city. We find a stronger correlation with NRXGDP (the difference with respect to MFGSERV is, however, not significant). If we

[33]These results on "inefficient" construction echoes the work of Collier et al. (2016) for roads. See Kirchberger (2018) for a recent survey on the literature on construction in developing countries.

Table 6: Natural Resources, (De-)Industrialization & Super-Tall Buildings, 1960-2020

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A:	**Long-Difference:** Dep. Var.: Log Urban Height Density c. 2020					
+ Urban Econ Dvt Ctrls	Non-Residential Buildings Only					
Buildings ≥ ... Meters:	All	125	140	160	200	240
$MFGSERV_{2020}$	0.01	-0.00	-0.03	0.06	0.03	0.01
	[0.022]	[0.039]	[0.037]	[0.045]	[0.051]	[0.049]
$NRXGDP_{1960-2020}$	0.05**	0.04	0.08**	0.09*	0.13**	0.14**
	[0.023]	[0.035]	[0.036]	[0.043]	[0.063]	[0.062]
$DEINDU_{1980-2020}$	-0.03	-0.06	-0.07*	-0.04	0.02	0.01
	[0.024]	[0.044]	[0.038]	[0.047]	[0.065]	[0.061]
MFGSERV - NRXGDP	-0.05**	-0.05	-0.11***	-0.03	-0.11	-0.12*
	[0.02]	[0.03]	[0.03]	[0.06]	[0.07]	[0.07]
MFGSERV - DEINDU	0.04	0.05	0.04	0.10	0.01	0.00
	[0.03]	[0.06]	[0.05]	[0.06]	[0.08]	[0.08]
Obs.; Controls	115; Y	115; Y	115; Y	115; Y	115; Y	115; Y
Panel B:	**10-Year Panel (with 4 Lags):** Log Urban Height Density in Year t					
+ Urban Econ Dvt Ctrls	Non-Residential Buildings Only					
Buildings ≥ ... Meters:	All	125	140	160	200	240
Sum for MFGSERV Lags	-0.01	0.01	-0.03	0.01	-0.05	-0.15
	[0.06]	[0.09]	[0.09]	[0.09]	[0.11]	[0.11]
Sum for NRXGDP Lags	0.04	-0.01	0.00	0.13*	0.13*	0.10
	[0.04]	[0.07]	[0.07]	[0.08]	[0.08]	[0.08]
Sum for DEINDU Lags	-0.06	0.10	0.13	0.58**	0.46*	0.39
	[0.07]	[0.13]	[0.12]	[0.26]	[0.27]	[0.25]
Country FE, Year FE	Y	Y	Y	Y	Y	Y
Obs.; Controls	346; Y	346; Y	346; Y	346; Y	346; Y	346; Y
Panel C: Long.Diff; Dep.Var.:	Vanity	Log Urban Height Density c. 2020 (Non-Resid. Buildings)				
+ Urban Econ Dvt Ctrls	(Tip-Occup.)	Steel	Concrete	Capital	(4)+Largest	Other
$MFGSERV_{2020}$	-0.06	0.13***	0.01	0.01	0.01	0.05
	[0.080]	[0.040]	[0.038]	[0.024]	[0.041]	[0.038]
$NRXGDP_{1960-2020}$	0.09	0.03	0.08**	0.05*	0.03	0.09**
	[0.065]	[0.052]	[0.033]	[0.026]	[0.054]	[0.037]
$DEINDU_{1980-2020}$	0.00	0.02	-0.04	-0.03	-0.03	0.09
	[0.035]	[0.054]	[0.033]	[0.029]	[0.044]	[0.059]
MFGSERV - NRXGDP	-0.15***	0.10*	-0.07**	-0.03	-0.03	-0.04
	[0.05]	[0.05]	[0.03]	[0.03]	[0.06]	[0.04]
MFGSERV - DEINDU	-0.06	0.11	0.05	0.04	0.04	-0.04
	[0.07]	[0.07]	[0.06]	[0.03]	[0.06]	[0.07]
Obs.; Controls	38; Y	115; Y	115; Y	115; Y	115; Y	115; Y

Notes: Robust SE in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

consider both the capital city and the largest city (not always the capital city), we find a weaker correlation (col. (5)). For other cities, we also find a possible gap (col. (6)).

Finally, tall buildings may spur economic growth. However, since we control for urban economic development, the excess of tall buildings in NRXGDP countries may be accompanied by lower occupancy rates. Since we do not have information on occupancy rates, we can instead examine how the overall construction sector is potentially affected.

For 80 countries, we know cement production every year from 1970 to date.[34] Cement, the main ingredient of concrete, is not traded typically.[35] As such, cement production is a good proxy for cement consumption. We rely on the same long-difference model as for tall buildings but use as our dependent variable the log sum of cement production over the period 1970-2020 while simultaneously controlling for log urban population in both 1970 and 2020 (thus capturing cement consumption per urban capita). Cols. (1)-(2) of Table 7 below shows positive correlations with MFGSERV and NRXGDP (significant for MFGSERV). Once we control for urban economic development, no difference is observed. If we use 10-year panel regressions with several lags of the variables of interest, we also do not find significant differences between the two types of countries (not shown). Thus, although NRXGDP countries have more tall buildings, they do not use more cement, which might imply eviction effects within the construction sector. Stated differently, the presence of taller non-residential buildings in NRXGDP countries despite similar use of cement as in other places might imply neglect of their residential sector.

Since cement is also used for infrastructure, we turn to information on the GDP share of construction from 1970 to date (United Nations, 2020c). We use the long-difference model and consider as the dependent variable the GDP share of construction in 2020 while controlling for the same share in 1970. Since the GDP share of construction mechanically decreases when the GDP share of MFGSERV increases, in cols. (3)-(4) of Table 7 we construct the share excluding MFGSERV's GDP contribution. In cols. (5)-(6), we also remove NRX. Once we control for urban development, the correlation for NRXGDP is weaker than (col. (4)) or similar to (col. (6)) the correlation for MFGSERV, consistent with the results on cement. If we use 10-year panel regressions with several lags of the variables of interest, we also do not find significant differences (not shown).

[34]Information was obtained from the *Minerals Yearbooks* of the U.S. Geological Survey (USGS).
[35]The world trade of cement only accounts for 3% of world cement production (World Cement, 2013).

Finally, if the residential construction is crowded out in NRXGDP countries, one might see higher slum shares in their urban areas. However, NRXGDP might also have more stringent slum clearance policies. Unfortunately, data on slum shares is only available for the most recent years (United Nations, 2020b). If we use the cross-sectional version of the long-difference model (thus not controlling for the slum share in 1960), we find no correlations between the slum share c. 2010 and the variables of interest also defined with respect to 2010 once we control for urban economic development (col. (8)). Therefore, the slum share is not higher, which would then imply crowding in the non-slum sector.

To summarize, the results on cement and construction GDP (in this section) and construction employment in urban areas (Section 4.) suggest that the over-construction of tall buildings in NRXGDP countries may lead to eviction effects in construction.

Table 7: Natural Resources, (De-)Industrialization & Construction, Long-Diff., 1970-2020

Dependent Variable: Long-Difference	**Log Sum Cement Prod. (Tons; 70-20)**		**Construction GDP Sh. (%) 2020 Excl. MFGSERV**		**Construction GDP Sh. (%) 2020 + Excl. NRX**		**Slum Share (%) c. 2010**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MFGSERV 2020/2010	0.05***	0.01	0.53***	-0.01	1.22*	0.47	-0.55*	0.18
	[0.018]	[0.014]	[0.17]	[0.19]	[0.70]	[0.75]	[0.32]	[0.31]
NRXGDP 1970-2020/2010	0.02	0.02	-0.13	-0.35**	0.93	0.43	-0.65*	0.14
	[0.021]	[0.017]	[0.17]	[0.15]	[0.69]	[0.68]	[0.36]	[0.37]
DEINDU 1980-2020/2010	-0.01	0.01	0.35	0.42	1.54	1.39	-0.16	0.06
	[0.034]	[0.021]	[0.38]	[0.37]	[1.69]	[1.73]	[0.74]	[0.57]
MFGSERV - NRXGDP	0.03	-0.01	0.66***	0.34*	0.29	0.05	0.10	0.04
	[0.02]	[0.02]	[0.22]	[0.20]	[0.52]	[0.51]	[0.36]	[0.33]
MFGSERV - DEINDU	0.06*	0.00	0.18	-0.43	-0.32	-0.91	-0.39	0.12
	[0.04]	[0.02]	[0.44]	[0.45]	[1.51]	[1.61]	[0.70]	[0.61]
Obs.; Core Controls	80; Y	80; Y	115; Y	115; Y	115; Y	115; Y	91; Y	91; Y
Ctrls Urban Econ Dvt.	N	Y	N	Y	N	Y	N	Y

Notes: Robust SE in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

6. Resources, (De-)Industrialization & Urban Primacy

As shown by Ades and Glaeser (1995), politics determine urban primacy. In resource-rich countries, governments disproportionately invest resources in their capital/largest city (World Bank, 2020a). At the same time, industrialization/FIRE-ization might initially also lead to the disproportionate growth of a country's largest city, if manufacturing/FIRE production requires resources typically found in larger cities (e.g., skilled labor or an international airport).[36] Resource exports also cause the growth of small- and medium-sized mining towns or agro-towns, which would decrease urban primacy. The associations between urban primacy and our variables of interest are thus ambiguous.

Cross-Sectional Regressions: Country-Level. We use model (8) to study the correlations between the urban primacy rate – i.e., the share of the country's urban population that lives in the largest city – in 2020 and MFGSERV (2020), NRXGDP (mean in 1960-2020) and DEINDU (change in 1980-2020).[37] We control for initial conditions, i.e. urban primacy, MFGSERV and NRXGDP in 1960. We thus capture *long-difference* correlations. We then control for the urban share in 2020, include the controls for area, population, small islands and the urban definition, and use populations in 2020 as regression weights.

As seen in Col. (1) of Table 8 below, only slightly higher primacy rates are observed in NRXGDP and DEINDU countries relative to MFGSERV countries (differences not significant).[38] In Col. (2), we decompose NRXGDP into the export-to-GDP ratios of fuel & mining (FMXGDP) and agriculture (AGXGDP). The column does not show particularly higher primacy rates for FMXGDP. But it shows lower primacy rates for AGXGDP. Thus, agricultural exports might be associated with growing agro-towns. Yet, the high standard errors suggest that this is not the case for all types of agricultural exports.

Panel Regressions: Country-Level. We examine the same correlations but in a panel framework using 10-year periods (116 countries x 7 years = 812). Indeed, it could be that some sectors only increase primacy in the shorter run, for example MFG. We use the same panel regression as before but the dependent variable is the primacy rate in t. The variables of interest are MFGSERV (t), DEINDU (change in 1980-t), and NRXGDP (t-1) (or FMXGDP and AGXGDP). In Cols. (3)-(6), we consider either three lags or four lags of the variables of interest and show the overall correlations across the various lags. We then always control for the urban share in t. Finally, we include controls for populations in t and cluster standard errors at the country level. No significant correlation is observed.

[36] In the longer run, as the cost of space increases and more stringent environmental regulations are adopted in larger cities, industrial activities move to small and medium-sized cities, thus reducing primacy.

[37] Urban primacy rates come from the *World Development Indicators* database of World Bank (2020b).

[38] While some resource-rich countries such as Angola, Ivory Coast and Malaysia have high urban primacy rates (30-40%), resource-poor countries such as Bangladesh, Japan and Thailand have similarly high rates. Argentina, Egypt and Peru, countries with intermediary levels of resource richness, also have high rates.

The point estimates are then smaller than for the long-difference specification.

Table 8: **Natural Resources, Structural Change & Urban Primacy, Country-Level**

Dependent Variable:	Urban Primacy (%) in 2020 (Long-Diff.)		Urban Primacy (%) in t (Panel) 3 Lags Incl.		4 Lags Incl.	
	(1)	(2)	(3)	(4)	(5)	(6)
MFGSERV ((3)-(6): sum of lags)	-0.19	-0.2	-0.10	-0.05	-0.09	-0.05
	[0.13]	[0.14]	[0.10]	[0.13]	[0.10]	[0.13]
NRXGDP ((3)-(6): sum of lags)	-0.11		0.02	0.05		
	[0.15]		[0.07]	[0.09]		
DEINDU ((3)-(6): sum of lags)	-0.08	-0.11	-0.09	-0.05	-0.1	-0.05
	[0.17]	[0.17]	[0.18]	[0.19]	[0.18]	[0.18]
FMXGDP ((3)-(6): sum of lags)		-0.09			0.06	0.08
		[0.16]			[0.08]	[0.11]
AGXGDP ((3)-(6): sum of lags)		-0.46			-0.11	-0.11
		[0.36]			[0.18]	[0.20]
MFGSERV - NRXGDP	-0.08		-0.12		-0.10	
	[0.18]		[0.09]		[0.14]	
MFGSERV - DEINDU	-0.11	-0.09	-0.01	0.01	-0.00	-0.00
	[0.20]	[0.18]	[0.24]	[0.23]	[0.28]	[0.27]
MFGSERV - FMXGDP		-0.11		-0.15		-0.13
		[0.20]		[0.10]		[0.16]
MFGSERV - AGXGDP		0.27		0.01		0.06
		[0.36]		[0.19]		[0.21]
Country, Year FE	N	N	Y	Y	Y	Y
Observations	115	115	462	346	462	346

Notes: Robust SE (clust. at the country level in (3)-(6)) in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

City-Level Results. We use the Functional Urban Area (FUA)-level data of the *Global Human Settlements* (GHS) database to study whether the *largest cities*, not just the *largest city*, grew differently than other cities depending on the "type" of the country. More precisely, we have population estimates for 7,422 FUAs c. 1975, 1990, 2000 and 2015 in 115 countries capturing 71% of the world's urban population as of 2015.[39] We regress the

[39]We actually only know their population in 2015. In the GHS database, the FUAs often comprise

log growth of their population between 1975 and 2015 — i.e. log (pop. + 1) 2015 - log (pop. + 1) 1975 — on the variables of interest and their interactions with a dummy for whether the FUA is the capital city or the largest city (as of 2015; we call this dummy "top 1"). Alternatively, we consider the capital city and the two (top 2) or five (top 5) largest cities, or the capital city only (top 0). We use the FUA's population in 2015 as weights. Finally, given the country fixed effects, we do not include country-level controls.

Web Appx. Table D.8 shows the estimated coefficients for each interaction. No significant coefficients are observed. However, for AGXGDP - MFGSERV in Cols. (5)-(8), point estimates suggest that the top cities may indeed be growing relatively slower in countries specialized in agricultural exports (relative to MFGSERV countries). However, differences are not significant. We also do not find any significant correlation in a 10-year panel framework with several lags included (see Web Appx. Table D.9).[40]

Overall, the city-level results are consistent with the country-level results. While some resources might be associated with urban primacy in some countries, it does not appear to be the case overall. More generally, urban primacy captures the relative number of residents of the largest cities instead of their relative stock of physical capital. When studying tall buildings, an important component of physical capital stocks, we found more such buildings in the largest cities. Discrepancies between the results on human primacy and capital primacy may then reflect the fact that cities in resource-rich countries have high levels of inequality and devote relatively less resources for residential construction, which constrains the arrival of migrants when incomes increase.

7. Concluding Discussion

Using census data for a large number of cities and countries we established the following stylized fact: For a given population size and a given level of urban economic development, cities across the world dramatically differ in their employment composition. While some cities have high employment shares of urban tradables and might be be characterized as *production cities*, a relatively high number of cities have

several cities, or "Urban Clusters" (UC) as they are called in the data. The GHS database reports the UCs' populations c. 1975, 1990, 2000 and 2015. We then reconstruct each FUA's population in each year.

[40] For the 7,422 FUAs and the years 1975, 1990, 2000 and 2015 (N =29,688), we regress log FUA population size in t on the variables of interest – MFGSERV (t), NRXGDP (t-1), and DEINDU (change in 1975-t) – as well as their interactions with the top city dummy. We include country-year fixed effects and use FUAs' populations in 2015 as weights. Standard errors are clustered at the country level. We consider different specifications with 1 lag and 2 extra lags of the variables of interest and their interactions.

instead high shares of urban non-tradables and may constitute *consumption cities*.

As we discussed in our theoretical framework, various paths of urbanization can lead to various sectoral compositions of cities despite similar urbanization rates. In particular, we focused on the possible roles of industrialization broadly defined (including tradable services), natural resource exports – including fuel and mining exports and agricultural exports – and de-industrialization. We then attempted to corroborate empirically some of the predictions of the model, finding higher urbanization rates in industrialized or resource-rich countries but not lower urbanization rates in deindustrializing countries.

Cities in industrialized countries have higher employment shares of urban tradables and wage employment than cities in resource-rich or deindustrializing countries, which in turn have higher employment shares in urban non-tradables. The difference between the employment shares of non-tradables in industrialized countries vis-a-vis those in resource-rich or de-industrializing countries appear to grow with city size. This suggests that the urbanization process' origin may matter for the largest cities, which are typically seen as countries' "engines of growth" (World Bank, 1999, 2009).

Consistent with resource rents being used to finance "white elephant" projects, cities in resource-rich countries have disproportionately tall and vanitous buildings. Since we do not find more urban construction overall in these countries, it might be that their tall building sector grew at the expense of their non-tall building sector. This may explain why we do not find that resource-rich countries have higher urban primacy rates, since urban primacy captures the relative number of residents of the largest city instead of their relative stock of physical capital (of which tall buildings are an important component).

Finally, our analysis is not causal. Future studies should thus investigate more causally how natural resources and de-industrialization can generate consumption cities. Likewise, we did not analyze the aggregate growth effects of having consumption cities instead of production cities, although we suspect that consumption cities may have smaller positive effects, given the higher prevalence of self-employment in consumption cities and more generally the lower productivity of non-tradables relative to tradables.

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A Regional Patterns of Production & Consumption Cities

Asia. Web Appx. Fig. D.1 shows the location of production cities and consumption cities in Asia. Unlike China, India has a mix of specialized production cities (e.g., Bangalore and Kanpur) and consumption cities (e.g., Kolkata). With the exception of some large production cities in Malaysia and Vietnam, other cities in Asia (e.g, in Indonesia, Iran, Iraq, and the Philippines) are either consumption or neutral cities.

Africa. Data are sparser in Africa (Web Appx. Fig. D.2). Nevertheless, one can see the dearth of production cities. With the exception of South Africa, most African cities are consumption cities, with more extreme consumption cities (in red) in Nigeria, Sierra Leone, Sudan or Mozambique. This is expected given the reliance of many African countries on resource exports, which fuels consumption in urban areas.

Europe. In Europe (Web Appx. Fig. D.3), countries have production and neutral cities. Productive urbanization increases as one moves away from the "edge" of Europe, as in Southern Spain or Eastern Turkey, in line with the division of labor and production sharing within the EU bloc and the importance of intra- and inter-regional trade.

North America. North America (Web Appx. Fig. D.4) has many production and neutral cities located in the North-East or the East Coast of the U.S. and the North and Centre of Mexico (so either where there are maquiladoras or close to Mexico City). Production cities can be seen in Central America, where production sharing brought in manufacturing activities from the U.S. (or Mexico) following reforms in the 1990s. Californian cities are neither consumption nor production centers, while Southern U.S. cities (e.g., Miami and Houston), coastal cities in Mexico (e.g., Acapulco and Cancun), and cities in the Dominican Republic or Haiti are (non-extreme) consumption cities (in yellow or orange).

South America. In South America (Web Appx. Fig. D.5), only the Southeastern areas of Brazil have production cities (Sao Paulo is, however, a neutral city). The rest of Brazil has consumption cities (Rio is a clear consumption city). In Argentina, Bolivia, Chile and Paraguay, cities are either neutral (e.g., Buenos Aires and Santiago de Chile) or consumption cities. Ecuador and Peru have slightly more consumption cities and Colombia and Venezuela have many large and small consumption cities (Bogota is a "medium" consumption city but Barranquilla is an "extreme" consumption city).

B Robustness for the Mapping Analysis

Non-Linearities. We obtain similar residuals if we also include the square, cube and perfect fourth of the urban share in 2000, and their interactions with the population dummies (coeff. correlation = 0.99), in case there are non-linearities in the relationship between MFGFIRE employment, urban economic development, and city size.

Per Capita GDP. We obtain a coefficient of correlation of 0.97 if we use log per capita

GDP in 2000 (PPP and constant international dollars) instead of urbanization (including the square, cube and perfect fourth of log per capita GDP, and their interactions with the population dummies). This is not surprising since urbanization rates and log per capita GDP are highly correlated cross-sectionally (correlation of 0.91 in 2000; N = 178).

Omitting Urbanization. The correlation is 0.99 if we do not control for the urban share and do not interact the population dummies with it. We then do not allow the relationship between city employment and size to change with urban economic development.

Using the Raw Employment Shares. We obtain a coefficient of correlation of 0.89 if we simply consider the raw, i.e. non-residualized, city-specific employment shares. While the residualization was a priori important to ensure we compare apples with apples, the very high correlation indicates the residualization is not entirely necessary.

Weights. We obtain a coefficient of correlation of 1.00 if we do not modify the weights so as to over-weigh developed countries (which are under-represented in IPUMS). In that case, the weights are only based on the FUAs' population levels c. 2000. We obtain a coefficient of correlation of 1.00 if we do not use weights at all.

Alternative City Categorizations. If we do not combine the top two population categories into one category, we obtain a coefficient of correlation of 1.00. If we use 5 population categories instead of 10 categories, we still get a correlation of 0.99.

Urban Definition. We can control for the urban definition used by the country c. 2010. We include dummies identifying whether the definition is based on a population threshold, another condition, an administrative function, or a combination of these, and the log of the threshold (U.N., 2011). We then interact these variables with the population dummies. The correlation of the residuals remains very strong (about 0.9). Another related question is whether we could instead of focusing on urban observations in FUAs consider all observations in administrative units with a population density above a certain threshold. However, this would include rural workers. In addition, population densities in urban areas are much higher in developing countries than in developed countries (Jedwab et al., 2021c). It is likely similar in rural areas. A high threshold would exclude rich country cities. A low threshold would then include rural areas/workers in poorer countries.

Urban Non-Tradables. The correlation with the residuals when the dependent variable is the employment share of the non-tradable domestic "wholesale and retail trade" sector (DWRT) is -0.51 (we include "other services" as it appears that IPUMS mistakenly reclassified some DWRT activities for a few countries). Adding "household services", it becomes -0.53. It is lower than -1.00 as other sectors see their share increase when MFGFIRE decreases. Also including "public administration", it becomes -0.60.

C Theory Appendix for Propositions 1-4

In this appendix we explain how we obtain propositions 1-4.

C1. Resource Revenues and Consumption Cities

Our Proposition 1 reiterates GJV16's result that resource revenues R offer a path to urbanization U and the emergence of "consumption cities". Indeed, employment in urban non-tradables L_n is increasing in R whereas employment in manufacturing and tradable services L_m is decreasing in R. In other words, a positive shock to R leads to the emergence of "consumption cities". The overall effect on urbanization is also positive.

Proposition 1 (Urbanization through commodity rents and "consumption cities")

From (C.21), (C.15), (C.17) and (C.19) below, we have the following:

$$\frac{\partial U}{\partial R} > 0, \frac{\partial L_n}{\partial R} > 0, \frac{\partial L_m}{\partial R} < 0, \frac{\partial L_f}{\partial R} < 0$$

Proof: From (6) we have the following implicit function for L_n:

$$F = L_n - \beta_n \left(1 + \frac{(1-L_n)^\alpha}{\underline{A}} \left(R - p_f^* \underline{c}_f \right) \right) = 0 \tag{C.13}$$

From the implicit function theorem:

$$\frac{\partial L_n}{\partial R} = -\frac{F_R}{F_{L_n}} \tag{C.14}$$

The partial derivatives of F with respect to R and L_n are respectively:

$$F_R = -\beta_n \frac{(1-L_n)^\alpha}{\underline{\mathrm{A}}} \tag{C.14a}$$

$$F_{L_n} = 1 + \beta_n \alpha \frac{(1-L_n)^{(\alpha-1)}}{\underline{\mathrm{A}}} (R - p_f^* \underline{c}_f) \tag{C.14b}$$

From (C.14) we obtain that:

$$\frac{\partial L_n}{\partial R} = \frac{\beta_n \frac{(1-L_n)^\alpha}{\underline{\mathrm{A}}}}{1 + \beta_n \alpha \frac{(1-L_n)^{\alpha-1}}{\underline{\mathrm{A}}} (R - p_f^* \underline{c}_f)} \tag{C.15}$$

Both the numerator and the denominator are positive. The denominator is positive not only when the country is resource rich and $R - p_f^* \underline{c}_f > 0$, but also when $R - p_f^* \underline{c}_f < 0$ because in this case we can show that the following inequality holds using the fact that since both $\alpha < 1, \beta_n < 1$ then $\alpha\beta_n < 1$. Replacing $\alpha\beta$ with 1 results in a smaller expression because $R - p_f^* \underline{c}_f < 0$. Then from (6) and because both $L_n < 1$ and $\beta_n < 1$ we have:

$$1 + \alpha\beta_n \frac{(1-L_n)^{\alpha-1}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right) > 1 + \frac{(1-L_n)^{\alpha-1}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right) = \frac{L_n (1-\beta_n)}{(1-L_n)\beta_n} > 0$$

After substituting (6) in (7a), we obtain:

$$L_m = \left[1 - \beta_n \left(1 + \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right)\right)\right] \left(\frac{p_m^* A_m}{\underline{A}}\right)^{\frac{1}{\alpha}} \tag{C.16}$$

Differentiating with respect to R, from (C.16) we obtain:

$$\frac{\partial L_m}{\partial R} = -\beta_n \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(\frac{p_m^* A_m}{\underline{A}}\right)^{\frac{1}{\alpha}} < 0 \tag{C.17}$$

Eq. (C.17) shows the (urban) Dutch Disease effect of an increase in resource revenue. The effect is larger for countries with small non-tradable sectors (these are mostly low-income countries) and for countries with relatively productive tradable urban activities.

Substituting (6) in (7b) we obtain:

$$L_f = \left[1 - \beta_n \left(1 + \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right)\right)\right] \left(\frac{p_f^* A_f}{\underline{A}}\right)^{\frac{1}{\alpha}} \tag{C.18}$$

Differentiating (C.18) with respect to R we get:

$$\frac{\partial L_f}{\partial R} = -\beta_n \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(\frac{p_f^* A_f}{\underline{A}}\right)^{\frac{1}{\alpha}} < 0 \tag{C.19}$$

Resource windfalls shift resources away from agriculture. The shift is stronger the smaller the non-tradable sector and the higher agricultural productivity is relative to the average in the country. Now we turn to the urbanization rate. From (6) and (C.16) we have:

$$U = L_n + L_m = \beta_n \left(1 + \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right)\right) + \left[1 - \beta_n \left(1 + \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right)\right)\right] \left(\frac{p_m^* A_m}{\underline{A}}\right)^{\frac{1}{\alpha}} \tag{C.20}$$

Differentiating (C.20) with respect to R we obtain:

$$\frac{\partial U}{\partial R} = \beta_n \frac{(1-L_n)^{\alpha}}{\underline{A}} \left[1 - \left(\frac{p_m^* A_m}{\underline{A}}\right)^{\frac{1}{\alpha}}\right] > 0 \tag{C.21}$$

End of Proof: Resource windfalls cause de-industrialization, but enable urbanization and the shift from rural and urban tradables to urban non-tradables in "consumption cities".

C2. Agricultural Growth and Consumption Cities

Faster productivity growth in agriculture has an income effect *and* a foreign earnings effect if the country exports agricultural products. Both result in a disproportionate increase of urban non-tradables, while the increase in foreign earnings enables the importing of urban tradables, whose share in employment decreases. Lastly, if the level of agricultural productivity is high enough, the urbanization rate increases as the urban non-tradable effect dominates the urban tradable effect. However, if the level of agricultural productivity is not high enough (especially relative to urban tradables), an increase in agricultural productivity may have an effect of pulling resources back to agriculture in order to meet the agricultural sufficiency requirement (in which case more of the urban tradable consumption is provided internally). Then the urbanization rate decreases. While this is possible, we discuss below why we think that de-urbanization is unlikely.

For brevity in exposition and for the sake of simplicity, we define x and y as follows: $x = p_m^* A_m$ for urban tradables and $y = p_f^* A_f$ for urban non-tradables. This allows us to explore not only the effect of productivity changes on urbanization and employment, but also the effect of price shocks affecting the agricultural and manufacturing sectors. For example, agricultural exports could increase because of productivity, A_f, increases and/or because of increases in world demand, and therefore the world price (p_f^*) for the country's agricultural product. It is important to clarify that, in our mind, the world agricultural price, p_f^*, in the agricultural subsistence constraint, differs from the world price for the agricultural commodities exported by the country. The price in the subsistence constraint represents the price for the basket of goods consumed locally which can be assumed to be fixed or to change less in response to global demand changes than the prices of the country's main agricultural exports.

Proposition 2 (Productivity growth in agriculture and "consumption cities")

So long as $R < p_f^* \underline{c}_f$, from (C.24), (C.25), (C.27) and (C.28) below, it follows that:

$$\frac{\partial L_n}{\partial y} > 0,\ \frac{\partial L_m}{\partial y} < 0$$

$$\frac{\partial U}{\partial y} < 0,\ \frac{\partial L_f}{\partial y} > 0,\ if\ \alpha(p_f^* A_f)^{\frac{1}{\alpha}} < (p_m^* A_m)^{\frac{1}{\alpha}}$$

$$\frac{\partial U}{\partial y} > 0,\ \frac{\partial L_f}{\partial y} < 0,\ if\ \alpha(p_f^* A_f)^{\frac{1}{\alpha}} > (p_m^* A_m)^{\frac{1}{\alpha}}$$

Proof: From (C.13) and the implicit function theorem and noticing that $y = p_f^* A_f$, we have:

$$\frac{\partial L_n}{\partial y} = -\frac{F_y}{F_{L_n}} \tag{C.22}$$

From (C.13) the partial derivatives of F with respect to y is respectively:

$$F_y = \beta_n \frac{(1-L_n)^\alpha}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^{\alpha+1}} y^{\frac{1}{\alpha}-1} \left(R - p_f^* \underline{c}_f\right) \tag{C.23}$$

From (C.14b), (C.22) and (C.23), we have:

$$\frac{\partial L_n}{\partial y} = \frac{-\beta_n \frac{(1-L_n)^\alpha}{\left(x^{\frac{1}{\alpha}}+y^{\frac{1}{\alpha}}\right)^{\alpha+1}} y^{\frac{1}{\alpha}-1} \left(R - p_f^* \underline{c}_f\right)}{\left(1 + \beta_n \alpha \frac{(1-L_n)^{\alpha-1}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right)\right)} \tag{C.24}$$

As long as $R < p_f^* \underline{c}_f$, i.e. the country is not particularly resource rich, the increase in agricultural productivity shifts resources into non-tradables ($\frac{\partial L_n}{\partial y} > 0$). In this case, the numerator is positive and, as shown above, the denominator is positive too. Differentiating (C.16) with respect to y, we get:

$$\frac{\partial L_m}{\partial y} = \frac{1}{\alpha} \frac{x^{\frac{1}{\alpha}} y^{\frac{1}{\alpha}-1}}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^2} \left[(\beta_n - 1) + \beta_n \frac{(1-L_n)^\alpha}{\underline{A}} \left(R - p_f^* \underline{c}_f\right)(1+\alpha)\right] \tag{C.25}$$

The first term in the brackets in (C.25) is negative and so is the second one in resource poor countries as $R - p_f^* \underline{c}_f < 0$. Therefore, $\frac{\partial L_n}{\partial y} < 0$

Differentiating (C.20) with respect to y, we obtain:

$$\frac{\partial U}{\partial y} = \left(-\beta_n \frac{(1-L_n)^\alpha y^{\frac{1}{\alpha}-1}}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^{\alpha+1}} \left(R - p_f^* \underline{c}_f\right)\right) + \frac{1}{\alpha} \frac{x^{\frac{1}{\alpha}} y^{\frac{1}{\alpha}-1}}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^2} \left[(\beta_n - 1) + \beta_n \frac{(1-L_n)^\alpha}{\underline{A}} \left(R - p_f^* \underline{c}_f\right)(1+\alpha)\right] \tag{C.26}$$

Rearranging the terms in (C.26) we get:

$$\frac{\partial U}{\partial y} = \frac{y^{\frac{1}{\alpha}-1}}{x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}} \left[\frac{1}{\alpha}(\beta_n - 1) \frac{x^{\frac{1}{\alpha}}}{x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}} + \beta_n (\frac{1+\alpha}{\alpha}) \frac{(1-L_n)^\alpha}{\underline{A}} (R - p_f^* \underline{c}_f)(\frac{x^{\frac{1}{\alpha}}}{x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}} - \frac{\alpha}{1+\alpha})\right] \tag{C.27}$$

From (C.27) we see that the effect of agricultural productivity growth on urbanization is negative in resource-poor countries where $R - p_f^* \underline{c}_f < 0$ and manufacturing productivity is relatively high ($\frac{x^{\frac{1}{\alpha}}}{x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}} > \frac{\alpha}{1+\alpha}$). In this case, the first and second terms in the square brackets are negative and there is a shift in employment away from urban areas ($\frac{\partial U}{\partial y} < 0$). However, when manufacturing productivity is low, the first term is small and the second term is positive. In this case, the agricultural productivity shock spurs urbanization ($\frac{\partial U}{\partial y} > 0$). Differentiating (C.18) with respect to agricultural productivity y, we obtain:

$$\frac{\partial L_f}{\partial y} = \frac{1}{\alpha} \frac{y^{\frac{1}{\alpha}-1}}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^2} \left[(1-\beta_n) x^{\frac{1}{\alpha}} + \beta_n \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right) \left(\alpha y^{\frac{1}{\alpha}} - x^{\frac{1}{\alpha}}\right) \right] \tag{C.28}$$

In resource-poor countries (i.e. $R - p_f^* \underline{c}_f < 0$) with sufficiently high manufacturing productivity so that $\alpha\, y^{\frac{1}{\alpha}} - x^{\frac{1}{\alpha}} < 0$, a productivity boost in agriculture shifts resources into rural areas. In this case, $\frac{\partial L_f}{\partial y} > 0$. Please note that whenever condition $\alpha\, y^{\frac{1}{\alpha}} - x^{\frac{1}{\alpha}} < 0$ is satisfied so is $\frac{x^{\frac{1}{\alpha}}}{x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}} > \frac{\alpha}{1+\alpha}$, which ensures that the productivity boost in agriculture has an opposite effect on urbanization, i.e. $\frac{\partial U}{\partial y} < 0$. However, when manufacturing productivity is low (i.e. $\alpha\, y^{\frac{1}{\alpha}} - x^{\frac{1}{\alpha}} > 0$ and $\frac{x^{\frac{1}{\alpha}}}{x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}} < \frac{\alpha}{1+\alpha}$. the first terms in (C.27) and (C.28) are small so the second terms dominate. In (C.27) the second term is positive implying a shift of labor into urban areas, i.e. $\frac{\partial U}{\partial y} > 0$, while in (C.28) the second term is negative, implying a shift of labor away from agriculture, i.e. $\frac{\partial L_f}{\partial y} < 0$.

End of Proof: In sum, if the level of agricultural productivity is high enough, agricultural development leads to de-industrialization but enables urbanization and the shift from rural and urban tradables to urban non-tradables in "consumption cities".

C3. Industrial and/or Service Revolution and Production Cities

We discuss how a manufacturing/FIRE revolution leads to production cities.

Proposition 3 (Urbanization through industrialization and "production cities")

From (C.31), (C.32), (C.33), and (C.34) below, we have:

$$\frac{\partial U}{\partial p_m^* A_m} > 0, \; \frac{\partial L_n}{\partial p_m^* A_m} > 0, \; \frac{\partial L_m}{\partial p_m^* A_m} > 0, \; \frac{\partial L_f}{\partial p_m^* A_m} < 0$$

so long as $R - p_f^* \underline{c}_f < 0$ and agricultural productivity is sufficiently high $(\alpha (p_m^* A_m)^{\frac{1}{\alpha}} < (p_f^* A_f)^{\frac{1}{\alpha}})$.

Proof: From (C.13) and the implicit function theorem and noticing that $x = p_m^* A_m$:

$$\frac{\partial L_n}{\partial x} = -\frac{F_x}{F_{L_n}} \tag{C.29}$$

The partial derivatives of F with respect to x is:

$$F_x = \beta_n \frac{(1-L_n)^{\alpha} x^{\frac{1}{\alpha}-1}}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^{\alpha+1}} \left(R - p_f^* \underline{c}_f\right) = \beta_n \frac{(1-L_n)^{\alpha} x^{\frac{1}{\alpha}-1}}{\underline{A}\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)} \left(R - p_f^* \underline{c}_f\right). \tag{C.30}$$

Using (C.14b), (C.29), and (C.30), we obtain the following result:

$$\frac{\partial L_n}{\partial x} = -\frac{\beta_n \frac{(1-L_n)^{\alpha} x^{\frac{1}{\alpha}-1}}{\underline{A}\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)} \left(R - p_f^* \underline{c}_f\right)}{1 + \beta_n \alpha \frac{(1-L_n)^{\alpha-1}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right)} \tag{C.31}$$

The numerator in (C.31) is negative because R is low in resource-poor countries; as shown before, the denominator is positive. Thus, (C.31) is positive and $\frac{\partial L_n}{\partial x} > 0$, implying that a positive productivity shock in manufacturing shifts resources into non-tradables.

Differentiating (C.16) with respect to x, we obtain:

$$\frac{\partial L_m}{\partial x} = \frac{1}{\alpha} \frac{x^{\frac{1}{\alpha}-1}}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^2} \left[(1-\beta_n) y^{\frac{1}{\alpha}} + \beta_n \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right) \left(\alpha x^{\frac{1}{\alpha}} - y^{\frac{1}{\alpha}}\right)\right] \tag{C.32}$$

The first term in the square brackets is positive. The second term is positive when the country is resource poor, i.e. $R - p_f^* \underline{c}_f < 0$, and agricultural productivity is high enough so that $\alpha\ x^{\frac{1}{\alpha}} - y^{\frac{1}{\alpha}} < 0$. The latter reflects the importance of the Green Revolution for industrial development. Industrialization in countries with low agricultural productivity is slower than in countries with higher agricultural productivity. Thus, the effect of a positive productivity shock in manufacturing is an expansion of employment in manufacturing and tradable services, i.e. $\frac{\partial L_m}{\partial x} > 0$. This suggests that productivity growth in manufacturing and/or tradable services in resource poor countries fosters an expansion in the total employment of these sectors.

Differentiating (C.20) with respect to x and using (C.32), gives us the following expression:

$$\frac{\partial U}{\partial x} = -\beta_n x^{\frac{1}{\alpha}-1} \frac{(1-L_n)^{\alpha}}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^{\alpha+1}} \left(R - p_f^* \underline{c}_f\right)$$
$$+ \frac{1}{\alpha} \frac{x^{\frac{1}{\alpha}-1}}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^2} \left[(1-\beta_n) y^{\frac{1}{\alpha}} + \beta_n \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right) \left(\alpha x^{\frac{1}{\alpha}} - y^{\frac{1}{\alpha}}\right)\right] \quad \text{(C.33)}$$

Both terms in (C.33) are positive when countries are resource-poor ($R - p_f^* \underline{c}_f < 0$) and agricultural productivity is high enough. In this case, productivity growth in manufacturing and/or tradable services fuels urbanization. Finally, from (C.18) we get:

$$\frac{\partial L_f}{\partial x} = \frac{1}{\alpha} \frac{x^{\frac{1}{\alpha}-1}}{\left(x^{\frac{1}{\alpha}} + y^{\frac{1}{\alpha}}\right)^2} \left[(\beta_n - 1)\, y^{\frac{1}{\alpha}} + \beta_n \frac{(1-L_n)^{\alpha}}{\underline{A}} \left(R - p_f^* \underline{c}_f\right) \left(y^{\frac{1}{\alpha}} - \alpha x^{\frac{1}{\alpha}}\right)\right] \quad \text{(C.34)}$$

End of Proof: In (C.34), if agricultural productivity is sufficiently high, then both terms in the square brackets are negative. Thus, a productivity boom in manufacturing / tradable services leads to a shift of resources away from agriculture and into urban tradables.

A shock that reduces the country's relative level of manufacturing productivity should reduce manufacturing employment according to (C.32). For instance, it could be that manufacturing productivity decreases (A_m) or that manufacturing productivity stays the same but other countries' manufacturing productivity increases, thus lowering manufacturing prices (p_m^*). In both cases, ($x = p_m^* A_m$) would decrease. Of course, this applies to both manufacturing and FIRE.

Various factors could account for a decrease in x. First of all, many countries, in particular in LAC, have adopted in the past ISI policies that artificially increased manufacturing productivity and employment at the expense of other sectors, and also raised the urbanization rate. When these policies were removed, productivity A_m declined, but urbanization rates decreased little. Second, increased trade competition in the world, especially with the growth of China (e.g., in manufacturing) and India (e.g., in business services), reduced the world price levels of urban tradables. In countries where urban tradable productivity was initially unchanged, x likely decreased, resulting in the same effects as the removal of ISI policies. Third, the production functions of eq. (2) implicitly assume complementarities between technology and labor. However, new labor-saving technologies have appeared over time in urban tradable sectors, especially in more developed countries. While our model does not explicitly account for this mechanism, it could be interpreted in our model via a lower x, with again the same consequences. In the end, regardless of the "origin" of the reduction in x, production cities see their sectoral composition change as employment in urban tradables declines. If we assume that urban residents do not migrate to rural areas, for example because skills acquired in the urban sectors have no value in the agricultural sector or because agricultural productivity is high, a negative shock to manufacturing will not shift resources from urban to rural areas (as in Proposition 3). Instead, it will shift resources from urban tradables to non-tradables, resulting in the transformation of a production city into a consumption city. Thus, we formulate Proposition 4.

D Data Creation: Aggregate Data

Sample. We focus on 116 countries that were still "developing" countries (i.e., had not reached high income status) in 1960. We obtain data every 5 years between 1960 and 2010. The full sample thus consists of 116 countries times 13 years = 1,508 observations.

GDP Share of Manufacturing and Services. We obtain when available the GDP *share of manufacturing* and the GDP share of manufacturing and services using the Beta version of the World Development Indicators (WDI) database of the World Bank (2020b).[41] More recent versions of the WDI do not report these GDP shares for earlier decades, only the older versions of the WDI do. The Beta version has the merit of showing all available yearly estimates simultaneously for all versions of the WDI. For each country-year, we then take the mean of the available estimates. To maximize the number of available estimates for the years 1960, 1965, ..., 2015, 2020, and in order to minimize fluctuations due to year-specific measurement issues, we rely on five-year moving averages.

After doing so, out of the 1,508 observations in our data, for 189, 159 and 195 observations we still do not have an available estimate for the GDP share of MFG, services (SERV), and MFG+SERV, respectively. For the 2010-2020 period, we complete the data using estimates from Central Intelligence Agency (2021) and reports from international organizations or governmental agencies. Even after doing this, for 188, 153 and 189 observations we still do not have an available estimate, respectively.

For the long-difference regressions, we need data c. 1960-1970. For these years, we use United Nations (1960-1980). However, for 87, 75, and 88 observations, we do not have an available estimate for the GDP share of MFG, SERV, and MFG+SERV, respectively.

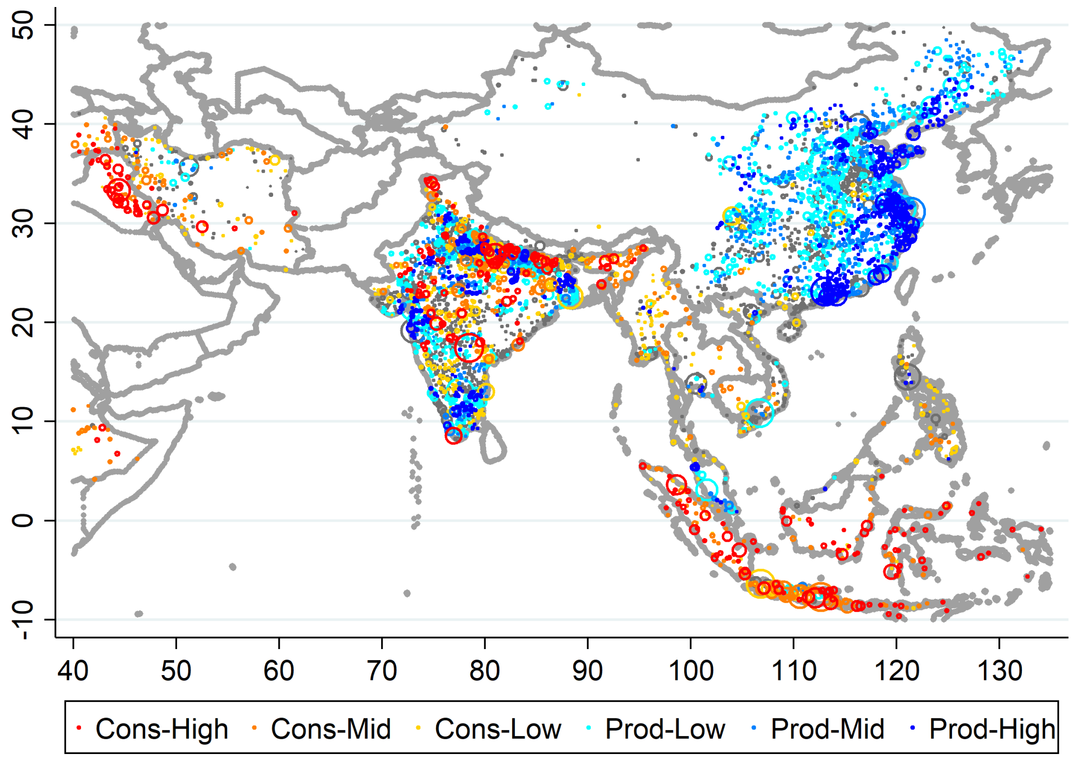
The *System of National Accounts* (SNA) - *Analysis of Main Aggregates* (AMA) database of United Nations (2020c) reports the GDP share of aggregated sectors, including MFG and services, for all countries from 1970 to 2020. When needed, we use this database to complete the missing country-years of our main data set, after verifying that the newly added estimates are consistent with the estimates that we already had for other years.[42]

GDP Share of FIRE. The *National Accounts Official Country Data database* of United Nations (2020a) reports when available the GDP share of various sectors – using both the ISIC Revision 3 and Revision 4 – from the 1960s to date. The data are patchy, however, and we employ them only to obtain the GDP share of FIRE c. 2020 (observations from 2015-2020).

[41] For manufacturing, we use the series "Manufacturing, value added (% of GDP)". For services, we use as our baseline the series "Services, etc., value added (% of GDP)". When estimates of the service share are not available, we rely on another WDI series: "Services, value added (% of GDP)".

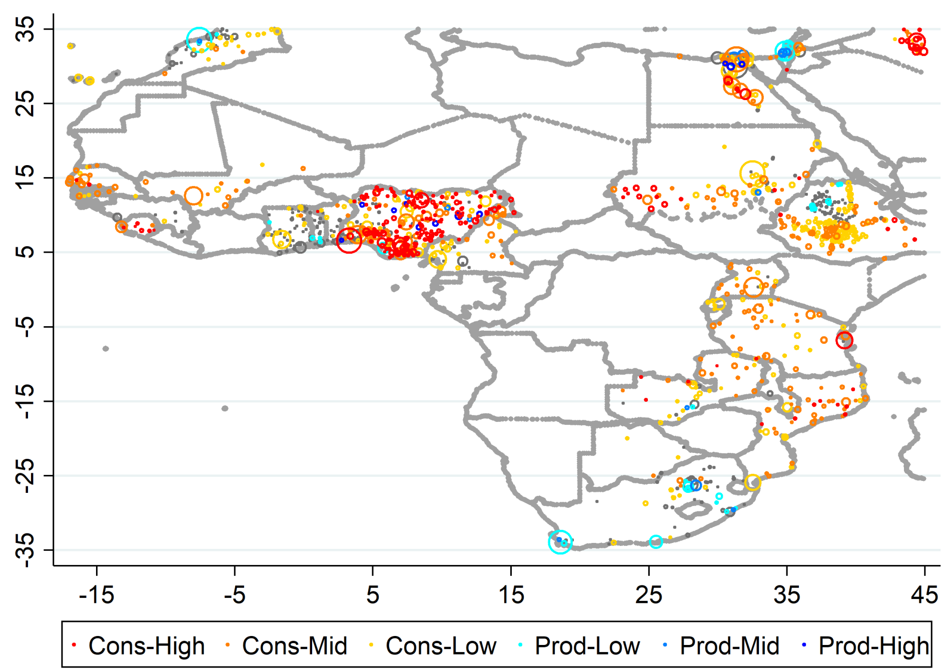
[42] We do not use SNA-AMA as our baseline database. Indeed, when comparing WDI + the yearbooks and SNA-AMA, it appears that many SNA-AMA estimates were extrapolated.

Figure D.1: **Map of Production Cities and Consumption Cities, Asia, c. 2000**



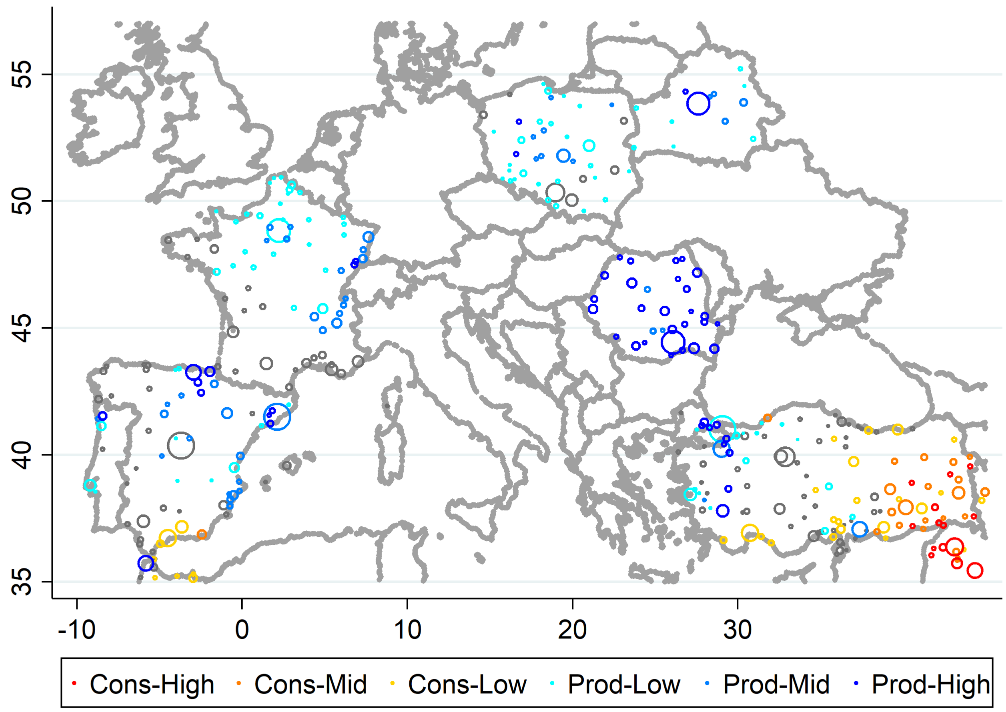
Notes: This figure shows for selected Asian countries the location of production cities (Prod., in blue), neutral cities (in grey), and consumption cities (Cons., in yellow-red).

Figure D.2: **Map of Production Cities and Consumption Cities, Africa, c. 2000**



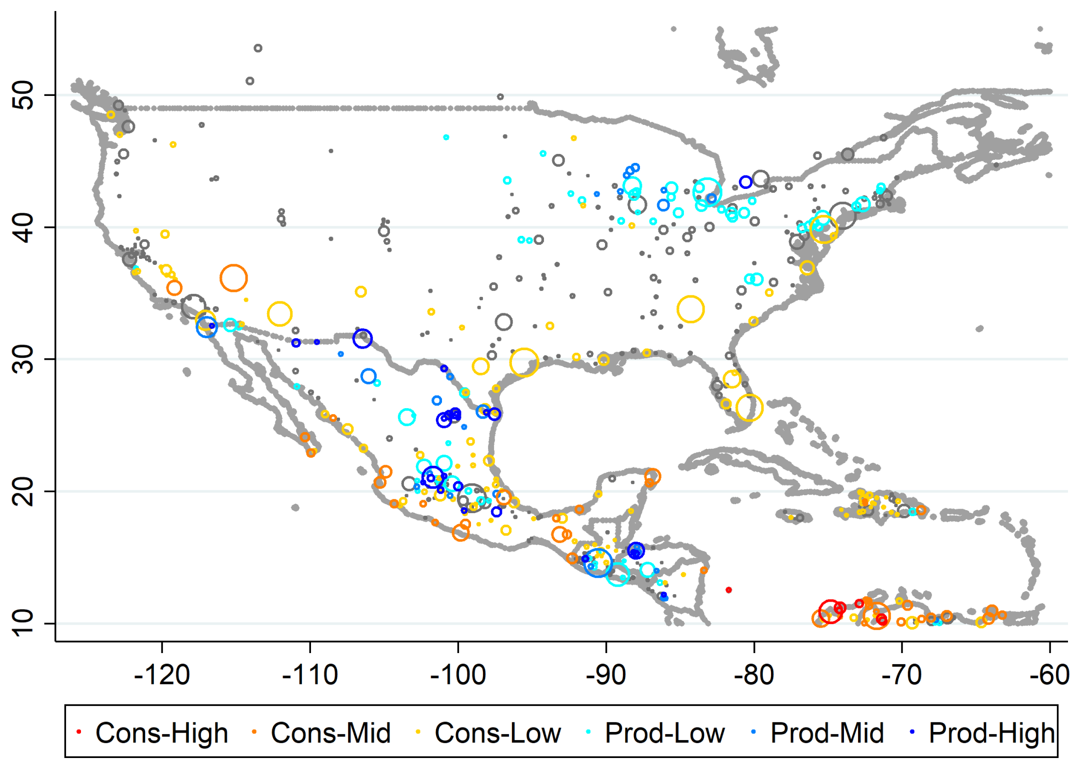
Notes: This figure shows for selected African countries the location of production cities (Prod., in blue), neutral cities (in grey), and consumption cities (Cons., in yellow-red).

Figure D.3: **Map of Production Cities and Consumption Cities, Europe, c. 2000**



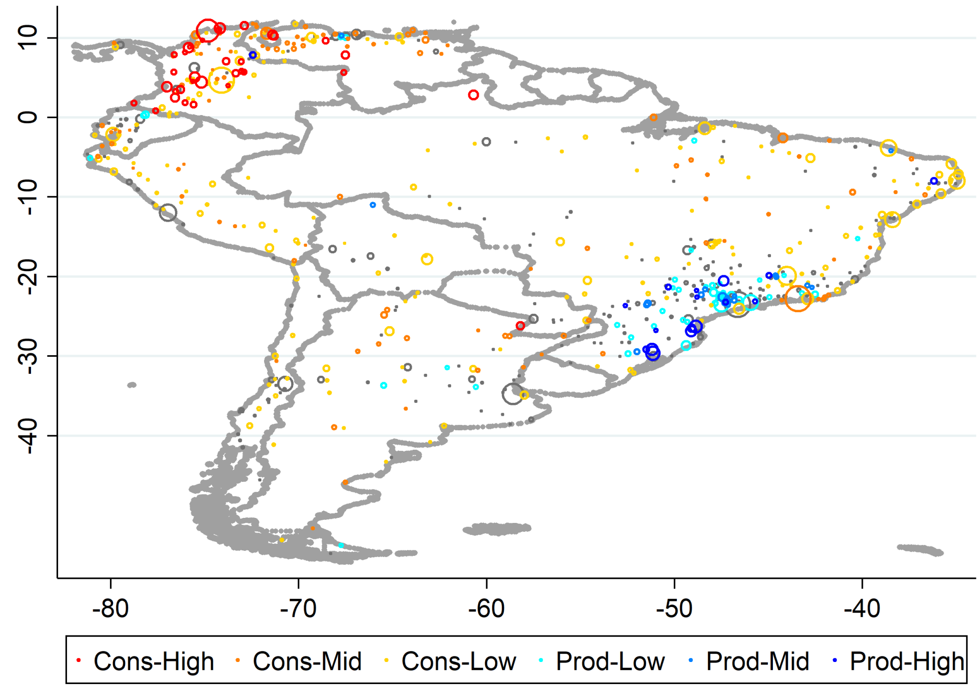
Notes: This figure shows for selected European countries the location of production cities (Prod., in blue), neutral cities (in grey), and consumption cities (Cons., in yellow-red).

Figure D.4: **Map of Production Cities and Consumption Cities, North America, c. 2000**



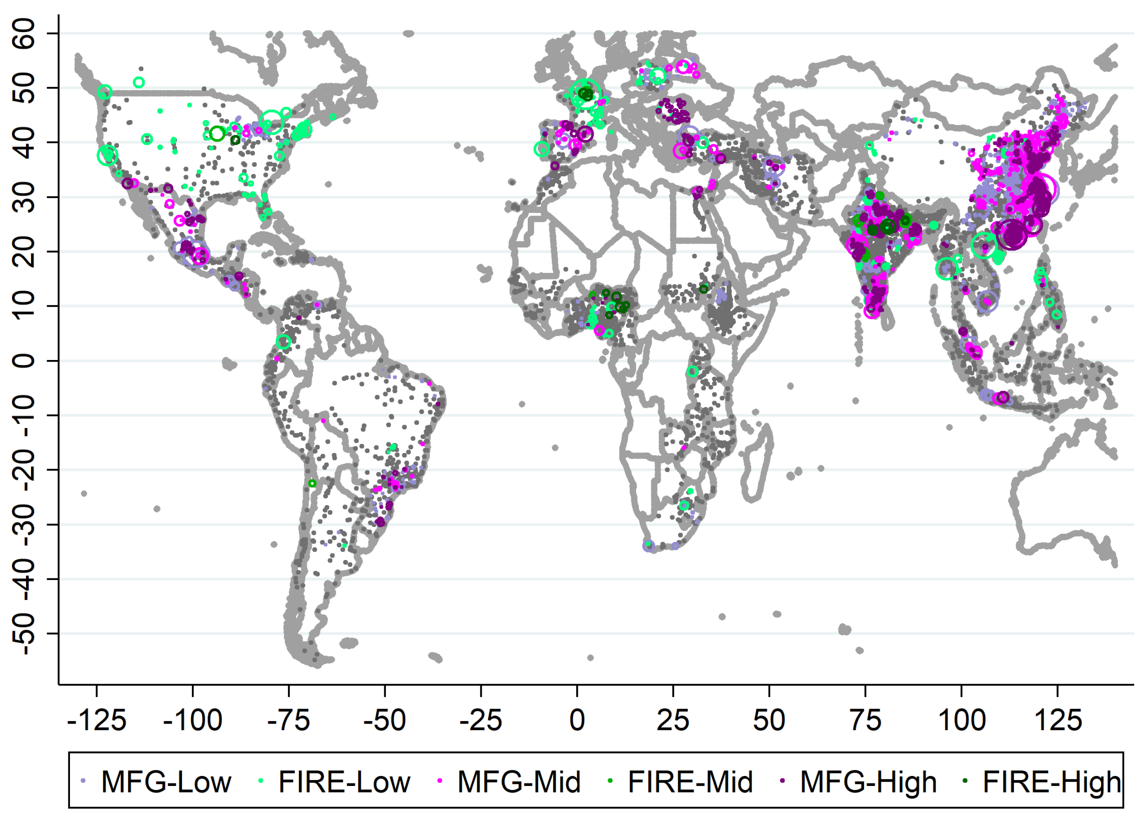
Notes: This figure shows for selected North American countries the location of production cities (Prod., in blue), neutral cities (in grey), and consumption cities (Cons., in yellow-red).

Figure D.5: **Map of Production Cities and Consumption Cities, South America, c. 2000**



Notes: This figure shows for selected South American countries the location of production cities (Prod., in blue), neutral cities (in grey), and consumption cities (Cons., in yellow-red).

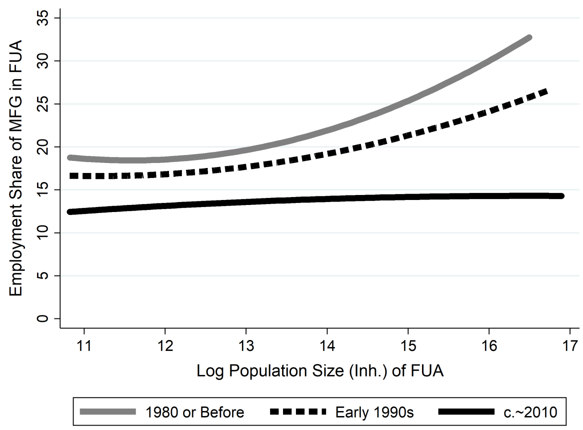
Figure D.6: **World Map of Production Cities in Manufacturing or FIRE, World, c. 2000**



Notes: This figure shows the location of production cities based on manufacturing only (MFG, purple), neutral production cities (grey), and production cities based on FIRE only (FIRE, green).

Figure D.7: **Evolution of MFG vs. FIRE Employment in LAC Cities, 1960s-2010s**

(a) Evolution for Manufacturing Only



(b) Evolution for FIRE Only

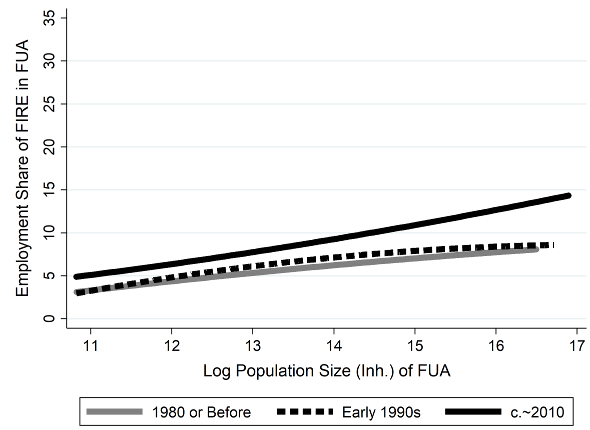
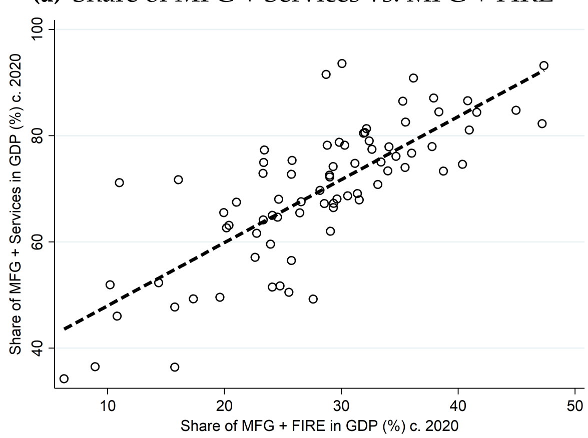


Figure D.8: **GDP Share of MFG+Services vs. GDP Share of MFG+FIRE, c. 2020 (N = 78)**

(a) Share of MFG + Services vs. MFG + FIRE



(b) Share of Services vs. FIRE

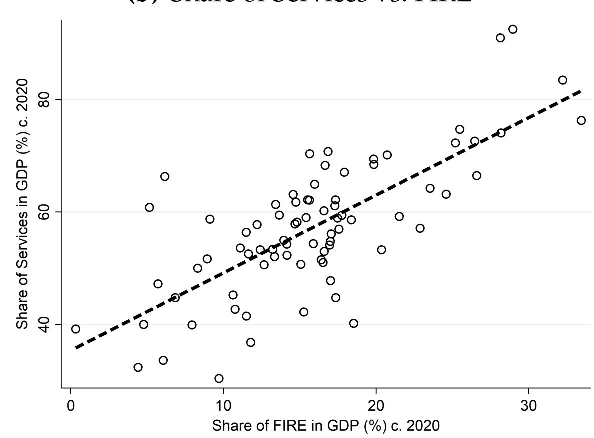
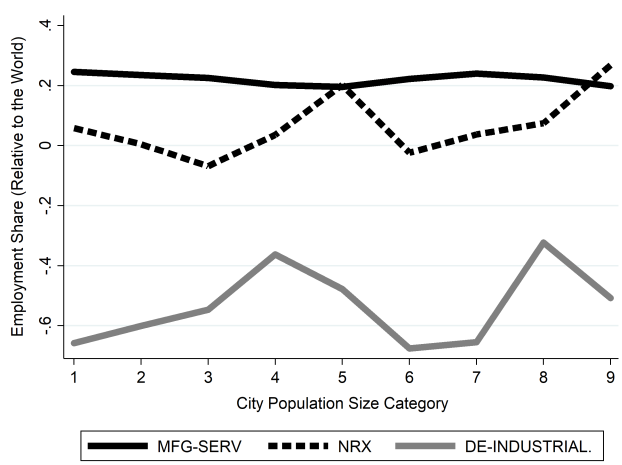
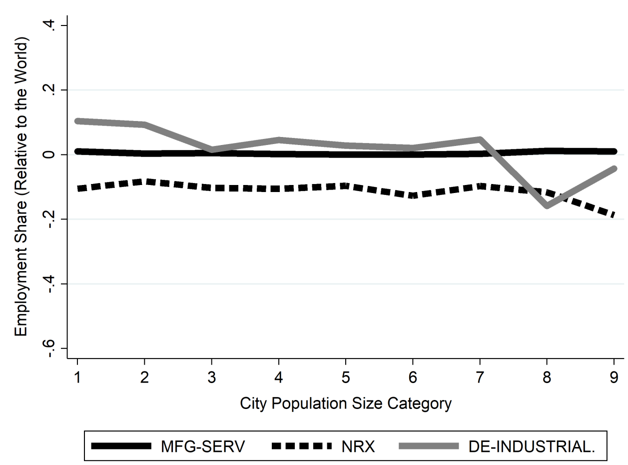


Figure D.9: **City Size and Urban Sectoral Shares for the Three Groups of Countries**

(a) Urban Tradables = MFG

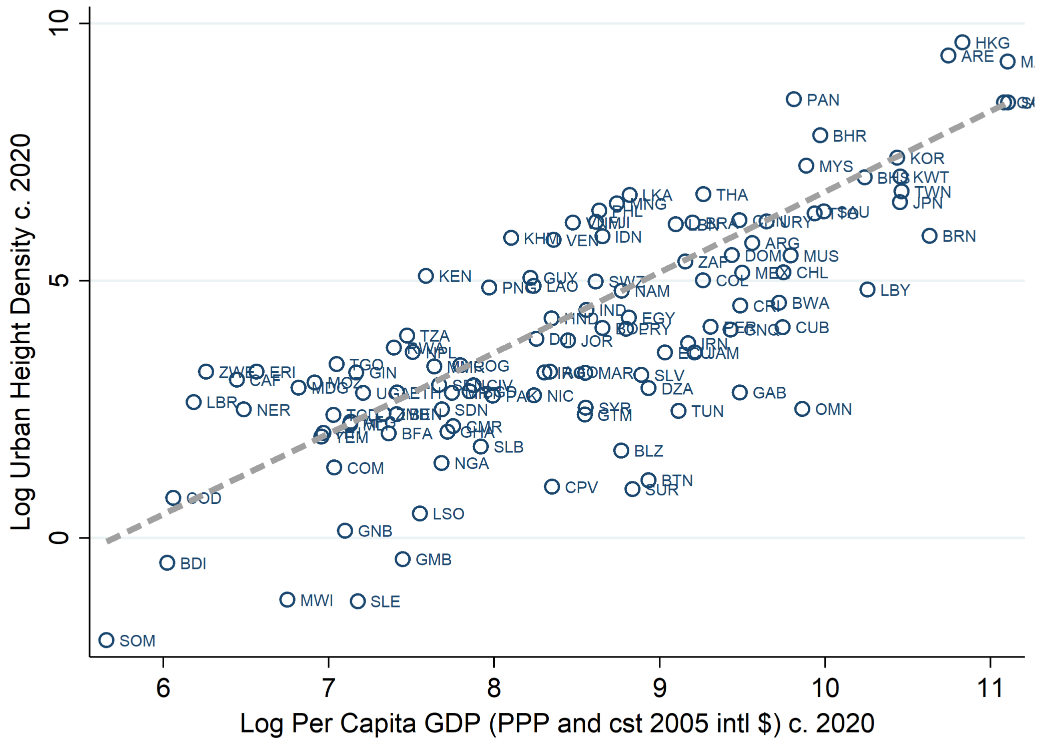


(b) Urban Tradables = FIRE



Notes: The figures show the correlations for each production/consumption city-ness measure-pop. category.

Figure D.10: **Tall Building Construction and Economic Development, World**



Notes: This figure shows for the 116 countries of our main sample the relationship between the log sum of tall building heights per urban capita (m per inh.) and log per capita GDP (PPP, cst 1990 intl $) c. 2020.

Table D.1: Employment Share of Urban Tradables by City Size, Cross-Section, c. 2000

Dep. Var. = $MFGFIRE_{a,00}$	Coef.	SE		Coef.	SE
Capital $City_a$ (CAP)	-5.629**	(2.433)	URB_c	0.0273	(0.055)
Pop. Size $CAT_a = 2$	-0.663	(1.417)	URB_c * Pop. Size $CAT_a = 2$	0.0738**	(0.0279)
Pop. Size $CAT_a = 3$	0.944	(2.336)	URB_c * Pop. Size $CAT_a = 3$	0.0768*	(0.0435)
Pop. Size $CAT_a = 4$	3.597	(3.980)	URB_c * Pop. Size $CAT_a = 4$	0.0402	(0.0628)
Pop. Size $CAT_a = 5$	5.709	(4.402)	URB_c * Pop. Size $CAT_a = 5$	0.0146	(0.0693)
Pop. Size $CAT_a = 6$	13.31***	(4.128)	URB_c * Pop. Size $CAT_a = 6$	-0.0612	(0.0644)
Pop. Size $CAT_a = 7$	8.739*	(4.453)	URB_c * Pop. Size $CAT_a = 7$	0.0283	(0.0700)
Pop. Size $CAT_a = 8$	12.03**	(5.950)	URB_c * Pop. Size $CAT_a = 8$	0.0395	(0.0979)
Pop. Size $CAT_a = 9$	21.81***	(5.369)	URB_c * Pop. Size $CAT_a = 9$	-0.0899	(0.0812)
Constant	16.24***	(4.060)			

Notes: Obs. = 6,812 urban agglomerations. R2 = 0.20. The dependent variable is the employment share of MFG+FIRE in each urban agglomeration a belonging to country c circa 2000. The other variables are also defined in 2000. Robust SE clustered at the country level in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table D.2: Additional Correlations for the Long-Difference Regressions

Dependent Variable:	**Urbanization Rate (%) in 2020**		
	(1)	(2)	(3)
NRXGDP (%) (Mean 1960-2020)	1.02***	0.74***	0.74***
	[0.239]	[0.236]	[0.275]
MFGSERV (%) (2020)	1.09***		
	[0.195]		
DEINDU (%) (1980-2020)	-0.04	-0.70	-0.88
	[0.343]	[0.480]	[0.628]
MFG (%) (2020)		1.57***	1.06***
		[0.279]	[0.395]
SERV (%) (2020)		0.41*	
		[0.244]	
FIRE (%) (2020)			0.69**
			[0.327]
SERV (non-FIRE) (%) (2020)			0.57*
			[0.303]
Beta Coef. MFGSERV	0.57		
Beta Coef. MFG		0.62	0.22
Beta Coef. SERV		0.16	
Beta Coef. FIRE			0.14
Beta Coef. SERV (non-FIRE)			0.16
Controls	Y	Y	Y

Notes: Obs. = 115. Whenever possible, we control for initial conditions c. 1960 (i.e., the urban share and the value of the variables c. 1960) and add the controls for area, population, small islands, and urban definitions. Robust SE in parentheses.

Table D.3: Timing of the Correlations btw Urbanization & the Measures, 10-Year Panel

Dependent Variable:			**Urbanization Rate (%) in Year t**		
Correlations with:	Baseline	The Leads	Columns (3)-(5): The Lags		
NRXGDP (%) t		0.05			
		[0.062]			
NRXGDP (%) t-10	0.19**	0.18***	0.12*	0.03	
	[0.089]	[0.065]	[0.065]	[0.080]	
NRXGDP (%) t-20			0.23***	0.23***	
			[0.072]	[0.068]	
NRXGDP (%) t-30				0.14***	
				[0.046]	
MFGSERV (%) t+10		0.15			
		[0.096]			
MFGSERV (%) t	0.43***	0.26***	0.33**	0.37**	0.37**
	[0.141]	[0.090]	[0.142]	[0.159]	[0.168]
MFGSERV (%) t-10			0.26**	0.16**	0.17**
			[0.103]	[0.077]	[0.078]
MFGSERV (%) t-20				0.31**	0.32**
				[0.127]	[0.125]
DEINDU (%) 1980-t+10		0.27			
		[0.238]			
DEINDU (%) 1980-t	0.42	0.15	0.37	0.11	0.10
	[0.266]	[0.152]	[0.252]	[0.271]	[0.272]
DEINDU (%) 1980-t-10			0.01	-0.09	-0.08
			[0.295]	[0.170]	[0.162]
DEINDU (%) 1980-t-20				0.35	0.35
				[0.443]	[0.440]
FMXGDP (%) t-10					0.05
					[0.090]
FMXGDP (%) t-20					0.23***
					[0.069]
FMXGDP (%) t-30					0.14***
					[0.047]
AGXGDP (%) t-10					-0.04
					[0.160]
AGXGDP (%) t-20					0.23
					[0.195]
AGXGDP (%) t-30					0.15
					[0.161]
Sum for NXGDP			0.35***	0.40***	
			[0.12]	[0.15]	
Sum for MFGSERV			0.60***	0.85***	0.85***
			[0.20]	[0.29]	[0.29]
Sum for DEINDU			0.37	0.37	0.37
			[0.32]	[0.46]	[0.46]
Sum for FMXGDP					0.42***
					[0.15]
Sum for AGXGDP					0.33
					[0.34]
Country FE, Year FE, Ctrls	Y	Y	Y	Y	Y
Observations	694	578	578	462	462

Notes: Robust SEs are clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01.

Table D.4: Resources, (De-)Industrialization, & Employment by Gender, Cross-Section

	Dependent Variable: Employment Share of Sector ... in Urban Areas (%) c. 2000									
PANEL A:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MALES	MFG	FIRE	SUM	NTR	NTR2	NTR3	GOVT	GOVT2	NRX	CONST
MFGSERV	0.20**	0.10**	0.29***	-0.18*	-0.30*	-0.28*	-0.01	-0.03	0.04	-0.01
	[0.08]	[0.04]	[0.09]	[0.10]	[0.15]	[0.15]	[0.04]	[0.06]	[0.10]	[0.05]
NRXGDP	-0.06	0.01	-0.05	-0.22	-0.12	-0.03	-0.07	-0.07	0.23	-0.14*
	[0.10]	[0.06]	[0.13]	[0.15]	[0.19]	[0.22]	[0.06]	[0.11]	[0.15]	[0.07]
DEINDU	-0.60*	0.18*	-0.42	0.19	0.62	0.58	-0.16	-0.31	0.38	-0.29
	[0.34]	[0.10]	[0.31]	[0.33]	[0.44]	[0.50]	[0.14]	[0.22]	[0.29]	[0.18]
MFGSERV	0.26***	0.08**	0.35***	0.04	-0.18	-0.24	0.07	0.04	-0.19	0.13***
- NRXGDP	[0.10]	[0.04]	[0.10]	[0.09]	[0.14]	[0.16]	[0.04]	[0.08]	[0.14]	[0.05]
MFGSERV	0.80**	-0.08	0.72**	-0.37	-0.92**	-0.86*	0.15	0.29	-0.34	0.28*
- DEINDU	[0.32]	[0.10]	[0.30]	[0.31]	[0.42]	[0.48]	[0.14]	[0.21]	[0.29]	[0.17]
PANEL B:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FEMALES	MFG	FIRE	SUM	NTR	NTR2	NTR3	GOVT	GOVT2	NRX	CONST
MFGSERV	0.16	0.09	0.24	-0.07	-0.03	0.09	-0.06	-0.27	0.06	-0.01
	[0.12]	[0.05]	[0.15]	[0.29]	[0.32]	[0.36]	[0.05]	[0.22]	[0.14]	[0.05]
NRXGDP	0.07	0.07	0.14	0.71**	0.67*	0.63	-0.18	-0.35	-0.14	-0.15*
	[0.16]	[0.09]	[0.21]	[0.31]	[0.34]	[0.42]	[0.11]	[0.33]	[0.23]	[0.07]
DEINDU	-0.88*	-0.08	-0.96*	0.71	1.31	2.03*	-0.44*	-0.72	0.26	-0.27
	[0.45]	[0.14]	[0.48]	[0.80]	[0.80]	[1.05]	[0.25]	[0.92]	[0.37]	[0.31]
MFGSERV	0.08	0.02	0.10	-0.78*	-0.69	-0.54	0.12	0.08	0.20	0.14*
- NRXGDP	[0.10]	[0.05]	[0.13]	[0.41]	[0.43]	[0.51]	[0.09]	[0.34]	[0.19]	[0.08]
MFGSERV	1.03**	0.17	1.20**	-0.78	-1.33	-1.94*	0.38	0.45	-0.20	0.26
- DEINDU	[0.42]	[0.14]	[0.46]	[0.89]	[0.89]	[1.13]	[0.24]	[0.93]	[0.36]	[0.31]
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Observations = 61 countries. This table shows the correlation between the employment share of each sector in urban areas c. 2000 and measures of natural resource exports, industrialization/FIRE-ization, and deindustrialization, also defined with respect to 2000. Robust SE. * p<0.10, ** p<0.05, *** p<0.01.

Table D.5: Resources, (De-)Industrialization, & Informality by Gender, Cross-Section

Dep.Var. =	Empl. Sh. in Urban Empl.			Empl. Sh. in Urban Empl.			Empl. Sh. in Urban Empl.		
Gender =	All Workers			Male Workers			Female Workers		
Type of Employment:	Wage Work	Self Empl.	Unpaid Empl.	Wage Work	Self Empl.	Unpaid Empl.	Wage Work	Self Empl.	Unpaid Empl.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MFGSERV	0.54*	-0.62**	0.08	0.55**	-0.57***	0.02	0.29	-0.43	0.14
	[0.28]	[0.24]	[0.07]	[0.23]	[0.21]	[0.05]	[0.44]	[0.40]	[0.11]
NRXGDP	0.06	-0.22	0.16	0.25	-0.24	-0.00	-0.44	0.06	0.37
	[0.37]	[0.28]	[0.12]	[0.31]	[0.27]	[0.07]	[0.61]	[0.45]	[0.23]
DEINDU	-0.33	0.19	0.15	-0.28	0.06	0.22*	-0.72	0.84	-0.12
	[0.69]	[0.57]	[0.17]	[0.59]	[0.52]	[0.11]	[1.05]	[0.86]	[0.28]
MFGSERV	0.48	-0.40	-0.08	0.30	-0.33	0.03	0.73	-0.50	-0.23
- NRXGDP	[0.31]	[0.24]	[0.09]	[0.25]	[0.22]	[0.05]	[0.53]	[0.42]	[0.18]
MFGSERV	0.88	-0.80	-0.07	0.83	-0.63	-0.20**	1.01	-1.27	0.26
- DEINDU	[0.72]	[0.62]	[0.15]	[0.59]	[0.54]	[0.10]	[1.17]	[1.01]	[0.26]
Observations	55	55	55	55	55	55	55	55	55
Ctrls	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows the correlation between the employment share of each type of employment in urban areas or specific sectors of urban areas c. 2000 and measures of natural resource exports, industrialization/FIRE-ization, and deindustrialization, also defined with respect to 2000. NTR = non-tradables (domestic wholesale and retail trade). Robust SE. * p<0.10, ** p<0.05, *** p<0.01.

Table D.6: Resources, Industrialization & Sectoral Employment / Informality, Panel

Dep.Var. =	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Empl. Sh. of ... (t)	MFG	FIRE	SUM	NTR	NTR2	NTR3	GOVT	GOVT2	WAGE	SELF
MFGSERV_t	0.34**	0.06	0.40	-0.29	-0.54**	-0.51***	-0.10	-0.15**	0.14	-0.27
	[0.154]	[0.111]	[0.243]	[0.239]	[0.233]	[0.099]	[0.083]	[0.063]	[0.337]	[0.271]
NRXGDP_{t-10}	0.30*	-0.04	0.26	0.21	0.49***	0.38***	0.18**	0.04	-0.31	0.30
	[0.166]	[0.071]	[0.217]	[0.153]	[0.152]	[0.104]	[0.076]	[0.167]	[0.257]	[0.228]
DEINDU_{1980-t}	-0.42	-0.03	-0.45	-0.23	-0.47***	-0.12	0.10	-0.17	0.30	-0.51***
	[0.368]	[0.204]	[0.563]	[0.161]	[0.153]	[0.191]	[0.126]	[0.127]	[0.199]	[0.171]
MFGSERV	0.04	0.10	0.14	-0.51	-1.03***	-0.90***	-0.28*	-0.19	0.45	-0.57
- NRXGDP	[0.19]	[0.13]	[0.29]	[0.35]	[0.30]	[0.15]	[0.14]	[0.18]	[0.49]	[0.42]
MFGSERV	-0.72**	0.00	-0.71	-0.44*	-0.96***	-0.50**	-0.07	-0.22	0.61**	-0.81***
- DEINDU	[0.33]	[0.20]	[0.52]	[0.23]	[0.23]	[0.19]	[0.13]	[0.15]	[0.27]	[0.24]
Observations	124	124	124	124	124	124	120	93	99	99
Country, Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows the correlation between the employment share of each sector/type of employment in urban areas in t and measures of natural resource exports (t-10), industrialization/FIRE-ization (t), and deindustrialization (1980-t). Robust SE clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01.

Table D.7: Resources, Industrialization & Employment, Cross-Section, I2D2 Database

Dep.Var. = **Empl. Sh. (c. 2005):**	(1) MFG	(2) FIRE	(3) MFGFIRE	(4) NTRI	(5) NTRI2	(6) WAGE	(7) SELF	(8) UNPAID
Panel A: Using 2000								
$MFGSERV_{2000}$	0.12***	-0.04	0.08*	0.09	0.14	0.44**	-0.48***	-0.15
	[0.035]	[0.039]	[0.043]	[0.127]	[0.144]	[0.180]	[0.136]	[0.118]
$NRXGDP_{1960-2000}$	-0.06	0.03	-0.03	0.18	0.03	0.41	-0.30	-0.15
	[0.056]	[0.045]	[0.076]	[0.127]	[0.209]	[0.294]	[0.221]	[0.121]
$DEINDU_{1980-2000}$	-0.26	0.14	-0.12	0.12	1.42**	-0.77	1.08*	0.54
	[0.167]	[0.105]	[0.204]	[0.364]	[0.597]	[0.715]	[0.557]	[0.326]
MFGSERV	0.18***	-0.07	0.11	-0.08	0.11	0.03	-0.18	0.00
- NRXGDP	[0.04]	[0.05]	[0.07]	[0.17]	[0.20]	[0.27]	[0.22]	[0.15]
MFGSERV	0.38**	-0.18	0.20	-0.03	-1.28**	1.21	-1.56***	-0.69*
- DEINDU	[0.16]	[0.12]	[0.21]	[0.40]	[0.60]	[0.74]	[0.57]	[0.36]
Panel B: Using 2010								
$MFGSERV_{2010}$	0.10	-0.03	0.07	0.09	0.26	0.69***	-0.62***	-0.23
	[0.061]	[0.043]	[0.061]	[0.145]	[0.199]	[0.217]	[0.157]	[0.142]
$NRXGDP_{1960-2010}$	-0.13**	0.04	-0.10	0.14	0.16	0.42*	-0.28	-0.13
	[0.065]	[0.045]	[0.070]	[0.143]	[0.223]	[0.244]	[0.195]	[0.134]
$DEINDU_{1980-2010}$	-0.09	0.14	0.05	0.10	1.11**	-0.02	0.47	0.23
	[0.134]	[0.085]	[0.159]	[0.309]	[0.503]	[0.652]	[0.564]	[0.242]
MFGSERV	0.23***	-0.07	0.16***	-0.05	0.09	0.27	-0.34*	-0.09
- NRXGDP	[0.05]	[0.07]	[0.06]	[0.20]	[0.20]	[0.22]	[0.18]	[0.18]
MFGSERV	0.19	-0.17	0.02	-0.02	-0.86	0.71	-1.09*	-0.45
- DEINDU	[0.15]	[0.10]	[0.17]	[0.36]	[0.55]	[0.69]	[0.57]	[0.30]
Observations	93	90	90	94	91	94	93	93
Controls	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows the correlation between the employment share of each sector/type of employment in urban areas c. 2005 and measures of natural resource exports, industrialization/FIRE-ization, and deindustrialization, defined with respect to 2000 or 2010. Robust SE. * p<0.10, ** p<0.05, *** p<0.01.

Table D.8: **Resources, Industrialization & Growth of FUAs, 1975-2015, Cross-Section**

Dependent Variable	Log FUA Pop. 2015 - Log FUA Pop. 1975							
Capital + Largest City:	Top 1	Top 2	Top 5	Top 0	Top 1	Top 2	Top 5	Top 0
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MFGSERV*TOP	-0.02	-0.01	0.00	-0.01	-0.02	-0.01	0.00	-0.01
	[0.025]	[0.024]	[0.025]	[0.025]	[0.026]	[0.025]	[0.026]	[0.026]
NRXGDP*TOP	-0.01	-0.01	-0.01	-0.00				
	[0.029]	[0.023]	[0.018]	[0.039]				
DEINDU*TOP	0.04	0.03	0.01	0.05	0.04	0.03	0.01	0.05
	[0.047]	[0.046]	[0.044]	[0.051]	[0.047]	[0.046]	[0.044]	[0.051]
FMXGDP*TOP					-0.01	-0.01	-0.01	-0.00
					[0.031]	[0.024]	[0.019]	[0.042]
AGXGDP*TOP					-0.06	-0.04	-0.05	-0.05
					[0.057]	[0.052]	[0.046]	[0.061]
TOP*(MFGSERV - NRXGDP)	-0.00	-0.00	0.01	-0.00				
	[0.05]	[0.04]	[0.04]	[0.06]				
TOP*(MFGSERV - DEINDU)	-0.06	-0.04	-0.01	-0.06	-0.06	-0.04	-0.01	-0.06
	[0.07]	[0.06]	[0.06]	[0.07]	[0.07]	[0.07]	[0.06]	[0.07]
TOP*(MFGSERV - FMXGDP)					-0.01	-0.00	0.01	-0.01
					[0.05]	[0.04]	[0.04]	[0.06]
TOP*(MFGSERV - AGXGDP)					0.04	0.03	0.05	0.04
					[0.05]	[0.05]	[0.04]	[0.05]
Observations	7,422	7,422	7,422	7,422	7,422	7,422	7,422	7,422

Notes: Robust SE in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table D.9: **Resources, Industrialization & Growth of FUAs, 1975-2015, Panel**

Dependent Variable:	Log FUA Pop. in Year t							
Extra Lags Included	1 Extra Lag				2 Extra Lags			
Capital + Largest City:	Top 1	Top 2	Top 5	Top 0	Top 1	Top 2	Top 5	Top 0
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sum of Lags for MFGSERV	0.01	0.00	0.00	0.00	0.02**	0.01*	0.01*	0.01
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Sum of Lags for NRXGDP	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
	[0.02]	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Sum of Lags for DEINDU	-0.02	-0.01	-0.01	-0.02	-0.01	-0.01	-0.00	-0.02
	[0.02]	[0.02]	[0.02]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Observations	29,681	29,681	29,681	29,681	22,259	22,259	22,259	22,259
City FE	Y	Y	Y	Y	Y	Y	Y	Y
Country-Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Lags	1	1	1	1	2	2	2	2
Top	1	2	5	0	1	2	5	0

Notes: Robust SE clust. at the city level in parentheses. * p<0.10, ** p<0.05, *** p<0.01.