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Urbanization and Productivity:

Evidence from Turkish Provinces over the Period 1980-2000

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Abstract

Since the early 1980s, Turkey has been going through a rapid urbanization process at a pace beyond the World average. This paper aims at assessing the impact of this rapid urbanization process on the country's sector productivity. The authors built a database combining two-digit manufacturing data and some geographical, infrastructural, and socio-economic data collected at the provincial level by the Turkish State Institute of Statistics. The paper develops a parsimonious econometric relation linking sector productivity to accessibility, localization, and urbanization economies, proxying variables in the tradition of the New Economic Geography literature.

The estimation results suggest that both localization and urbanization economies, as well as market accessibility, are productivity-enhancing factors in Turkey, although the causation link between productivity and these agglomeration measures is not clearly established. The sector-by-sector estimation confirms this result, although the localization economies effect is negative for the non-oil mineral sector, and the urbanization economies effect is weak for natural-resource-based sectors such as the wood and metal industry.

Although the data cover the period up to 2000 and thus ignore the financial crisis that hit Turkey in 2001, the current structural transformation of the country away from the agricultural sector gives room to use the insights of these results as a preliminary step to understand the new challenges faced by the Turkish manufacturing sector. The results provide a discussion base to revisit the policy agenda on the improvement of the accessibility to markets, the improvement of the business environment to ease the creation and development of new firms, and a well-managed urbanization process to tap in the economic potential of cities.

This paper—a product of the Urban Unit, Sustainable Development Network in the Europe and Central Asia region—is part of a larger effort in the department to assess the impact of the growing urbanization on productivity in the Europe and Central Asia region. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at scoulibaly2@worldbank.org.

Urbanization and Productivity: Evidence from Turkish Provinces over the Period 1980-2000

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[2] The findings reported in this paper are those of the authors alone, and should not be attributed to the World Bank, its executive director, or the countries they represent.

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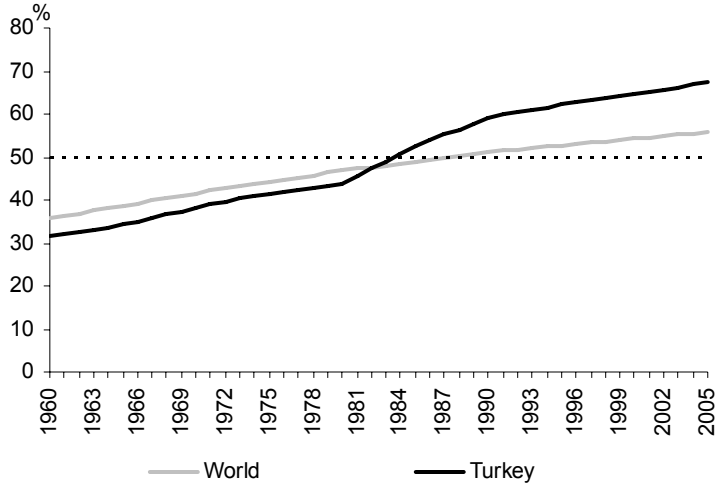
1) Introduction

Since the early 1980s, Turkey has been going through a rapid urbanization process at a pace beyond the world average. A recent World Bank study qualified this process as "the strongest socio-economic force that has changed peoples' lives since the foundation of the Turkish Republic in 1923" (World Bank 2004). More than 20% of the country's urban population lives in Istanbul's various district municipalities, and half of the urban population lives in the seven largest urban settlements (each of which includes several municipalities). About 75% of the total urban population lives in the 352 largest municipalities with an average of 104,000 residents per municipality. The remaining 2,848 municipalities have an average population size of about 4,000 (World Bank 2004).

Figure 1: Turkey vs World urbanization rate



Sources: WDI 2006.

Given this backdrop, Turkey appears to be a good laboratory for assessing the impact of agglomeration economies on productivity. However, we first need to clearly define what we mean by agglomeration economies. Indeed, a contrasted point in the agglomeration literature is whether agglomeration economies are related to the concentration of an industry or to the size of a location itself. Rosenthal and Strange (2004) nicely summarize this debate by revisiting the seminal contributions of Marshall (1920) and Jacobs (1969) on this topic.

According to Marshall and the Marshallian-externality-based papers (Henderson 1974 and 1988, Carlino 1978, Stelting and al. 1994 among others), the micro-foundations of agglomeration stem from urban specialization through localized spillovers induced by firms operating in the same sector, while Jacobs and Jacobian-externality-based papers (Shefer 1973, Sveikaukas 1975, Segal 1976, Fogarty and Garofalo 1978, Moomaw 1981, and Tabuchi 1986 among others) emphasize on urban diversity fostering cross-fertilization of ideas from various sectors.

The new economic geography literature encompasses these two ideas: firms located in an agglomerated area can take advantage from a larger market and the proximity of intermediate products' suppliers (localization and urbanization effects), but this positive externality can be counterbalanced by high congestion costs and increased competition from other firms located in the same place. Urban agglomeration can thus reinforce or reduce firms' productivity depending on which of these forces prevail, and these forces depends on the characteristics of the place where the firm is located (population density, accessibility to other places, congestion effects, industrial specialization of the location, access to financial and other professional services…).

For instance, using two-digit Japanese manufacturing data, Nakamura (1985) estimates that a doubling of industry scale leads to a 4.5% increase in productivity, while a doubling of city population leads to 3.4% increase. Henderson (1986) finds almost no evidence of urbanization effects, while a 10% increase in own industry employment induces a 1% increase in output. Moonmaw (1983) finds evidence of both, while Rosenthal and Strange (2003) and Henderson (2003) find stronger evidence of localization effects. Taken together, all these papers are more favorable to the existence of localization economies than urbanization economies.

More recently, Lall and others (2004) used a genuine plant-level database to examine the impact of improved market access, intra-industry localization economies and inter-industry urbanization economies on Indian's manufacturing firms' productivity. They found that access to market through improved interregional infrastructure is an important determinant of plant-level productivity, whereas the benefits of locating in dense urban areas do not appear to offset the associated costs.

In this paper, we use Turkish two-digit manufacturing data and geographical, infrastructural and socio-economic data to assess the impact of the increasing urbanization of the country on sectoral productivity. A parsimonious model linking sectors' productivity to accessibility, localization and urbanization economies proxy variables, and controlling for sector and sector-time specific effects is estimated using various adjustments of the initial database. The specifications pooling all the sectors indicate a positive correlation between sectoral productivity and:

(i) a better accessibility to local, national and international markets;

(ii) the number of firms operating in the same sector;

(iii) the total number of firms operating in the same province.

This suggests that both localization and urbanization economies, as well as market accessibility are some productivity-enhancer factors in Turkey, although the causation link between productivity and these agglomeration measures is not clearly established. The sector-by-sector estimation confirms this result, although the localization economies effect is negative for non-oil mineral sector, and the urbanization economies effect is weak for natural-resource-based sectors such as Wood and Metal industry.

Although the data used cover the period up to 2000 and thus ignoring the financial crisis that hit Turkey in 2001, the current structural transformation of country away from the agricultural sector gives room to use the insights of these results as a preliminary step to understand the new challenges faced by the Turkish manufacturing sector. The results

provide a discussion base to revisit the policy agenda on the improvement of the accessibility to markets, the improvement of the business environment to ease the creation and development of new firms, and a well-managed urbanization process to tap in the economic potentiality of cities.

The remaining of the paper is organized as follows. Section 2 presents a simple theoretical framework and the empirical approach chosen to assess the impact of accessibility, localization and urbanization economies on Turkish sectors' productivity. Section 3 presents and comments the empirical results, while Section 4 explores some policy implications of these results. Section 5 concludes the paper.

2) Theoretical framework and empirical approach

Many recent papers in the flourishing New Economic Geography literature have revisited the interaction between agglomeration economies and productivity using various proxy and estimation techniques. For instance, Ciccone and Hall (1996) and Ciccone (2002) estimated the relation between labor productivity and employment density. Cingano and Shivardi (2004) use a panel of plant-level data across Italian cities to estimate the long-run impact of city employment on firms' productivity. Rice and al. (2006) use travel time within Britain NUTS3 regions as the measure of proximity and estimate the impact of the underlying spatial variation of earnings on firms' productivity. Ottaviano and Pinelli (2006) assess the impact of market potential on Finnish firms' productivity using a basic new economic geography model highlighting market accessibility and demand linkages.

Theoretical framework

Following Lall and al. (2004), this paper makes the prior assumption that agglomeration economies impact on firms' productivity through three channels: (i) market accessibility, (ii) intra-industry localization economies, and (iii) inter-industry urbanization economies. In the tradition of the early eighties papers presented in the introduction, we consider the following production function of a representative firm:

$$Y_i = g(S, L, U).\widetilde{Y}(K_i) \qquad (1)$$

where $\widetilde{Y}(K_i)$ is the firms' own constant return to scale technology for a vector of inputs K, $g(.)$ is a Hick's neutral external shift factor whose arguments are accessibility (S), intra-industry localization economies (L), and inter-industry urbanization economies (U). Since $\widetilde{Y}(.)$ is a constant return to scale function, we can aggregate over firms and use sector-location observations.

Equation (1) may be rewritten as $y_s = Y_s / N_s = g(S, L, U).\widetilde{Y}(k_s)$ where N_s is labor inputs in sector s and k_s is the vector of ratios of remaining factors to N_s. It directly links sectoral

productivity to agglomeration economies variables on the one hand, and sector-specific characteristics on the other hand.

Empirical approach

For the sake of simplicity, we assume a multiplicative form of $g(.)$ in equation (1). Hence, including the time and spatial dimensions and taking the log of this relation yield:

$$Ln(y_{s,r,t}) = \alpha + \alpha_S Ln(S_{r,t}) + \alpha_L Ln(L_{s,r,t}) + \alpha_U Ln(U_{r,t}) + \alpha_T t + FE_s + FE_{st} + \varepsilon_{s,r,t} \quad (2)$$

where $S_{r,t}$ is a proxy for market accessibility, $L_{s,r,t}$ is a proxy for localization economies, $U_{r,t}$ is a proxy for urbanization economies, t is the time trend, FE_s and FE_{st} are sector and sector-time fixed effects included to control for sector-specific effects (production function and internal shocks over time), and $\varepsilon_{s,r,t}$ is an error term. Using sector and sector-time fixed effects instead of an explicit sectoral production function presents the advantage of switching all the potential econometric problems to the agglomeration variables that are of interest in this paper. Furthermore, the sector and sector-time fixed effects will correct any potential omitted variable problem.

We measure market accessibility by the distance between the province capital and the nearest airport (*ACCESS*). The urbanization economies is captured by various proxies included alternatively in various specifications: the total number of firms within the province ($N_{r,t}$), the urbanization rate (*URBAN*), total amount of loan in the province (*LOAN*), the total electricity consumption in the province (*ELECT*), the ratio of asphalt roads in villages (*ROAD*), and the rate of university graduates in the 25 years and over population (*UNIV*). The localization economies will be captured by the "potential" number of same sector firms within the province ($PN_{r,s,t}$) computed as follows:

$$PN_{r,s,t} = N_{r,s,t} + \sum_{l \neq r} \left(N_{l,s,t} / Dist_{r,l} \right) \quad (3)$$

where r and l are province indices, and $Dist_{r,l}$ is the distance between the capital of province r and province l. Note that the coefficient of correlation between $N_{s,r,t}$ and $PN_{s,r,t}$ is 0.98, indicating the relevance of this variable as a proxy for localization economies. Furthermore, it is in line with the way a market potential is computed in the new economic geography literature.

3) Descriptive analysis

Data sources and econometric issues

Various sources have been mobilized to construct the database used for this study. The core database is the manufacturing data from the Turkish State Institute of Statistics covering all the provinces over the period 1980-2000. The industries included in the database are classified according to the two-digit ISIC Revision 2 nomenclature. This database is complemented with population, geographical, infrastructure and socio-economic variables at the provincial level. The manufacturing and population data cover the entire period 1980-2000, while the infrastructure and socio-economic data are available with some five-year gaps. Since we do not have sector price indices at the provincial level, we use the country two-digit wholesale price index as price deflator.

Although Turkey counts 81 provinces, some of them were established by a series of Laws adopted during the period 1989-1996, out of the territory of one or two of the initial 65 provinces.[3] In order to have a consistent database over time, we added these new provinces back to their parent provinces as described in Appendix 1.

The final database is a panel of 65 provinces, 8 sectors and 21 years, but including many missing observations since most of the sectors are concentrated in a few number of provinces and the infrastructure and socio-economic variables are available with some five-year gaps. The total number of observation is 10'920, and the total number of observations with non-missing sector output observation is 5'218. This unbalanced structure may cause some heteroskedastic problems, which we deal with by computing the White/Hubber robust standard errors in all the regressions.

In addition to the unbalanced panel feature, the variability of some key variables such as the number of operating firms and their total outputs is quite high from year to year. There are also many gaps in the panel patterns. To cope with this problem, we opt for two approaches: a five-year non-centered moving average and a simple five-year average.

While the simple average yields a balanced panel, the moving average leads to an unbalanced panel. It also raises the issue of the treatment of missing observations in the panel patterns. We propose two alternatives: (i) exclude from the computation all the missing observations preceded by two missing observations and succeeded by two missing observations, or (ii) keep all the missing observations and simply rely on the moving average process. Table 1 presents for each sector the percentages of observations with complete patterns, that is, with 21 non-missing observations (corresponding to the number of years) within the panel's cells.

Some clarifications need to be made before presenting the estimation results. Since the infrastructure and socio-economic variables are available with five-year gaps, only the database constructed from simple five-year averages is used to estimate the specifications including *LOAN*, *ELECT*, *ROAD* and *UNIV*. Furthermore, in the moving average panels, only the productivity ($y_{s,r,t}$), and number of firms ($PN_{s,r,t}$ and $N_{r,t}$) variables are

[3] After 1990, new provinces were carved out of the old provinces. In 1989 (law No: 3578), Aksaray was formed out of Konya, Bayburt out of Gümüşhane, Karaman out of Konya. In 1990 (Law No: 3647), Batman and Şırnak were formed out of Siirt and some parts of Hakkari and Mardin. In 1992 (Law No: 3760), Bartın was formed out of Zonguldak. In 1992 (Law No: 3806), Ardahan and Iğdır were formed out of Kars. In 1995 (Law No: 4109), Yalova was formed out of İstanbul, Kilis out of Gaziantep and Karabük out of Zonguldak. In 1996 (Law No: 4200), Osmaniye was formed out of Adana. In 2000 (Law No: 4452), Düzce was formed out of Bolu.

smoothed since the accessibility and the urbanization variables do not depict the same high variability as the formers.

Table 1: Share of complete patterns in panel databases

Sector Code	Sector	Initial panel	Moving average panels	
			excluding missing observations	including missing observations
31	Food, Beverages and Tobacco	65%	75%	75%
32	Textile, Wearing Apparel and Leather Industries	37%	48%	50%
33	Wood and Wood Products, Including Furniture	17%	29%	33%
34	Paper and Paper Products, Printing and Publishing	22%	30%	41%
35	Chemicals and Chemical, Petroleum, Coal, Rubber and Plastic Products	36%	41%	46%
36	Non-Metallic Mineral Products, except Products of Petroleum and Coal	39%	60%	60%
37	Basic Metal Industries	31%	35%	52%
38	Fabricated Metal Products, Machinery and Equipment	51%	63%	63%

Source: Authors' calculation.

Spatial concentration of sectors

Before estimating the econometric relation derived in Section 2, it is worth exploring some basic patterns describing Turkish provinces and their sectoral distribution. To prospect the spatial concentration of the eight manufacturing sectors, we use the absolute Herfindhal index computed as follows:

$$H_s = \sum_{r=1}^{65} \left(n_{r,s} / n_s \right)^2 \qquad (4)$$

where $n_{r,s}$ is the number of firms of sector s operating in province r, and n_s is the total number of manufacturing firms operating in sector s. The maximum value of H_s is 1 and corresponds to a totally concentrated sector, while its minimum (1/65) corresponds to a perfectly dispersed sector. Figure 2 plots the evolution of the Turkish sectoral Herfindhals over the period 1980-2000.[4]

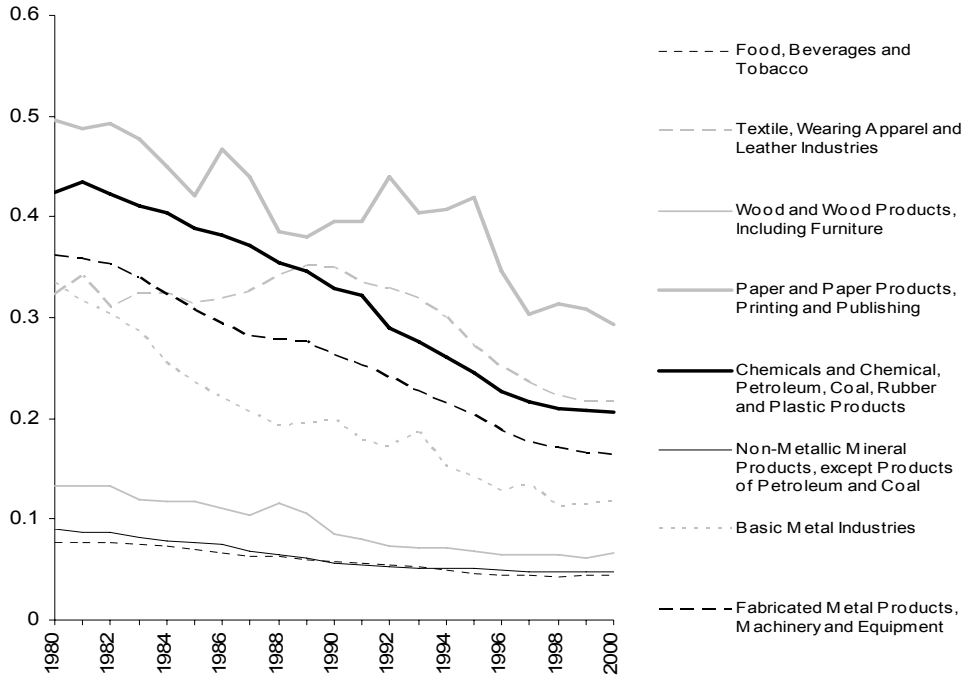
The general trend of the Herfindhals is decreasing, indicating a dispersion of the manufacturing sectors over time. The textile sector was concentrating until 1990 and then started to spread too. The most concentrated sector is the Paper and Paper Products sector with a Herfindhal varying form 0.5 in 1980 to 0.30 in 2000.

By computing for each sector the threshold $\left(H_s^{\max} + H_s^{\min}\right)/2$ and the average number of operating firms, we can focus on provinces receiving higher than average share of firms operating in spatially concentrated sectors as depicted in Table 2. This Table indicates

[4] We use the five-year moving average database excluding missing observation to compute these Herfindhal index.

that only Textile (32), Paper Products (34) and Chemicals (35) sectors remained significantly concentrated over the period 1980-2000. Istanbul and Ankara are receiving the lion's share of these manufacturing sectors, but other provinces such as Bursa and Izmir seem to be emerging. The textile sector has also been consistently concentrated in Adana, while the chemicals sector was located in Kocaeli.

Figure 2: Turkish sectoral Herfindhals over 1980-2000



Sources: Authors calculations.

Table 2: Spatial concentration of Turkish manufacturing sectors over 1980-2000

year	Sector	Provinces
1980	Textile	Adana, Aydin, Bursa, Gaziantep, Istanbul, Izmir, Manisa, Usak
	Paper	Ankara, Istanbul
	Chemicals	Gaziantep, Istanbul, Izmir, Kocaeli
	Basic metal	Istanbul, Kocaeli
	Fabricated metal	Adana, Ankara, Bursa, Eskisehir, Istanbul, Izmir, Kayseri, Kocaeli, Konya
1990	Textile	Adana, Ankara, aydin, Bursa, Denizli, Gaziantep, Istanbul, Izmir, Manisa, Rize, Tekirdag, Usak
	Paper	Ankara, Istanbul, Izmir
	Chemicals	Bursa, Istanbul, Izmir, Kocaeli
	Fabricated metal	Adana, Ankara, Bursa, Eskisehir, Istanbul, Izmir, Kayseri, Kocaeli, Konya
2000	Textile	Adana, Ankara, Bursa, Denizli, Gaziantep, Istanbul, Izmir, Ordu, Rize, Tekirdag, Usak
	Paper	Ankara, Istanbul, Izmir
	Chemicals	Ankara, Bursa, Istanbul, Izmir, Kocaeli

Source: Authors' calculation.

Sectoral concentration and infrastructure endowment of the provinces

As mentioned in the data source subsection, the Turkish Statistical Agency provides some socio-economic and infrastructure variables (some with a five-year gap) at the provincial level. We can complement these variables with the share of each of the 8 manufacturing sectors within each province and perform a Factor Analysis to determine the types of socio-economic and infrastructure variables significantly correlated with each sector. Factor Analysis is a class of multivariate statistical methods whose purpose is to analyze the interrelationships among a large number of variables by defining a set of common underlying dimensions known as factors (Hair and al. 1998). The two basic models used are *common factor analysis* and *components analysis*. The component factor model is appropriate when the primary concern is about determining the minimum number of factors needed to account for the maximum portion of the variance represented in the original set of variables, and when prior knowledge suggests that the specific and error variance represent a relatively small portion of the total variance. In contrast, when the primary objective is to identify the shared variance of the original variables, and the researcher has little knowledge about the amount of specific and error variance and therefore wishes to eliminate this variance, the common factor model is most appropriate.

Appendix 2 presents the variables included in the Factor Analysis. We use a simple five-year average (1980, 1985, 1990, 1995 and 2000) to adjust the database as suggested in the *data source* subsection, and we adopt the common factor approach under STATA to analyze the correlation matrix. Figure 3 presents the plan formed by the two most significant factors.

Figure 3: Plan formed by the two most significant factors

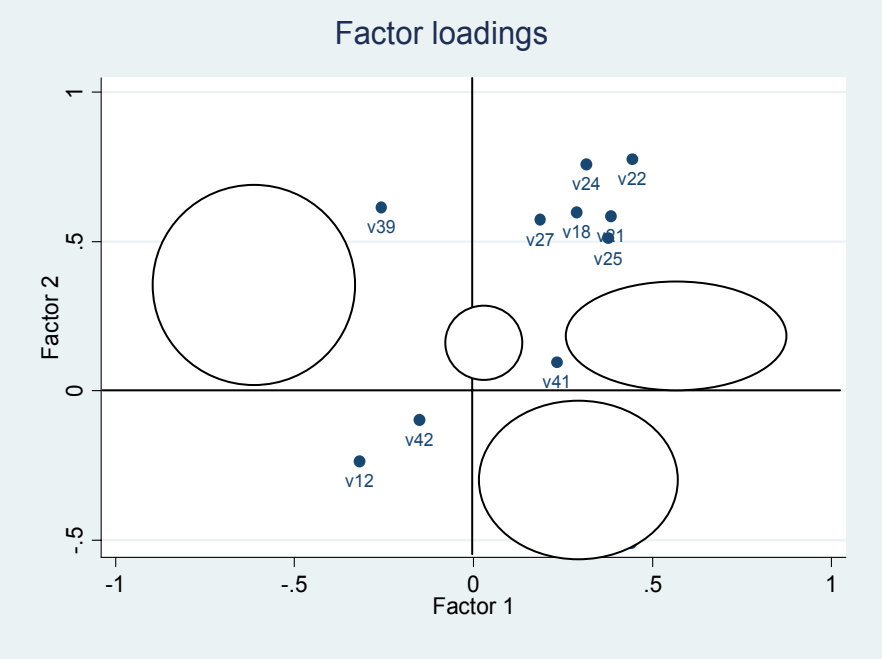


Figure 3 shows that a higher share of the food and beverage sector (Z31) is positively correlated with some variables characteristic of a rural environment: the average household size (v32), the number of primary school students per teacher (v38) and the distance to nearest major seaport (v44). The share of the textile (Z32) and wood products (Z33) sectors are positively correlated with industrial share in GDP (v14), electricity consumption per capita (v30 and v31), and number of counters with local, long distance and international calls per capita (v33). The share of paper products (Z34), chemicals (Z35), basic metal (Z37) and fabricated metal (Z38) sectors are positively correlated with population density (v20), state highways and provincial roads in provinces areas (v34), ratio of asphalt roads in villages (v35), ratio of villages with sufficient freshwater (v36), and the literacy rate (v40). The non-metallic mineral products sector (Z36) does not depict a specific correlation with the socio-economic and infrastructure variables.

Figure 3 suggests that the first factor is a rural-urban split, while the second factor highlights provinces' endowments in infrastructure. The textile and wood sectors seem to interact more with energy infrastructures, while the paper, chemicals and metallic sectors seem to interact more with transportation infrastructures. The non-metallic mineral products sector is particularly concentrated in two provinces (Sinop and Corum) where it represents more than two-third of the manufacturing sector.

4) Empirical estimation

For the sake of comparison, we use the four databases built in the *data source and econometric issues* Section (the initial panel, the two moving average panels, and the simple average panel) to assess the econometric relation derived in Section 2. Since we use different urbanization proxies, the ultimate equations to be estimated are:

$$Ln(y_{s,r,t}) = \alpha + \alpha_S Ln(ACCESS_{r,t}) + \alpha_L Ln(PN_{s,r,t}) + \alpha_U Ln(N_{r,t}) + \alpha_T t + FE_s + FE_{st} + \varepsilon_{s,r,t}$$
$$Ln(y_{s,r,t}) = \alpha + \alpha_S Ln(ACCESS_{r,t}) + \alpha_L Ln(PN_{s,r,t}) + \alpha_U Ln(URBAN_{r,t}) + \alpha_T t + FE_s + FE_{st} + \varepsilon_{s,r,t}$$
$$Ln(y_{s,r,t}) = \alpha + \alpha_S Ln(ACCESS_{r,t}) + \alpha_L Ln(PN_{s,r,t}) + \alpha_U Ln(LOAN_{r,t}) + \alpha_T t + FE_s + FE_{st} + \varepsilon_{s,r,t}$$
$$Ln(y_{s,r,t}) = \alpha + \alpha_S Ln(ACCESS_{r,t}) + \alpha_L Ln(PN_{s,r,t}) + \alpha_U Ln(ELECT_{r,t}) + \alpha_T t + FE_s + FE_{st} + \varepsilon_{s,r,t}$$
$$Ln(y_{s,r,t}) = \alpha + \alpha_S Ln(ACCESS_{r,t}) + \alpha_L Ln(PN_{s,r,t}) + \alpha_U Ln(ROAD_{r,t}) + \alpha_T t + FE_s + FE_{st} + \varepsilon_{s,r,t}$$
$$Ln(y_{s,r,t}) = \alpha + \alpha_S Ln(ACCESS_{r,t}) + \alpha_L Ln(PN_{s,r,t}) + \alpha_U Ln(UNIV_{r,t}) + \alpha_T t + FE_s + FE_{st} + \varepsilon_{s,r,t}$$

The proxies included in these specifications directly reflect the parameters of the shift factor introduced in the theoretical framework, i.e. *g(accessibility, localization, urbanization).* Appendix 3 departs from this approach by including provincial population and per capita as market capacity proxies. The specifications using per capita GDP as market capacity proxy provide qualitatively identical results whereas the specifications using population tend to suggest that a larger population alter the productivity of the

manufacturing sector. The following comments are based on specifications directly derived from the theoretical model for the sake of coherence.

Estimation results

Tables 3-7 report the estimated coefficient for the key variables only: accessibility, "potential" number of firms operating in a sector within a province, total number of firms operating in a province, urbanization rate, total loan at the provincial level, total consumption of electricity at the provincial level, ratio of asphalt roads in the villages located in the province, and the rate of university graduates in the 25 years and over population in the province.[5] The dependent variable is the log of real productivity per employee, $Ln(y_{s,r,t})$. A coefficient with an upper index *a* is significant at 1% level, that with an upper index *b* is significant at 5%, and that with an upper index *c* is significant at 10%. Note that for sector-specific regressions, the dummy variables FE_s and FE_{st} are reduced to a time fixed effects.

For almost all the regressions, the general fit is quite good with an R^2 statistics varying between 30 and 70%, and a P-value equal to zero. Table 2 reports the results of the specifications using the initial database (which does not correct for the abnormal variations in the productivity and number of operating firms' variables). The two specifications pooling all the sectors yield statistically significant coefficients indicating that Turkish sectoral productivity is negatively correlated with distance to the shortest major airport, positively correlated with number of operating firms within the same sector, and positively correlated with the number of firms operating in the same province or the urbanization rate. This general result is confirmed with the three other databases correcting for abnormal variations in the productivity and the number of operating firms variables (see Tables 4-7).

Accessibility, localization and urbanization economies appear thus to play a key role in Turkish firms' productivity. The shorter the distance of a location to a major airport, the easier it is to do business with firms located there since intermediate goods, physical and human capital can easily flow in and out, increasing the efficiency of the daily operations of firms. The higher the number of same industry firms in a province, the more attractive is this location for workers' specific skills needed in this industry, and the more attractive is this location for the upstream and downstream industries. The positive and statistically significant coefficients of the localization and urbanization variables indicate that globally, the positive effect of agglomeration dominate its negative effects such as fierce local competition for firms operating in the same sector or overall congestion costs. The sector-by-sector regressions provide additional insight in the same way.

As can be seen in Table 3, 4 and 5, the sector-specific regressions highlight three groups of industry:

[5] The whole regressions' outputs can be obtained upon request. They are not included in the Table to save space.

(i) industries yielding an unusual positive coefficient for the distance variable: Food, Beverages and Tobacco (31); Chemicals and chemical Products, Petroleum, Coal, Rubber and Plastic Products (35), Basic Metal industries (37); and Fabricated Metal Products, Machinery and Equipment (38);

(ii) industries yielding the expected negative coefficient for the distance variable, a negative and significant coefficient for the localization economies proxy, and a positive and significant coefficient for the urbanization economies proxies: Non-Metallic Mineral Products (36).

(iii) industries yielding the expected negative coefficient for the distance variable and a positive and significant coefficient for the localization economies proxy: Textile, Wearing Apparel and Leather industries (32); Wood and Wood products, including Furniture (33); and Paper and Paper Products, Printing and Publishing (34);

Table 3: Specifications using initial non-adjusted database

Sector	$Ln(ACCESS_r)$	$Ln(NP_{s,r,t})$	$Ln(N_{r,t})$	$Ln(URBAN_{r,t})$	R^2	P-value	Obs.
All	-0.011[c]	0.085[a]	0.105[a]		0.367	0.000	5217
	-0.013[b]	0.173[a]		0.170[a]	0.360	0.000	5217
Food & beverages	0.008	0.080[c]	0.127[a]		0.388	0.000	1176
	0.018[b]	0.242[a]		0.204[a]	0.378	0.000	1176
Textile	-0.051[a]	0.190[a]	-0.009		0.273	0.000	721
	-0.069[a]	0.246[a]		-0.485[a]	0.285	0.000	721
Wood products	-0.029[c]	0.256[a]	-0.078[a]		0.304	0.000	481
	-0.046[a]	0.228[a]		-0.373[a]	0.306	0.000	481
Paper & printing	-0.077[a]	0.214[a]	-0.127[c]		0.267	0.000	299
	-0.116[a]	0.285[a]		-1.021[a]	0.345	0.000	299
Chemicals	0.015	0.415[a]	-0.027		0.291	0.000	531
	0.081[a]	0.168[a]		1.433[a]	0.347	0.000	531
Minerals	-0.031[a]	-0.546[a]	0.358[a]		0.361	0.000	893
	-0.039[a]	-0.261[a]		1.061[a]	0.293	0.000	893
Basic metals	0.113[a]	0.158[a]	0.144[a]		0.480	0.000	401
	0.058[a]	0.348[a]		-0.356[a]	0.475	0.000	401
Fabricated metals	0.038[a]	0.237[a]	0.075[c]		0.624	0.000	715
	0.028[b]	0.353[a]		-0.346[a]	0.627	0.000	715

[a] significant at 1%; [b] significant at 5%; [c] significant at 10%.

Table 4: Specifications using database adjusted with a moving average excluding missing observations

Sector	$Ln(ACCESS_r)$	$Ln(NP_{s,r,t})$	$Ln(N_{r,t})$	$Ln(URBAN_{r,t})$	R^2	P-value	Obs.
All	-0.014[a]	0.134[a]	0.088[a]		0.371	0.000	6112
	-0.016[a]	0.204[a]		0.146[a]	0.366	0.000	6112
Food & beverages	0.010	0.122[a]	0.101[a]		0.435	0.000	1296
	0.016[b]	0.260[b]		0.135[b]	0.426	0.000	1296
Textile	-0.044[a]	0.254[a]	-0.018		0.305	0.000	871
	-0.050[a]	0.268[a]		-0.242	0.307	0.000	871
Wood products	-0.042[a]	0.276[a]	-0.040[c]		0.309	0.000	624
	-0.073[a]	0.301[a]		-0.490[a]	0.327	0.000	624
Paper & printing	-0.070[a]	0.183[a]	-0.084		0.277	0.000	348
	-0.105[a]	0.245[a]		-0.779[a]	0.335	0.000	348
Chemicals	0.004	0.465[a]	-0.073		0.315	0.000	628
	0.060[a]	0.231[a]		1.236[a]	0.356	0.000	628
Minerals	-0.046[a]	-0.420[a]	0.318[a]		0.322	0.000	1029
	-0.061[a]	-0.173[a]		0.818[a]	0.252	0.000	1029
Basic metals	0.131[a]	0.091[a]	0.207[a]		0.483	0.000	476
	0.075[a]	0.292[a]		-0.218	0.449	0.000	476
Fabricated metals	0.037[a]	0.311[a]	0.022		0.619	0.000	840
	0.031[a]	0.362[a]		-0.251[a]	0.622	0.000	840

[a] significant at 1%; [b] significant at 5%; [c] significant at 10%. See Table 1 for Sector codes.

Table 5: Specifications using database adjusted with a moving average including missing observations

Sector	$Ln(ACCESS_r)$	$Ln(NP_{s,r,t})$	$Ln(N_{r,t})$	$Ln(URBAN_{r,t})$	R^2	P-value	Obs
All	-0.014[a]	0.131[a]	0.091[a]		0.369	0.000	6232
	-0.017[a]	0.203[a]		0.140[a]	0.363	0.000	6232
Food & beverages	0.010	0.122[a]	0.101[a]		0.435	0.000	1296
	0.016[b]	0.260[a]		0.135[b]	0.426	0.000	1296
Textile	-0.042[a]	0.238[a]	-0.008		0.297	0.000	890
	-0.050[a]	0.265[a]		-0.262	0.299	0.000	890
Wood products	-0.043[a]	0.271[a]	-0.034		0.308	0.000	642
	-0.073[a]	0.297[a]		-0.457[a]	0.324	0.000	642
Paper & printing	-0.065[a]	0.129[a]	-0.021		0.253	0.000	391
	-0.093[a]	0.217[a]		-0.637[a]	0.293	0.000	391
Chemicals	0.000	0.465[a]	-0.070		0.326	0.000	652
	0.051[b]	0.257[a]		1.140[a]	0.361	0.000	652
Minerals	-0.046[a]	-0.421[a]	0.318[a]		0.322	0.000	1030
	-0.061[a]	-0.173[a]		0.818[a]	0.252	0.000	1030
Basic metals	0.136[a]	0.056[c]	0.236[a]		0.459	0.000	498
	0.076[a]	0.276[a]		-0.242	0.413	0.000	498
Fabricated metals	0.037[a]	0.313[a]	0.021		0.620	0.000	843
	0.032[a]	0.363[a]		-0.248[a]	0.623	0.000	843

[a] significant at 1%; [b] significant at 5%; [c] significant at 10%. See Table 1 for Sector codes.

Table 6: Specifications using shortest distance to a seaport as accessibility proxy[6]

Sector	Ln(ACCESS$_r$)	Ln(NP$_{s,r,t}$)	Ln(N$_{r,t}$)	Ln(URBAN$_{r,t}$)	R^2	P-value	Obs.
All	-0.033[a]	0.124[a]	0.078[a]		0.376	0.000	6112
	-0.038[a]	0.173[a]		0.194[a]	0.374	0.000	6112
Food & beverages	0.041[a]	0.134[a]	0.114[a]		0.450	0.000	1296
	0.036[a]	0.293[a]		0.086	0.438	0.000	1296
Chemicals	-0.117[a]	0.305[a]	0.002		0.371	0.000	628
	-0.143[a]	0.080[c]		1.424[a]	0.432	0.000	628
Basic metals	-0.121[a]	0.156[a]	0.039		0.519	0.000	476
	-0.123[a]	0.239[a]		-0.435[a]	0.535	0.000	476
Fabricated metals	-0.026[a]	0.296[a]	0.006		0.619	0.000	840
	-0.025[a]	0.338[a]		-0.280[a]	0.622	0.000	840

[a] significant at 1%; [b] significant at 5%; [c] significant at 10%. See Table 1 for Sector codes.

To understand the factors underlying the unusual positive coefficient for the distance to the shortest major airport yielded by some sectors, we use another accessibility proxy: the shortest distance to a major sea port. This helps to sort out the industries with a consistent unusual positive coefficient for accessibility proxy (see Table 5). Indeed, except for the Food and Beverages industry, this adjustment turns the estimated coefficient of the distance variable to the expected negative sign in all the other sectors. Therefore, these sectors (Chemicals and chemical Products, Petroleum, Coal, Rubber and Plastic Products (35); Basic Metal industries (37); and Fabricated Metal Products (38)) add to the third group of sector-specific regressions that depicts a negative and significant coefficient for the accessibility proxy and a positive and significant coefficient for the localization economies proxy.

With the appropriate accessibility proxy, we end up with industry 31 (Food and Beverages) in group 1, industry 36 (Non-Metallic Mineral) in group 2, and the remaining industries in group 3. As can be seen in Table 7, This classification is confirmed when using the five-year average database which includes additional proxy variables to approximate urbanization economies (total amount of loan at the provincial level, total consumption of electricity at the provincial level, ratio of asphalt roads in the villages located in the province, and rate of university graduates in the 25 years and over population in the province). The following comments focus first on sectors in the group 3, and then turn to the specificities of the Food and Beverages, and the Non-Metallic Mineral sectors. The preferred specifications used to do these comments are the one based on the database adjusted with moving average excluding missing observations, and the five-year simple average.

The productivity of the textile industry appears to be positively impacted by a good accessibility to local, national and international market. Indeed, the estimated coefficient in Table 6 indicated that halving the distance to the nearest major airport will increase textile firms' productivity by 40%, and a 10% increase of ratio of asphalt roads in villages will increase their productivity by 2.5%. The proximity of firms operating in the same sector is also a productivity-enhancer factor since all the specifications yield a

[6] The database used is the one adjusted with a moving average excluding missing observations.

positive and statistically significant coefficient for the "potential" number of firms operating in the textile sector, with the coefficients ranging between 0.084 and 0.265. Finally, the share of university graduates in the 25 years and over population is positively correlated with the sectoral productivity. In a world where the textile market is the one with the fiercest international competition, this result is plausible: the easier it is to find locally qualified people aware of what is going on around the world, the better off are textile firms. All these comments also hold for the Chemicals sector. In addition, the urbanization rate, the total amount of loans and the total consumption of electricity are unambiguously positively correlated with the sector's productivity.

The Wood, Metal and alike industries (Paper, Printing, Fabricated Metal Products, Machinery…) are slightly different. Although their productivity is positively correlated with a better accessibility to market, and stronger intra-industry interaction, the impact of a broader urbanization is ambiguous, sometimes even negative. For instance, Table 6 indicates that the urbanization rate, the total loan, and the share of university graduates are unambiguously negatively correlated with these sectors' productivity. This result is plausible for industries that are directly dependent on natural resource supply. Indeed, a firm operating in these sectors will be bettor off locating close to the source of the natural resources instead of locating in a diversified megalopolis. The infrastructures that matter more for these sectors are roads as highlighted in the Factor Analysis, so that they can ship their production to their targeted markets.

Table 7: Specifications using the database adjusted with a simple average

Sector	Ln($ACCESS_r$)	Ln($NP_{s,r,t}$)	Ln($N_{r,t}$)	Ln($URBAN_{r,t}$)	Ln($LOAN_{r,t}$)	Ln($ELECT_{r,t}$)	Ln($ROAD_{r,t}$)	Ln($UNIV_{r,t}$)	R^2	P-value	Obs.
All*	-0.039[a]	0.101[a]	0.077[a]						0.410	0.000	1428
	-0.044[a]	0.152[a]		0.169[b]					0.401	0.000	1428
	-0.031[a]	0.115[a]			0.073[a]				0.331	0.000	925
	-0.019	0.089[a]				0.178[a]			0.322	0.000	638
	-0.039[a]	0.142[a]					0.084[a]		0.377	0.000	1177
	-0.045[a]	0.161[a]						0.072	0.407	0.000	1110
Food & beverages*	0.043[a]	0.102	0.138[a]						0.489	0.000	303
	0.038[a]	0.286[a]		0.151					0.473	0.000	303
	0.034[b]	0.261[a]			0.028				0.377	0.000	187
	0.032[c]	0.292[a]				0.004			0.362	0.000	128
	0.033[b]	0.250[a]					0.058[b]		0.421	0.000	238
	0.040[a]	0.323[a]						-0.035	0.449	0.000	240
Textile	-0.061[c]	0.228[c]	-0.003						0.308	0.000	201
	-0.069[b]	0.255[a]		-0.228					0.310	0.000	201
	-0.012	0.128[a]			0.052				0.239	0.000	131
	-0.015	0.133				0.0787			0.1718	0.000	94
	-0.050	0.084[a]					0.265[a]		0.365	0.000	169
	-0.056	0.169[a]						0.406[b]	0.326	0.000	156
Wood products	-0.032	0.244[a]	-0.046						0.353	0.000	145
	-0.061[c]	0.259[a]		-0.442[b]					0.368	0.000	145
	-0.059[c]	0.229[a]			-0.065[c]				0.228	0.000	94
	-0.057	0.262[a]				-0.034			0.257	0.000	67
	-0.046	0.233[a]					-0.032		0.318	0.000	119
	-0.061[c]	0.315[a]						-0.708[a]	0.445	0.000	109
Paper & printing	-0.049	0.170[c]	-0.085						0.263	0.000	86
	-0.816[b]	0.222[a]		-0.768[a]					0.316	0.000	86
	-0.028	0.209[a]			-0.115[c]				0.200	0.007	61
	-0.011	0.079				0.079			0.139	0.058	41
	-0.042	0.111[a]					0.018		0.254	0.002	75
	-0.084[b]	0.194[a]						-0.508[c]	0.296	0.000	66

[a] significant at 1%; [b] significant at 5%; [c] significant at 10%, * specifications using distance to nearest major seaport. See Table 1 for Sector codes.

Table 7: Specifications using the database adjusted with a simple average (continuing)

Sectors	Ln(ACCESS$_r$)	Ln(NP$_{s,r,t}$)	Ln(N$_{r,t}$)	Ln(URBAN$_{r,t}$)	Ln(LOAN$_{r,t}$)	Ln(ELECT$_{r,t}$)	Ln(ROAD$_{r,t}$)	Ln(UNIV$_{r,t}$)	R^2	P-value	Obs.
Chemicals *	-0.133[a]	0.261[c]	-0.006						0.360	0.000	152
	-0.163[a]	0.044		1.382[a]					0.422	0.000	152
	-0.073[c]	0.016			0.294[a]				0.327	0.000	98
	-0.051	-0.006				0.480[a]			0.450	0.000	69
	-0.129[a]	0.190[a]					0.256[a]		0.383	0.000	124
	-0.143[a]	0.206[a]						0.320	0.366	0.000	118
Minerals	-0.057[b]	-0.409[a]	0.305[a]						0.343	0.000	233
	-0.066[a]	-0.172[a]		0.787[a]					0.282	0.000	233
	-0.032	-0.296[a]			0.281[a]				0.280	0.000	154
	-0.026	-0.381[a]				0.482[a]			0.342	0.000	105
	-0.106[a]	-0.144[a]					0.104[b]		0.221	0.000	198
	-0.061[b]	-0.202[a]						0.727[a]	0.338	0.000	178
Basic metals *	-0.133[a]	0.070	0.068						0.568	0.000	114
	-0.134[a]	0.179[a]		-0.484[a]					0.584	0.000	114
	-0.119[a]	0.195[a]			0.075				0.363	0.000	77
	-0.101[a]	0.214[b]				-0.064			0.333	0.000	52
	-0.108[a]	0.113[b]					0.074		0.453	0.000	94
	-0.158[a]	0.157[a]						-0.413[a]	0.611	0.000	89
Fabricated metals	-0.024	0.274[a]	0.001						0.679	0.000	194
	-0.021	0.318[a]		-0.321[c]					0.683	0.000	194
	-0.041[b]	0.412[a]			-0.138[b]				0.598	0.000	123
	-0.029	0.363[a]				-0.042			0.479	0.000	82
	-0.024	0.268[a]					0.084[c]		0.634	0.000	160
	-0.043[a]	0.327[a]						-0.479[a]	0.688	0.000	154

[a] significant at 1%; [b] significant at 5%; [c] significant at 10%, * specifications using distance to nearest major seaport. See Table 1 for Sector codes.

Now we turn to the Food and Beverages sector. Except for the unusual positive coefficient of the distance to the nearest major airport or seaport, the localization and urbanization economies proxies depict the expected positive sign, that is, Food and Beverages firms are better off being located in urbanized area with a good connection to other firms operating in the same sector. This is the typical mass-production sector for which demand from final consumers are the key engine of growth. And since these final consumers are located in dense urban agglomerations, the production needs to be there. In fact, this is the most dispersed sector in the database: all the sixty-five provinces host at least one firm operating in the Food and Beverages sector. This may explain the unusual positive coefficient of the distance to the nearest major airport or seaport: for instance, in 2000, among the top ten provinces receiving Food and Beverages firms, the nearest distance to a major seaport of three of them (Ankara, Gaziantep, and Konya) was larger than the national average distance to a nearest major seaport (194 km). If we reduce this average distance by the standard deviation of the distance to the nearest major seaport, which is 160km, four more provinces added to this list: Adana, Balikesir, Bursa, and Rize.

The last sector examined is the Non-Metallic Mineral sector. As can be seen in Table 7, the productivity of this sector is positively correlated with a better accessibility to market, positively correlated with all the urbanization proxies (total number of firms operating in the provinces, urbanization rate, total amount of loans, total consumption of electricity, share of asphalt road in villages, and share of university graduates), but negatively correlated with the number of firms operating in the same sector. This may suggest a fierce competition in the sector. The Factor Analysis also points to the specificity of this sector: it is apparently uncorrelated with the socio-economic and infrastructure variables, and is essentially clustered in two provinces (Sinop and Corum) where it represents more than two-third of the manufacturing sector.

Correlation vs causality

So far, we have addressed the various interactions between sector productivity and localization, urbanization and other socio-economic and infrastructure variables in terms of correlations. The Factor Analysis used the common factor approach to highlights underlying correlations between the provinces' sector shares and a set of socio-economic and infrastructure variables. The previous section estimated an econometric model linking sector productivity to accessibility, localization and urbanization proxies, but because of the underlining endogeneity of some regressors, these results are purely correlations. For instance a high urbanization rate can improve sector productivity through reduced intermediate goods costs and quick access to various business services, but an increasing productivity in a specific sector can also attract other firms (operating in the same sector or not) and also workers and thus reinforce the urbanization process. To translate all these results into policy recommendations, we need to bear in mind these endogeneity problems.

Some econometric devices can be used to cope with this problem, but they all have their limitations. The Instrumental Variables technique try to find for instance a set of

variables (called the instruments) dependent on localization and urbanization proxies but independent on sector productivity, and then use a two-stage estimations approach to first project localization and urbanization variables on the space formed by the instruments, and then used these projections on a second regression on the sector productivity variable. However, it is not obvious to find good instruments since most of the socio-economic variables can easily be determined by one another. In our case, we don't have good instrument candidates in the available set of variables.

Another econometric device is the Granger-causality test, which tries to determine the predetermined variables, that is, the variables whose lags help to predict the other one. Mathematically, let us consider two variables X and Y. We will say that X Granger-causes Y if $Y_t = \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + ... + \beta X_{t-1} + \varepsilon_t$, and similarly, that Y Granger-causes X if $X_t = \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + ... + \beta Y_{t-1} + \varepsilon_t$. Since we have a panel database covering the period 1980-2000 for a set of variables, we can use this approach to have some insights on the causation relation between productivity and localization and urbanization variables. Table 8 summarizes the results.

Table 8: Granger-causality between sectoral productivity and localization and urbanization

Y	**Productivity**		**Localization**	**Urbanization**
X	**Localization**	**Urbanization**	**Productivity**	
Food, Beverages and Tobacco	yes	yes	no	yes
Textile, Wearing Apparel and Leather Industries	no	yes	no	yes
Wood and Wood Products, Including Furniture	no	yes	no	yes
Paper and Paper Products, Printing and Publishing	yes	yes	no	no
Chemicals and Chemical, Petroleum, Coal…Products	no	yes	yes	yes
Non-Metallic Mineral Products	no	yes	no	yes
Basic Metal Industries	yes	no	no	no
Fabricated Metal Products, Machinery and Equipment	yes	yes	yes	no

Source: Authors' estimations.

Table 8 suggests that the causation between sector productivity and localization is such that localization effects Granger-cause the productivity in the Food and Beverages, Paper products and Basic Metal products sector. Urbanization effects also appear to Granger-cause the productivity of Paper products and Fabricated Metal products sectors. Except for these clear causations, Table 8 indicates generally that productivity and urbanization Granger-cause each other, which suggest that both factors constitute a self-sustaining system.

4) Policy implications

Given these two-directional causations, the policy implications discussed in the next section should be taken with caution. In addition, the database used for the estimations does not cover the period 2001 onwards that has been characterized by the financial crisis

of 2001. However, the macroeconomic framework put in place after the crisis enabled a quick recovery and accompanied the country in its structural transformation away from the agricultural sector. The insights on the productivity of the manufacturing sectors provided by this empirical exercise is therefore a preliminary but necessary step to understand the new challenges this structural transformation is bringing along. A more direct inspection of the provinces and the manufacturing sector's specificities based on up-to-date data would be useful in providing the insights necessary for effectiveness of the policy interventions needed.

The empirical exercise provides some insights on three policy interventions: (i) the accessibility to markets, (ii) the business environment, and (iii) the urbanization process.

Improving accessibility to markets

The empirical exercise indicates that a better accessibility to local (rural roads), national (connection between main cities) and international (access to ports or airports) markets is a key productivity-enhancer factor. Indeed, a better accessibility to markets increases the demand faced by firms, which in turn increases their productivity through the Home Market Effect, which is one of the key result of the new economic geography telling us that the increase in market potential is self-reinforcing since its helps firms exploit scale economies making their products more competitive.

In Turkey, the freight is forwarded mainly through highways (the share of domestic highways freight varied from 88.7% in 2000 to 90% in 2005), although only 14% of the state and provincial roads are suitable for handling heavy loads.:, The railways network is 10,984 km long with 79% being main lines, 21% being electrified and 24% being signalized lines. The most important problem of the railway infrastructure is that lines between highly populated cities are inappropriate for high speed traffic and are in poor condition. The maritime ports are facing higher demand than their capacity allows, but there are some ongoing extension investments. The Airways sector is growing, particularly since the reduction of the tax burden on tickets in 2005 (Turkey Ninth Development Plan, 2006).

The Ninth Development Plan has set a series of policy actions to be taken to address these weaknesses. For instance, there is a move now toward the shift of freight transportation to railways so as to induce competition between the highway and railway modes, and simultaneously transform maritime ports into world-class logistic centers. However, given the Government's budgetary constraints, there is a need to mobilize private sector participation through Public-Private Partnerships in the development of these accessibility infrastructures. The success of this plan will be beneficial for the whole economy, and particularly for the expansion of the manufacturing sector as suggested by the econometric exercise carried out in this paper.

Improving business environment

The empirical exercise also indicates that, except for the Non-metal Mineral sector, the productivity of Turkish industrial sectors is positively correlated with the number of firms operating in the same sector, that is, the size of these sectors matter for a sustained industrial growth. Indeed, when firms operating in the same sector a geographically close to each other, the common knowledge of best industrial practices is spread by the formal and informal interactions between workers living in the same neighborhood, hence improving the productivity of the firms.

A business environment facilitating business creation and attracting qualified workers seems to be essential in sustaining the productivity of Turkish manufacturing sector. The 2007 Doing Business report ranks Turkey 91 out of 175 on overall ease of doing business, the three worst ranking being on dealing with licenses (148/175), employing workers (146/175) and closing business (138/175). For instance, to build a warehouse in Turkey, it takes 32 different procedures (against 14 in the OECD), requiring 232 days (against 150 in the OECD), and costing 150% of the country's income per capita (against 72% in the OECD).

The recent Competitiveness and Employment Development Policy Loan contracted with the World Bank by the Turkish Government is intended to improve the investment climate of the country. Indeed, the first component of the reform program supported by this loan focuses on addressing issues with Turkey's investment climate, including: (a) the complexity of administrative barriers to firms' entry, operation and exit; (b) the size and complexity of the Personal Income Tax and Corporate Income Tax and the effectiveness of the tax administration; (c) competition in the private sector, as related to state aid and State Owned Enterprises, and; (d) the level of FDI in Turkey. For instance, the short-term reform strategy to further facilitate firms' entry and operation supported under the loan includes measures to facilitate company registration and simplify the licensing regime. The policy actions envisaged include: (a) drafting a Commercial Code broadly compliant with the provisions of the EU *Acquis Communautaire* on commercial matters and submitting it to the Parliament for approval; (b) reviewing registration and licensing regulations to (i) unifying licensing procedures for the entire country, ensuring consistency among regions; (ii) review and streamline the process for firms; and (c) piloting electronic linkage of Government agencies involved with company registrations in Ankara to improve efficiency of registration. The success of this plan will increase the clustering of firms operating and therefore improve their productivity as suggested by the econometric exercise performed in this paper.

Accompanying the urbanization process

The empirical exercise also emphasizes the importance of positive urbanization spillovers on firms' productivity. Indeed, the urbanization process brings positive externalities such as network effects and the availability of business support services, but also negative externalities such as congestion effects and its corollaries.

The World Bank has engaged a policy dialogue with the Turkish Government on municipal management in the context of the public sector reform agenda and a sector

work reviewing the municipal sector was completed in 2004 (World Bank 2004). The report pointed to some inefficiencies such: (a) the long-standing practice of meeting the growing service demands with increased allocations from the central budget becoming unsustainable due to fiscal pressures; (b) the system of heavy reliance on budgetary transfers and borrowing through Treasury guarantees not providing incentives for fiscal discipline; (c) traditional administrative control becoming increasingly ineffective to oversee, influence, and guide Turkey's large and growing urban sector; and (d) the role of the private sector in the delivery and financing of urban services being minimal. Most of these inefficiencies have been addressed by the Government through the Programmatic Public Sector Development Policy Loan contracted with the World Bank in 2006.

The loan also addressed the fiscal challenge implied by the preponderance of small settlement units by including a set of core disbursement conditions that allowed the enactment of four individual laws on Metropolitan Municipalities (Law no.5216, enacted in July 2004), Special Provincial Administration (Law no. 5302, enacted in March 2005), Local Administration Unions (Law no.5355, enacted in May 2005), and Municipalities (Law no. 5393 adopted in July 2005). The new legislative framework transfers or delegates a number of new responsibilities to the local authorities. This gradual transfer of expenditure responsibilities to lower tiers of government is expected to continue. Obviously, the trend will necessitate revisiting the revenue assignments as well because it is clear that the revenues available to the lower tiers of government are inadequate to finance the provision of services for which local administrations will be increasingly responsible for.

5) Conclusion

The aim of this paper was to assess the impact of the rapid Turkish urbanization process on the country's sector productivity. We built a database combining two-digit manufacturing data and some geographical, infrastructural and socio-economic data collected at the provincial level by the Turkish State Institute of Statistics. We then developed a parsimonious econometric relation linking sectors' productivity to accessibility, localization and urbanization economies proxy variables, and controlling for sector and sector-time specific effects. This relation is estimated using different adjustments of the initial database to cope with some specific estimation problems raised by the data.

The specifications pooling all the sectors clearly show the positive impact of a better accessibility to markets, a larger sector in terms of more firms operating in the same sector, and urbanization externalities on sector productivity. The sector-by-sector estimations confirm this result, although the localization economies effect is negative for Non-metallic Mineral sector, and the urbanization economies is weak for some natural-resource-based sectors such as Wood and Metal industries.

Although the data used cover the period up to 2000 and thus ignores the financial crisis that hit Turkey in 2001, the current structural transformation of country away from the agricultural sector gives room to use the insights of these results as a preliminary step in

understanding the new challenges faced by the Turkish manufacturing sector. The results provide a discussion base to revisit the policy agenda on the improvement of the accessibility to markets, the improvement of the business environment to ease the creation and development of new firms, and a well-managed urbanization process to tap in the economic potential of cities. The next steps should try to confront these conjectures with a more direct inspection of the provinces and the manufacturing sector's specificities based on up-to-date data so as to provide the necessary insights for the effectiveness of the policy interventions needed.

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Appendix 1: Province adjustments

Traffic Code	Province name	Capital City
01	Adana+Osmaniye	Adana
02	Adıyaman	Adıyaman
03	Afyon	Afyon
04	Ağrı	Ağrı
05	Amasya	Amasya
06	Ankara+Kırıkkale	Ankara
07	Antalya	Antalya
08	Artvin	Artvin
09	Aydın	Aydın
10	Balıkesir	Balıkesir
11	Bilecik	Bilecik
12	Bingöl	Bingöl
13	Bitlis	Bitlis
14	Bolu+Düzce	Bolu
15	Burdur	Burdur
16	Bursa	Bursa
17	Çanakkale	Çanakkale
18	Çankırı	Çankırı
19	Çorum	Çorum
20	Denizli	Denizli
21	Diyarbakır	Diyarbakır
22	Edirne	Edirne
23	Elazığ	Elazığ
24	Erzincan	Erzincan
25	Erzurum	Erzurum
26	Eskişehir	Eskişehir
27	Gaziantep+Kilis	Gaziantep
28	Giresun	Giresun
29	Gümüşhane+Bayburt	Gümüşhane
30	Hakkari+Batman+Şırnak+Siirt+Mardin	Hakkari
31	Hatay	Antakya
32	Isparta	Isparta
33	İçel	Mersin
34	İstanbul+Yalova	İstanbul
35	İzmir	İzmir
36	Kars+Ardahan+Iğdır	Kars
37	Kastamonu	Kastamonu
38	Kayseri	Kayseri
39	Kırklareli	Kırklareli
40	Kırşehir	Kırşehir
41	Kocaeli	Kocaeli
42	Konya+Karaman	Konya
43	Kütahya	Kütahya
44	Malatya	Malatya

45	Manisa	Manisa
46	Kahramanmaraş	Kahramanmaraş
48	Muğla	Muğla
49	Muş	Muş
50	Nevşehir	Nevşehir
51	Niğde+Aksaray	Niğde
52	Ordu	Ordu
53	Rize	Rize
54	Sakarya	Sakarya
55	Samsun	Samsun
57	Sinop	Sinop
58	Sivas	Sivas
59	Tekirdağ	Tekirdağ
60	Tokat	Tokat
61	Trabzon	Trabzon
62	Tunceli	Tunceli
63	Şanlıurfa	Şanlıurfa
64	Uşak	Uşak
65	Van	Van
66	Yozgat	Yozgat
67	Zonguldak+Bartın+Karabük	Zonguldak

Appendix 2: Variables included in the Factor Analysis

Variables	Label
v12	Share of agriculture in GDP (%)
v14	Share of industry in GDP (%)
v18	Urbanization rate (%)
v20	Population density (persons per km2)
v21	Specialized loans
v22	Other loans
v24	Bank deposits in Turkish Lira
v25	Bank deposits in foreign currency
v27	Total electricity production capacity (MW)
v30	Electricity consumption per capita (KWh)
v31	Industrial electricity consumption per capita (KWh)
v32	Average Household size
v33	Number of counters with local, long distance and international calls per capita
v34	State highways and provincial roads in provinces area
v35	Ratio of asphalt road in villages
v36	Ratio of villages by sufficient freshwater
v38	Number of primary school students per teacher
v39	Number of High School Students Per Teacher
v40	Literacy Rate (%)
v41	Rates of University Graduates in 25 Years and Over Population
v42	Distance to the nearest major airport (km)
v44	Distance to the nearest major seaport (km)
Z31	Share of Food and beverage sector
Z32	Share of Textile sector
Z33	Share of Wood products sector
Z34	Share of Paper products sector
Z35	Share of chemicals products sector
Z36	Share of non-metallic mineral products sector
Z37	Share of basic metal products sector
Z38	Share of fabricated metal products sector

Appendix 3: Specifications using the database adjusted with a simple average and provincial population and per capita GDP to proxy market capacity

Sector	Ln($ACCESS_r$)	Ln($NP_{s,r,t}$)	Ln($N_{r,t}$)	Ln($GDPPC_{r,t}$)	Ln($POP_{r,t}$)	R^2	P-value	Obs.
All*	-0.018[c]	0.078[a]	0.027	0.370[a]		0.427	0.000	1428
	-0.039[a]	0.100[a]	0.076[a]		0.00	0.409	0.000	1428
Food & beverages *	0.049[a]	0.109	0.115[c]	0.090		0.491	0.000	303
	0.045[a]	0.139[c]	0.156[a]		-0.136[a]	0.504	0.000	303
Textile	-0.076[b]	0.178	-0.124	0.726[a]		0.370	0.000	201
	-0.072[c]	0.161[a]	0.041		-0.125	0.312	0.000	201
Wood products	-0.032	0.236[a]	0.055	0.090		0.355	0.000	145
	-0.038	0.251[a]	0.029		-0.184[a]	0.364	0.000	145
Paper & printing	-0.051	0.114	-0.110	0.418[a]		0.312	0.000	86
	-0.065	0.224[b]	-0.00		-0.281	0.288	0.000	86
Chemicals *	-0.076[b]	0.161	-0.117	1.089[a]		0.451	0.000	152
	-0.131[a]	0.269[c]	-0.206		0.452[a]	0.402	0.000	152
Minerals	-0.059[b]	-0.426[a]	0.263[a]	0.215		0.349	0.000	233
	-0.032	-0.377[a]	0.190[a]		0.307[a]	0.379	0.000	233
Basic metals *	-0.131[a]	0.066	0.064	0.050		0.568	0.000	114
	-0.137[a]	0.072	0.191[b]		-0.286[b]	0.586	0.000	114
Fabricated metals*	0.019	0.118	0.022	0.760[a]		0.737	0.000	194
	-0.027[c]	0.256[a]	0.188[b]		-0.404[a]	0.728	0.000	194

[a] significant at 1%; [b] significant at 5%; [c] significant at 10%, *specifications using distance to nearest major seaport.