An anatomy of Italian cities: Evidence from firm level data

Andrea R. Lamorgese and Andrea Petrella*

first version: June 15th 2016
this version: June 15th 2016

Abstract

Economic activity concentrates in urban areas and urban population has outgrown the national average in many countries during the XX century. Why is this the case? In this paper we focus on the urban premium of firms' productivity. We run three exercises. First, we document an urban premium in the level of firms' productivity and we inspect its determinants both among firms' and cities' characteristics. Second we corroborate evidence on the determinants of urban productivity gap by studying the heterogeneity in productivity across urban and non urban area in a counterfactual way by the means of a Blinder-Oaxaca decomposition. Third, we decompose productivity growth of Italian firms in the contribution of incumbent firms, reallocation of market shares across them, entry and exit, and firms relocations across cities and document the differences in the contribution of the different components across urban and non urban firms.

JEL classification: D24, O47, R30

Keywords: urban productivity premium; reallocation; dynamic externalities

*Research Department, Bank of Italy, Via Nazionale 91, 00192 Roma, Italy. Email address: andrea.lamorgese@bancaditalia.it. We wish to thank Antonio Accetturo, Vernon Henderson and Andrea Linarello for valuable advice, as well as seminar participants at the Bank of Italy. The usual disclaimer applies. The views expressed herein are those of the author are not necessarily those of Bank of Italy.

1 Introduction

Two stylized facts emerge strongly from casual observation and the empirical literature in urban economics.

First, economic activity around the world concentrates in urban areas. Large US cities generated almost 85 percent of the countrys GDP in 2010, compared with 78 percent for large cities in China, 76 percent in Latin America and just under 65 percent for those in Western Europe during the same period (Manyika et al., 2012).[1,2] The same report predicts that in the next 15 years, the 259 large US cities are expected to generate more than 10 percent of global GDP growtha share bigger than that of all such cities in other developed countries combined.

The second notable stylized fact is than urban population has outgrown the national average in many countries during the XX century. Table 1 shows that the gap is large in US and Spain, less so in Italy and France.

Table 1: Population growth in urban areas in selected countries

	Growth rate of population (10-years averages)		
	time range	urban areas	national average
USA	1920-2010	17.9	12.6
Spain	1920-2010	18.1	8.9
France	1937-2007	7.7	5.7
Italy	1911-2001	7.2	4.9

Source: Giffoni et al. (2016), Duranton and Puga (2014).

Why is this the case?

In this paper we focus on productivity differences between urban and non urban areas as determinant of agglomeration and look into static and dynamic productivity advantages of urban area using a novel dataset on the universe of Italian firms.

We first establish whether Italian firms located in urban areas feature an advantage in the levels of productivity (measured as value added per employee) with respect to firms located outside urban areas. Our results point toward a sizable urban productivity advantage in the period between 2005 and 2013, both for manufacturing and (up to a larger extent) services

[1]Large cities are defined as those with 150,000 or more inhabitants in U.S.A (where they were 259 in 2010) and Western Europe (186); as those with more than 200,000 inhabitants in China (710) and Latin America (289).

[2]In Italy, the 12 largest cities (those with more than 200,000 inhabitants) together with their commuting zones produce 1/3 of the national value added; another third is produced in the 67 cities (plus their commuting zones) with population between 150,000 and 200,000 inhabitants. The remaining third is produced in the remaining (about 500) cities.

firms. Using detailed data on the universe of Italian firms, we can control for a great deal of heterogeneity across firms; in so doing we verify that a large part of the urban productivity premium is explained by sector specific factors and firm size. Nevertheless a sizable amount of the gap depends on local characteristic of the city, which for the sake of clarity, we distinguish into five sets: Urban economies, Size of the local market and demographic composition, Education, Mobility and Real Estate, and Labor market participation. For each of them we provide a measure of the contribution to the total urban productivity premium.

We then analyse heterogeneity in productivity levels across urban and non urban areas by the means of a Oaxaca-Blinder decomposition. This amounts to estimate the effect of groups of covariates on productivity in both urban and non urban areas and allow to recover the effects of groups of covariates on the urban productivity gap. Average productivity in manufacturing, net of sector and time fixed effect, is larger in urban than in non urban areas and it is due more to differences in endowments than to differences in coefficients; firm's size, education and labor market characteristics comes out of the picture as main determinants of the urban productivity premium in ma, whereas any difference in the coefficients comes out as prevalent.

We finally analyse the dynamics of labor productivity. We perform two different exercises. In the first one, borrowing from Melitz and Polanec (2014), we analyze the effect on the local distribution of firms' labor productivity in urban and non urban areas of i) death and birth of firms, ii) relocation of firms (henceforth "switchers") across urban and non urban areas, iii) shifts of the average productivity of incumbent firms, and iv) reallocation of market shares across incumbent firms. All in all, the net effect of the entry and exit of firms due to the selection process raises average productivity in the urban areas, whereas it depresses the average in non urban areas. The relocation process widens the gap between urban and non urban areas in manufacturing –providing evidence of a sorting mechanism for firms– while it bridges the gap in services. The dynamics of average productivity of incumbents widens the urban productivity premium both manufacturing and services before the crisis, only on services during it, whereas in manufacturing productivity of urban incumbents decreases more than non urban ones. Finally, reallocation of market shares among the incumbent firms occurs mostly manufacturing firms during the crisis, when it contributes largely to counterbalance the average drop in productivity both in urban and non urban areas.

The remaining of the paper is organized as follows. Section 2 introduces the ASIA dataset and the other data used in the paper. Section 3 analyse the urban premium in productivity levels and give an assessment of the relative contribution of firms' and areas' characteristics. Section 4 decomposes the dynamic of local firm's productivity and **??** focuses on the effects on productivity of relocation. Section 5 concludes.

2 Data

In this paper we use three sets of data: the definition of urban areas which we build borrowing on OCSE-Eurostat definition and the map of Italian Local Labor Markets (henceforth, LLMs); firm level data on value added, sales and the number of workers; data on the characteristics of the Italian urban and non urban areas. The next three subsection describe the three sources of data.

2.1 Italian urban areas

What is meant by city in the empirical urban literature is vague.

Urban areas indeed do not necessarily overlap with the administrative borders of single municipalities and in general not even with those of the administrative units a a lower level of breakdown (NUTS3 region, provinces in Italy). So urban areas end up being constituted by more than one municipality, but their territory do not exhaust the one of a province. In a word cities are in between the level of aggregation of two administrative units, the municipality and the province.

A functional agglomeration which stays in between municipalities and provinces is the Local Labor Market (LLM), which is conventionally deemed as a good representation of an urban area. LLMs are the result of a partition of the national territory made of subset of municipalities chosen in such a way that they contain both the place of residence and the workplace of (a majority of) residents.[3]

The analyses in this paper use a definition of urban and non urban areas based on the OCSE-Eurostat definition and adapted to keep into account the Italian Bureau of Census' (Istat) definition of commuting areas.

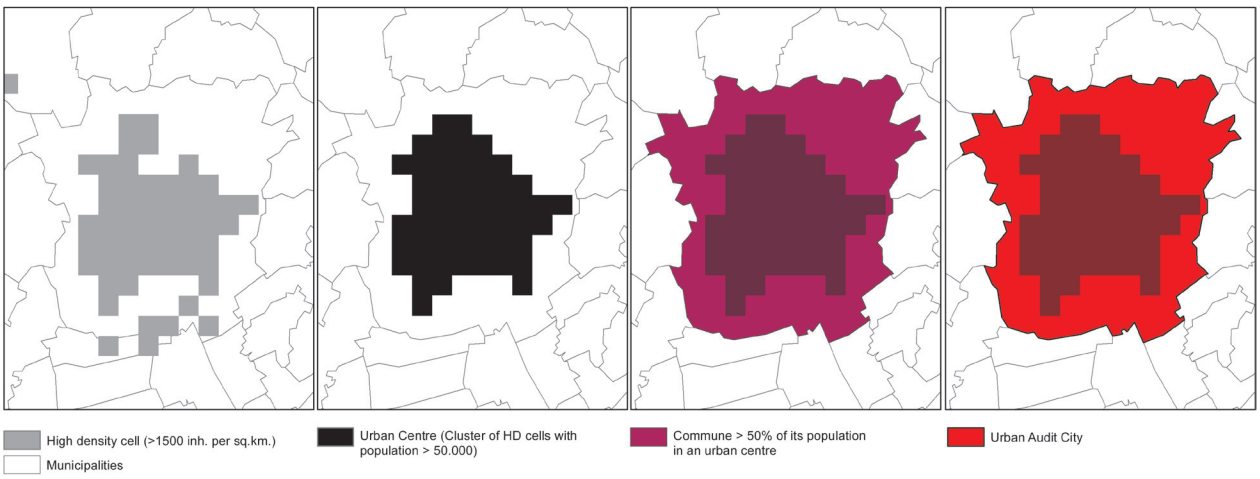
OCSE-Eurostat methodology defines a urban area as a homogenous set of areas whose density of population exceeds a certain threshold `http://ec.europa.eu/eurostat/statistics-explained/index.php/European_cities\_\%E2\%80\%93\_the\_EU-OECD\_functional\_urban\_area\_definition`. This definition is consistent with the traditional view that urban agglomeration are the places where production and knowledge spillovers take place, for the simple reason that density creates thick markets and favors the matching between demand and supply. It is therefore consistent with the traditional sources of agglomeration *labor pooling*, *cost sharing* and *knowledge spillovers* which are at the core of the birth of the industrial cities in XIX century.

[3] At the end of 2014 Istat issued the fourth classification of LLMs based on commuting flows of the 2011 Census (cfr. `http://www.istat.it/it/strumenti/territorio-e-cartografia/sistemi-locali-del-lavoro`). The three classification before (corresponding to the commuting flows of the 1981, 1991, and 2001 Census) used the same kind of data but slightly different definitions. Starting in 2011 the definition has changed rather radically to be consistence with the European definition of LLM. For the sake of comparability, for 2001 the new and the old definition coexist.

This definition is also consistent with international standards set by the Urban Audit program, thus allowing international comparisons.

To define a urban area Eurostat perform a three steps procedure. First, it considers a partition of the territory of the European Union in a grid of 1 square km cells, select all those with a population density of at least 1 500 inhabitants per square km and cluster togeher in what it calls a urban center all the neighboring dense cells reaching a population of 50,000 inhabitants or more. Second, it considers the administrative borders and aggregate to the urban center all (LAU2) municipalities whose at least half of the popilation is resident in the urban center. The so formed agglomeration is candidate to make part of the urban agglomeration. This latter is defined such that: i) there is a administrative link; ii) half of the population of the urban area lives within one of the urban centers therein; iii) at least 75% of the population of the urban centers therein live in the urban agglomeration (fig. 1). The urban agglomeration thus defined is the metropolitan *core*.

Figure 1: Urban centers and urban cities



Source: Eurostat. *Note*: Municipalities are white-colored; cells of the density grid that are denser than 1500 inhabitants per square km are grey-colored; urban centers (i.e. *cluster* of dense cells with more that 50,000 inhabitants) are black-colored; the sets of municipalities that contain the urban center are crimson-colored; urban areas are red-colored.

Third, OCSE-Eurostat defines a urban area as the union metropolitan core and its commuting area. Such urban area is called a Large Urban Zone (LUZ).[4]

[4]The commuting area is similar to the LLM, with slightly different thresholds. Namely, OCSE-Eurostat's commuting zones is constituted by all municipalities with at least 15% of residents who work in a neighboring municipality, such that the LUZ is continuous and self contained. A LLM is characterized by the fact that: i) people commute for work reasons; ii) LLMs are self contained (at least 75% of resident work within the LLM; 25%

In this work we adopt the first two steps of OCSE-Eurostat definition, while we consider Italian LLM, rather than OCSE-Eurostat LUZ in the third step, so that we define a urban area as an LLM containing a urban center, that is containing a municipality or a group of neighboring municipalities with a population density of at least 1,500 inhabitants per square km. This methodology identifies 73 urban areas (or urban LLMs) over a total number of 611 LLMs in 2011. Non urban areas are the remaining LLMs, that is they are less dense commuting zones. While the 73 urban areas have grown both in population and size, having absorbed an increasing number of municipalities, non urban areas have diminished over time from 880, to 710 to 612 and finally to 538 over the 4 Census between 1981 and 2011 (table 2).

Table 2: Evolution of Italian LLMs over time

Census year	Urban	Non Urban	Totale	LLM definition
1981	74	880	954	1981
1991	74	710	784	1991
2001	74	612	686	2001
2001	74	609	683	2011
2011	74	538	612	2011

Source: Istat, *Census* in 1981, 1991, 2001 e 2011.

2.2 Firm level data

The main source of the data used in this paper is the *Archivio statistico delle imprese attive* (ASIA).[5]

Data refer to the population of Italian firms of the private sector excluding those operating in agriculture and in the financial sector for the years 2005, 2008 and 2011-2013. The sectors for which information are gathered are: Manufacturing; Construction; Retail and wholesale trade; Transportation and storage (Logistics); Accommodation and food service activities; ICT; Real Estate; Professional, scientific and technical activities; Travel agency, rental, cleaning, security and other administrative and support services. Sector information is provided at the 5 digits breakdown.

For each firm the dataset gather information about the year of birth, the sector the firm belongs to, the number of employees, the sales and the value added.

For the population of Italian firms contained in the ASIA archives, the Italian national institute of statistics computes the value added using dif-

at most outside it); iii) municipalities within a LLM are contiguous (commuting takes place between contiguous municiplaities, non contiguous ones are excluded); iv) the *core* of the LLM is the municipality toward which commuting flows are maximum.

[5]Data have been made available for elaboration at the former school SAES-Istat within the agreement Bank of Italy and Istat.

ferent sources: the SCI (*Sistema dei Conti delle Imprese*) for all the firms with more than 100 employees; balance sheets data (coming from *Camere di Commercio e Cerved*) for incorporated firms with less than 100 employees; taxes data (from *Agenzia delle Entrate*) for all other firms.

With these data sources it is possible to recover the value aded for more than 80% of firms operating in Italy between 2005 and 2008. For the remaining ones the value is imputed computing the median value added per employee in the same region, the same class of size (among 5 different ones) and the same sector code (5 digits Ateco classification).

Starting from 2011 the share of firms for which value added can be computed directly grows larger than 95%; starting from 2012 the database corresponds to the data of the FRAME-SBS archives, which are also the microeconomic information support for the national accounts.

The dynamics of value added is deflated using cost deflator for the factors used in each sector economic activity (in the 2010 base year). Labor productivity is measured as value added per worker.

On aggregate, the ASIA microdata are consistent with Italian national accounts (CN) data and with the Structural business statistics (SBS) from Eurostat.

In manufacturing the dynamics of VA coming of the aggregation of ASIA microdata tracks closely the dynamics of national accounts, while they slightly differ from SBS in particular between 2008 ND 2011. In the services there is a larger decoupling among between dynamics of ASIA, on the one side, and the ones of CN and SBS on the other one. The decoupling is particularly accentuated with respect to CN (which takes into account the black market) and in the period between 2011 and 2012, when both SBS and ASIA show a drop in productivity of about 5% (only 1.8% for CN).

Table 3 shows some descriptive statistics computed on the ASIA database. The number of firms in the whole economy has been raising before the crisis (up to 2008) and steadily decreasing afterwards, both in urban and non urban areas. This dynamics is due to manufacturing —where a widespread process of restructuring, churning, and selection had been going on since the early 90's, while the number of firms in services shows smaller fluctuations over the period of observation. There is no much heterogeneity in such dynamics across urban and non urban areas.

Between the first and the last year of observation the average firm size has increased across the board, steadily in the services, with a hum shape in manufacturing. Urban firms are larger than non urban ones, during the whole period.

Labor productivity increases during the reference period in manufacturing (cumulatively and year on year, but in the aftermath of the sovereign debt crisis in 2012), while decreasing in services. In manufacturing, the growth of productivity reflected a growth of value added larger than the growth of the number of workers in the period 2005-2008, and a drop larger

Table 3: Descriptive statistics

	Non-urban			Urban		
Year	# firms	# workers per firm	VA per worker	# firms	# workers per firm	VA per worker
			Manufacturing			
2005	225,960	8.41	42,818	235,087	9.69	51,666
2008	219,459	8.83	45,617	225,000	10.13	54,691
2011	206,206	8.63	47,516	212,778	10.00	55,958
2012	204,726	8.62	46,639	209,798	9.98	55,122
2013	200,768	8.53	47,909	206,279	9.97	55,681
			Services			
2005	1,052,146	2.52	31,543	1,452,897	3.56	40,388
2008	1,084,041	2.69	28,819	1,490,655	3.78	41,746
2011	1,065,450	2.75	27,379	1,471,030	3.84	39,875
2012	1,069,544	2.75	25,909	1,473,835	3.86	37,813
2013	1,056,372	2.74	25,734	1,460,670	3.86	37,957
			Total economy			
2005	1,278,106	3.56	36,243	1,687,984	4.42	43,833
2008	1,303,500	3.72	35,530	1,715,655	4.62	45,472
2011	1,271,656	3.70	34,998	1,683,808	4.62	44,276
2012	1,274,270	3.70	33,680	1,683,633	4.62	42,473
2013	1,257,140	3.66	33,979	1,666,949	4.61	42,698

Source: Authors' computation on data from Archivio statistico delle imprese attive (ASIA).

in the number of workers than in value added afterwards. In the services, instead the dynamic of productivity reflects a steady expansion of the number of workers against a drop in value added.

An interesting heterogeneity between urban and non urban areas is apparent. Productivity in manufacturing grows non urban areas at larger rates than in urban areas (11.9% vs. 7.8% cumulate over 2005-2013), while in services the drop is three times as large in non urban areas than in urban ones (-18.4% vs -6.0% cumulate over the same period). The big difference across the two sectors is in the year on year dynamics: in manufacturing the dynamics is qualitatively similar across urban and non urban areas but the magnitudes are larger in non urban areas; while in services productivity was already dropping in non urban areas before the crisis and continued to drop during, whereas in urban areas it dropped only in the period 2008-2012, showing some recovering in 2013.

2.3 Data on areas' characteristics

The data on areas' characteristics come from the dataset 8milacensus.[6] We have a very rich set of area specific controls which we distinguish in 5 subset:

i. **Urban economies**, which contains variables proxying productive amenities of the area, as sector composition (shares of real value added) of the area, average firm size, specialization (Herfindhal-Hirschman index of real sales).

ii. **Size of the local market and demographic composition**, which contains population, population density, elders' dependency ratio, share of foreign residents, index of residential mobility of foreigners, school attendance of foreigners.

iii. **Education**, which contains gender gap in high school attainment, share of illiterates, early school dropout, share of adult with high school attainment, level of education in the 15-19 age range.

iv. **Mobility and Real Estate**, which contains variables proxying the quality of infrastructures (incidence of population who (i) commute daily outside the municipality of residence for work; (ii) use public transportation; (iii) commute daily for study or work for longer than 60 minutes) and variable proxying the supply of residential housing (share of home ownership, share of residential buildings in the area increase in residential construction, residential mobility).

v. **Labor market participation**.

[6] www.8milacensus.it.

Data are provided for each of the 7 census years in the time range 1951-2011. We take values in 2001, so to balance the need to capture areas' characteristics which are still actual with the technical requirement that they should be reasonably predetermined with respect to the dependent variable, which ranges in the interval 2005-2013.

3 The urban productivity premium: Levels

In this section we want to document whether firms located in the urban areas of the country experience consistently larger levels of labor productivity than firms located in non urban areas.

Obviously part of this gap does depend on observable characteristics of the firms and the places where the firms are located. That is, firms operating in some sectors might be consistently more productive than firms operating in some other sectors and these firms might be accidentally located in urban areas, so that a large part of the urban productivity premium might be explained by the sector composition rather than by any deeper economic mechanism. Analogously, larger firms, which are notoriously more productive might be located in urban areas, so that composition by size might be the only reason why urban areas are more productive.

So on the one hand we try and net these spurious effects so to get to a measure of the urban productivity premium that condition out firms' and areas' specificities, on the other hand we compute the contribution to the unconditional urban productivity premium of a wide range of firms and areas' characteristics.

Operatively, we estimate the following regression model:

$$y_{isc,t} = \alpha + \beta I_{\text{Urban}} + \gamma_i X_{i,t-s} + \gamma_c X_{c,t-s} + \delta_1 I_t + \delta_1 I_s + \varepsilon_{isc,t}, \qquad (1)$$

where $y_{isc,t}$ is the value added per worker in firm i which at time t operates in sector s and is located in the area c. I_{Urban} is a dummy which takes value 1 if the firm is located one of the 73 Italian urban areas which we have defined above, $X_{i,t-s}$ and $X_{c,t-s}$are a set of firm- and area- specific controls, lagged of s periods, so to be reasonably predetermined with respect to time t variables. I_t and I_s are respectively time and sector fixed effects, where sector fixed effects are at a very disaggregated breakdown (5 digits of the Ateco classification), so to take into account a large chunk of sectoral idiosyncratic specificities.

While we have a small set of firm specific controls, basically only lagged sales and the sector fixed effect, we have a very rich set of area specific controls distinguished in the 5 subsets: Urban economies, Size of the local market and demographic composition, Education, Mobility and Real Estate, and Labor market participation.

We start estimating a very parsimonious version of model (1), in which we

only include the urban area dummy and time fixed effects. This amount to computing an unconditional average of the gap between labor productivity in firms located in urban areas and firms located elsewhere, only controlling for time varying idiosyncratic shocks which are common to all firms in the sample.

Between 2005 and 2013 firms located in the urban areas of the country show a premium in the levels of labor productivity of more than 7.7 percentage points in manufacturing and 15.6 in services with respect to non urban firms, controlling for time fixed effects (tables 4 and 5).

Table 4: Determinants of the levels of productivity: Manufacturing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Urban areas	0.077*	0.029	0.012***	0.049***	0.037***	0.022***	0.015**
	[0.045]	[0.018]	[0.005]	[0.009]	[0.007]	[0.007]	[0.007]
Sales		0.265***	0.257***	0.255***	0.254***	0.254***	0.2539***
		[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
HHI			-0.087***	-0.230***	-0.154***	-0.176***	-0.145***
			[0.020]	[0.025]	[0.020]	[0.020]	[0.020]
Area sales			0.064***	0.074***	0.044***	0.049***	0.0373***
			[0.006]	[0.007]	[0.005]	[0.005]	[0.005]
Elders' dependency ratio				0.002***	0.002***	0.003***	0.0063***
				[0.000]	[0.000]	[0.000]	[0.001]
Foreign residents				0.001***	0.001***	0.001***	0.000
				[0.000]	[0.000]	[0.000]	[0.000]
Foreign residential mobility				0.002***	0.001***	0.000	-0.000
				[0.000]	[0.000]	[0.000]	[0.000]
Foreign school attendance				0.000	0.000	0.000	0.000
				[0.000]	[0.000]	[0.000]	[0.000]
Population				-0.034***	-0.023***	-0.009***	-0.008***
				[0.002]	[0.002]	[0.003]	[0.003]
Density				0.012**	0.011**	0.005	0.004
				[0.006]	[0.006]	[0.006]	[0.005]
Gender gap in high school attainment					-0.001*	-0.001**	-0.000
					[0.000]	[0.000]	[0.000]
Illiterate ratio					-0.045***	-0.038***	-0.026***
					[0.002]	[0.002]	[0.002]
Early school dropouts					0.001	0.000	0.001
					[0.001]	[0.001]	[0.001]
Share of adults w/					-0.003***	-0.003***	-0.001***

(Continued on next page)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
high school attainment					[0.000]	[0.000]	[0.000]
Education levels in the 15-19 age range					0.008*** [0.001]	0.006*** [0.001]	0.003*** [0.001]
Work mobility						0.000*** [0.000]	0.000*** [0.000]
Use of public transports						-0.000 [0.000]	0.000 [0.000]
Long mobility						0.003 [0.002]	0.002 [0.002]
Share of home ownership						0.0005 [0.001]	0.0004 [0.001]
Share of residential buildings in the area						-0.001*** [0.000]	-0.000* [0.000]
Increase in residential construction						0.000 [0.000]	-0.001** [0.000]
Residential mobility						-0.002 [0.002]	-0.002 [0.002]
Workforce participation							0.011*** [0.001]
Sectors controls	no	yes	yes	yes	yes	yes	yes
Area's sector composition	no	no	yes	yes	yes	yes	yes
Obs.	1333035	1333035	1333035	1333035	1333035	1333035	1333035
R^2	0.004	0.379	0.383	0.386	0.388	0.389	0.389

Clustered SE in parenthesis at LLM level. * significant at 10 per cent, ** at 5 per cent, *** at 1 per cent.

Firm's characteristics like the level of sales in the previous period and the sector fixed effect, explain most of the level differences in productivity premium across manufacturing firms and services ones: conditioning them out, the urban productivity premium decreases to about 3% both in services and in manufacturing (although heterogeneity is such that the premium is estimated with a large standard error). Net of sector heterogeneity, larger firms —that is firms with larger sales in the previous period—[7] have a larger level of productivity.

Adding area's characteristics among the regressors increases the precision

[7] As a robustness check also the number of workers in the previous period was considered, without any significant change in the estimate.

of the estimates of the urban wage premium, and they in general explain a larger part of it in the services sector than in manufacturing.

Proxies for urban economies, that is proxies for the strategic interactions of the economic environment in which firms operate, like the specialization of the area, its sectoral composition, or the average size (in term of sales) of the firms which are thereby located influence firm's productivity in the expected way: the latter is larger in areas where specialization is smaller (that is, in a more diverse environment) and where the average firm's size is larger. Diversity seems to be more important for manufacturing than for services, though.

Demographic decomposition of the population (elders' dependency ration, share of foreign resident, foreign residential mobility, foreign school attendance) and proxies for the size of the local market (population and density) affect the levels of productivity similarly in services and in manufacturing, but explain a larger share of the urban productivity premium in former than in the latter (column (4)).

Proxies for an higher level of education (that is a lower gender gap in high school attainment, a lower illiterate ratio, a lower level of school dropouts, a larger share of the population with high school attainment, larger incidence of education among youngsters) are correlated with higher levels of productivity. Manufacturing firms enjoy a larger effect on productivity of being located in an environment featuring higher levels of education than services firms. Finally the level of education explains a larger share of the urban productivity premium in manufacturing than in services (column (5)).

Table 5: Determinants of the levels of productivity: Services

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Urban areas	0.155***	0.028*	0.008***	0.034***	0.027***	0.016***	0.012**
	[0.036]	[0.015]	[0.003]	[0.007]	[0.005]	[0.005]	[0.005]
Sales		0.334***	0.329***	0.328***	0.327***	0.327***	0.326***
		[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
HHI			-0.016	-0.120***	-0.081***	-0.118***	-0.086***
			[0.023]	[0.019]	[0.018]	[0.017]	[0.015]
Area sales			0.067***	0.067***	0.049***	0.052***	0.042***
			[0.006]	[0.005]	[0.004]	[0.005]	[0.004]
Elders'				0.001**	0.001**	0.001***	0.004***
dependency ratio				[0.000]	[0.000]	[0.000]	[0.000]
Foreign				0.001***	0.001***	0.001***	0.000
residents				[0.000]	[0.000]	[0.000]	[0.000]
Foreign residential				0.002***	0.001**	0.000	-0.000

(Continued on next page)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
mobility				[0.000]	[0.000]	[0.000]	[0.000]
Foreign school attendance				0.000*** [0.000]	0.000*** [0.000]	0.000*** [0.000]	0.0003*** [0.000]
Population				-0.027*** [0.002]	-0.021*** [0.002]	-0.015*** [0.002]	-0.014*** [0.002]
Density				0.010*** [0.004]	0.010*** [0.004]	0.003 [0.003]	0.004 [0.003]
Gender gap in high school attainment					-0.000 [0.000]	-0.000 [0.000]	0.000 [0.000]
Illiterate ratio					-0.027*** [0.002]	-0.024*** [0.002]	-0.016*** [0.002]
Early school dropouts					0.002*** [0.001]	0.002** [0.001]	0.002*** [0.001]
high school attainment					[0.000]	[0.000]	[0.000]
Education levels in the 15-19 age range					0.002 [0.001]	-0.000 [0.001]	-0.002** [0.001]
Work mobility						0.000*** [0.000]	0.000*** [0.000]
Use of public transports						0.002*** [0.000]	0.002*** [0.000]
Long mobility						0.002 [0.001]	0.001 [0.001]
Share of home ownership						0.000 [0.001]	-0.000 [0.000]
Share of residential buildings in the area						-0.000** [0.000]	-0.000 [0.000]
Increase in residential construction						0.001* [0.000]	-0.000 [0.000]
Residential mobility						-0.002 [0.002]	-0.003 [0.002]
Workforce participation							0.008*** [0.001]
Sectors controls	no	yes	yes	yes	yes	yes	yes
Area's sector composition	no	no	yes	yes	yes	yes	yes
Obs.	7562403	7562403	7562403	7562403	7562403	7562403	7562403
R^2	0.011	0.353	0.355	0.357	0.357	0.358	0.358

Clustered SE in parenthesis at LLM level. * significant at 10 per cent, ** at 5 per cent, *** at 1 per cent.

Better mobility and a more responsive supply of residential buildings increase productivity, more for servces than for manufacturing firms, and the effect of such area's characteristics on the urban productivity premium are sizeable in both sectors (column (6)).

Labor market partecipation increases productivity more in manufacturing than in services, and explain a larger shateof the urban productivity premium in the former than in the latter (column (7)).

All in all larger and more productive firms localize in denser, less specialized areas, where the average firm dimension is larger, higher skilled people gather, commuting is easier, the supply of residential property is more elastic and the participation to the labor market is larger. Correlation between this characteristics and the levels of productivity are in general stronger in denser than less dense areas, that is in urban than in non urban areas (table 8).[8]

Figure 2 provides a graphical description of the contribution of each set of firms' and areas' controls by depicting the changes in the coefficient β in equation (1) passing from leaner to richer specifications.

3.1 Robustness

The number of areas controls we have been introducing in the previous exercise is large and most of the characteristics have little variability over time and risk to be a catch all of a number of underlying feature linked to other local features. Even if they have been selected from a wider set of variables trying to minimize multicollinearity problems some of them remain correlated and such correlation risk to return biased estimated of the coefficients of the controls (γ_i and γ_c), but potentially also of the coefficient of interest (β)

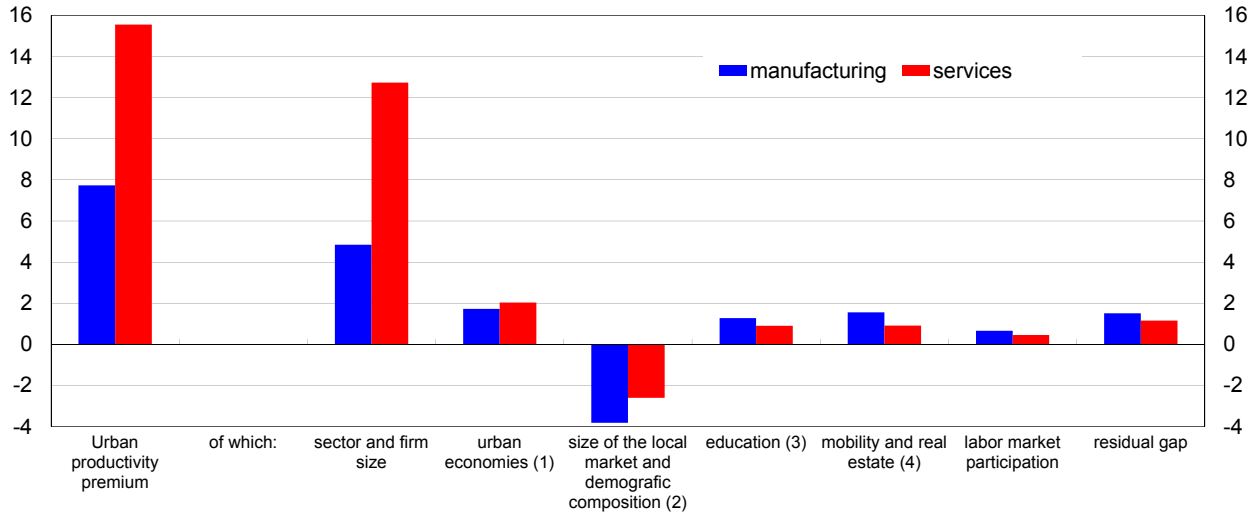
In order to check for robustness in this section we adopt a standard technique and replace each group of controls (i.e. Urban economies, Size of the local market and demographic composition, Education, Mobility and Real Estate) with the its first principal component.[9]

Results are shown in tables 6 and 7. The results of the baseline estimation are by and large confirmed, although in column (3) the estimate of the urban

[8]Technically, the interaction between the urban area dummy and the areas' characteristics is highly collinear with these latter ones, so preventing a consistent estimation of the coefficient of the interaction itself. Since the definition of urban areas relies on residential density, we interact areas' characteristics with residential density and are confident that estimate of such interaction provided qualitatively similar results.

[9]The fifth control for the characteristics of the area is Labor market participation, which is a single control that already summarizes the features of the local labor market, since it is highly collinear with the other variables related to the local labor market that are available in the dataset.

Figure 2: Contributions to the urban productivity premium



Source: Authors' computation on data from Archivio statistico delle imprese attive (ASIA)
Notes: (1) Proxied by sector composition (shares of real value added) of the area, average firm sales, specialization (Herfindhal-Hirschman index of real sales). (2) Proxied by population, population density, elders' dependency ratio, share of foreign residents, index of residential mobility of foreigners, school attendance of foreigners. (3) Proxied by the gender gap in high school attainment, share of illiterates, early school dropout, share of adult with high school attainment, level of education in the 15-19 age range. (4) Contains variables proxying the quality of infrastructures (incidence of population who (i) commute daily outside the municipality of residence for work; (ii) use public transportation; (c) commute daily for study or work for longer than 60 minutes) and variable proxying the supply of residential housing (share of home ownership, share of residential buildings in the area, increase in residential buildings, residential mobility).

productivity premium (β) is larger in magnitude when urban economies are included in the regression as principal components than in the case in which sector composition (shares of real value added) of the area, average sales in the are, and specialization (Herfindhal-Hirschman index of real sales) enter as distinct regressors.

3.2 A Blinder-Oaxaca decomposition

The previous section evaluates the effects of covariates on the urban productivity premium by analysing the stability of the estimates of the coefficient β in regression (1) as long as an increasing set of controls are taken into account. The advantage of such design is that it is simple, but it has got two main drawbacks. First, it relies on the assumption that the elasticities of labor productivity with respect to the different covariates are the same

across urban and non urban areas.[10] This means that and all the productivity differences boil down to the effect of heterogeneity in the covariates ("endowent effect") and in differences in the intercept. The second drawback is that results depend on the order with which the different set of covariates enter the regression. Obviously some robustness check, changing such order, has been performed, and results end up being qualitatively similar, but the order in which covariates are taken into account remains discretionary.

One natural way to overcome these drawbacks and test for the robustness of the empirical strategy adopted so far is to perform a Oaxaca-Blinder decomposition (Blinder, 1973; Oaxaca, 1973).

The Oaxaca-Blinder decomposition is used to study heterogeneity in outcomes (typically labor-market ones) by groups (sex, race, and so on) by decomposing mean differences in the log of the outcome based on linear regression models in a counterfactual manner. It divides the outcome differential (i.e. wage differential) between two groups into a part that is "explained" by group differences in some characteristics, which are typically deemed to be determinants of the outcome (i.e. education or work experience), and a residual part that cannot be accounted for by such differences in determinants of the outcome. The "explained" part can be in turn decomposed in a component accounting for the heterogeneity across groups in the endowment of the characteristics and the heterogeneity across groups in the response of wage to those characteristics. This "unexplained" part is often used as a measure for discrimination, but it also subsumes the effects of group differences in unobserved predictors.

In our case, the Oaxaca-Blinder decomposition estimates the effect of groups of covariates on productivity in both urban and non urban areas and allows to recover the effects of groups of covariates on the urban productivity gap. With respect to the simpler exercise in the previous sections, therefore, the Oaxaca-Blinder decomposition does not rely in any ordering of the covariates and provides a direct estimation of their contribution on the gap in productivity across the two groups, that is urban and non urban areas.

Operatively, the Oaxaca-Blinder decomposition takes the mean outcome difference

$$R = E(Y_{NUA}) - E(Y_{UA})$$

and decompose it based on a set of predictors X and a linear model

$$Y_l = X_l'\beta_l + \varepsilon_l, \quad E(\varepsilon_l) = 0 \;\; l = \{NUA, UA\}$$

[10] Adding interaction of covariates with the urban area dummy variable is not viable, since the interacted regressors ends up to be highly collinear with the original covariate.

into

$$\begin{aligned} R =& E(Y_{NUA}) - E(Y_{UA}) = E(X_{NUA})'\beta_{NUA} - E(X_{UA})'\beta_{UA} \\ =& \left[E(X_{NUA}) - E(X_{UA})\right]' \beta_{UA} + E(X_{UA})' \left(\beta_{NUA} - \beta_{UA}\right) \\ &+ \left[E(X_{NUA}) - E(X_{UA})\right]' \left(\beta_{NUA} - \beta_{UA}\right) \\ =& E + C + I. \end{aligned} \tag{2}$$

The first component

$$E = \left[E(X_{NUA}) - E(X_{UA})\right]' \beta_{UA}$$

the so called "endowment effects" amounts to the part of productivity differential that is due to group differences in the predictors, that is to differences in the firms' and areas' characteristics across urban and non urban areas. More specifically, the E component measures the expected change in the urban area's mean productivity if urban areas had the same levels of covariates of non urban areas.

The second component

$$C = E(X_{UA})' \left(\beta_{NUA} - \beta_{UA}\right)$$

the so called "endowment effects" measures the contribution of differences in the coefficients (including differences in the intercepts), and describes basically the different returns of the local characteristics. Component C measures the expected change in the urban area's mean productivity if urban areas firms reacted to local characteristics with the same elasticities measured by non urban areas' coefficients.

The third component

$$I = \left[E(X_{NUA}) - E(X_{UA})\right]' \left(\beta_{NUA} - \beta_{UA}\right)$$

is the interaction term accounting for the fact that differences in endowments and coefficients exist simultaneously between the two groups.

Performing the Oaxaca-Blinder decomposition with our very rich set of sector controls (with a 5 digits breakdown) is challenging from a computational point of view. We therefore proceed in two different ways.

In a first exercise, we condition out time and sector fixed effect in a preliminary step and then run the Oaxaca-Blinder decomposition on the residuals separately for manufacturing and services firms. In a second exercise we run the Oaxaca-Blinder decomposition in a single step, using sector controls with a two digits breakdown. The drawback of the first exercise is that when conditioning on time and sector fixed effects we are taking out sectorXyear averages that might be different across the urban and non urban areas. The drawback of the second exercise is that we are controlling less precisely for sector heterogeneity.

Tables 9 and 10 present results of the Oaxaca-Blinder decomposition on filtered data for manufacturing and services firms respectively.

Average productivity in manufacturing, net of sector and time fixed effect, is larger in urban than in non urban areas. The premium is explained more by differences in the local endowments of the different characteristics than by the ones in the coefficients (table 9). Coming to the contributions in the endowment of the different sets of covariates, firm's size, education and labor market characteristics comes out of the picture as main determinants of the urban productivity premium, whereas any difference in the coefficients comes out as prevalent.

Average productivity in services, net of sector and time fixed effect, is around 8 percentage larger in urban than in non urban areas and the gap is primarily due to differences in endowments, only partly to differences in coefficients (table 10). Firm's size and education are the main determinants of the urban productivity premium and the elasticity of the productivity to firm's size is also larger in urban areas, firm's size raise the urban productivity premium both thorugh an endowment and a coefficient effect. Finally, being in an area which is specialized in accommodation and food services decreases the urban productivity premium (because of the higher productivity of firms specialized in that sector in tourism specialized non urban areas).

4 Dynamic decomposition of firms' productivity

The dynamics of productivity of italian firms in the period 2005-2013 shows a significant amount of heterogeneity between the period before the crisis (2005-2008) and the one of the crisis (2008-2013), between manufacturing and services firms and between urban and non urban ones.

In particular in the pre-crisis period the labor productivity of manufacturing firms in the pre-crisis period grew by 2% year on year both in urban and non urban areas, with a small gap in favor of the latter ones. Over the same period labor productivity in services firms grew at paces slightly larger than 1% in urban areas, whereas it deacreased by almost 3% each year in non urban areas.

During the crisis (2008-2013) labor productivity increased for manufacturing firms more in non urban (1% each year over the five-years-period) than in urban areas (0.4%); in the same period the productivity of services firms decreased faster in non urban areas (-2.1% each year on average) than in urban ones (-1.8%).

Economic theory stresses some mechanisms that provide a rationale for the part of urban productivity premium which is non explained by the above firms' and location's observed characteristics. They hinge upon selection and sorting of firms in the market.

Urban areas are competitive markets, featuring higher fixed and variable costs, which only more productive and more profitable firms can sustain. Selection thus drive less productive firms out of the market so the aggregate distribution of productivity gets truncated in the left tail and the distribution of surviving firms ends up having a larger productivity (Combes et al., 2012). Beyond this merely statistical effect of selection of the aggregate distribution of firms productivity, the presence of more productive firms makes competition fiercer in urban areas. This induces reallocation of market shares across surviving firms from less productive firms to more productive ones, which in turns increases size, productivity and profitability of surviving firms and makes them more able to face activities characterized by large set-up costs and large value added, like internationalization and R&D. This in turn strengthens their productivity primacy.

Finally, larger and more productive firms and high skilled workers draw larger advantages from being closer to other firms as productive and other workers as highly skilled, so that the productivity advantage of firms and workers in urban area works as attractor of other productive firms and skilled workers by a mechanism know as sorting or assortative matching. Empirically, the productivity advantage of firms in urban areas is therefore partly explained by the fact that in the same area a large fraction of highly productive firms and high skilled workers are settled.

To characterize the determinants of the premium of urban areas with respect to non urban areas in the dynamics of labor productivity we proceeded to decompose it into three components, which reflect respectively the contribution of selection, sorting and reallocation of market shares (Melitz and Polanec, 2014). More precisely we estimate i) the contribution of the birth of new firms and the death of firms which cannot stand the competition in a certain (urban or non urban) market; ii) the contribution of the relocation of firms between urban and non urban areas; iii) the contribution of incumbent firms,[11] which reflects both changes in the efficiency of single firms (the within margin) and the reallocation of market shares across firms with heterogenous levels of productivity (the between margin).

Table 11 shows an increase of the productivity gap between urban and non urban firms driven by a stronger selection only for services firms before the crisis: firms entering the market have levels of productivity slightly closer to the average than non urban firms, so their entry depresses the average to a lesser extent. Conversely, firms exiting the market have levels of productivity much lower than the average in the urban areas and comparable to the average in the non urban ones. All in all, the net effect of the entry

[11] Incumbent firms are firms which are in operation at the beginning and at the end of the period, and do not change place of residence during the reference period.

and exit of firms due to the selection process raises average productivity in the urban areas, whereas it depresses the average in non urban areas.

Relocation of firms across urban and non urban areas has a small effect on the productivity gap between the two area before the crisis, while it is more sizeable during the crisis, both in manufacturing and services. In general, in both sectors, firms moving out of urban areas (decentralizing ones) have a lower productivity than the urban average, but higher than the average of the destination area. Firms than move in the opposite direction (from non urban to urban areas) have a higher productivity than the average of the non urban areas they come from but suffer a gap withrespect to the urban areas they relocate to. During the crisis, nevertheless, this trend changes for manufacturing firms: decentralizing firms have a lower productivity than the average not only of the urban area they come from, but also of the non urban area they relocate to; conversely, firms going urban have a larger productivity than the average of non urban area they come from and slightly lower than the urban areas they go to. The net result is that the relocation process widens the gap between urban and non urban areas in manufacturing —providing evidence of a sorting mechanism for firms— while it bridges the gap in services.

Reallocation of market shares among the incumbent firms occurs mostly manufacturing firms during the crisis, when it contributes largely to counterbalance the average drop in productivity both in urban and non urban areas. Before the crisis, reallocation increases productivity in manufacturing and decreases it in services, relatively more in non urban areas than in the urban ones. This might be an effect of the deep process of change which has interested Italian productive system in the last 15 years, which has mostly interested industrial firms which are traditionally located outside urban areas.

5 Concluding remarks

This paper provides a few stylized facts about labor productivity of firms in Italian urban and non urban areas. We first establish that firms resident in urban areas experience a sizable productivity premium with respect to the ones residing in non urban areas. Then we describe the main drivers of productivity in urban and non urban areas and of the urban productivity premium. Size of firms and some characteristics of the area, mainly connected to the education levels of the population are showed to drive the urban productivity premium. Finally, we decompose the dynamic of urban productivity among four components: average dynamics of the productivity of incumbent firms, reallocation of mkt shares across incumbent, firms' death and birth, and relocation of firms across urban and non urban areas. The first three component explain the lion share of the dynamic of pro-

ductivity of Italian firms with a sizable heterogeneity across urban and non urban areas, manufacturing and services and pre-crisis period (2005-2008) and the crisis one (2008-2013).

References

Blinder, A. S. (1973). Wage discrimination: Reduced form and structural estimates. *Journal of Human Resources*, 8:436455.

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

Duranton, G. and Puga, D. (2014). The Growth of Cities. In *Handbook of Economic Growth*, volume 2 of *Handbook of Economic Growth*, chapter 5, pages 781–853. Elsevier.

Giffoni, F., Gomellini, M., and Pellegrino, D. (2016). Human capital and urban growth. Manuscripts.

Manyika, J., Remes, J., Dobbs, R., Orellana, J., and Schaer, F. (2012). Urban america: Us cities in the global economy. Technical report, McKinsey Global Institute.

Melitz, M. J. and Polanec, S. (2014). Dynamic olley-pakes productivity decomposition with entry and exit. *RAND Journal of Economics*, 46(2):362–375.

Oaxaca, R. (1973). Male-female wage differentials in urban labor markets. *International Economic Review*, 14(693709).

Table 6: Determinants of the levels of productivity: Manufacturing (principal components)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Urban areas	0.077*	0.029	0.042***	0.046***	0.037***	0.028***	0.017*
	[0.045]	[0.018]	[0.014]	[0.013]	[0.012]	[0.011]	[0.009]
Sales		0.27***	0.259***	0.259***	0.258***	0.257***	0.255***
		[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Urban			0.017***	0.017***	0.011***	0.011***	0.007***
economies (1)			[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Size of local mkt				-0.008**	-0.007***	0.005	-0.005*
& demography (2)				[0.003]	[0.002]	[0.003]	[0.003]
Education (3)					0.028***	0.024***	0.027***
					[0.002]	[0.002]	[0.002]
Mobility						.019***	.002
& RE (4)						[0.002]	[0.002]
Labor mkt							.011***
participation							[0.000]
N	1333035	1333035	1333035	1333035	1333035	1333035	1333035
R^2	0.004	0.379	0.382	0.383	0.384	0.384	0.386

Source: Authors' computation on data from Archivio statistico delle imprese attive (ASIA).

Notes: Clustered SE in parenthesis at LLM level. * significant at 10 per cent, ** at 5 per cent, *** at 1 per cent. (1) First principal component of sector composition (shares of real value added) of the area, average firm sales, specialization (Herfindhal-Hirschman index of real sales). (2) First principal component of population, population density, elders' dependency ratio, share of foreign residents, index of residential mobility of foreigners, school attendance of foreigners. (3) First principal component of the gender gap in high school attainment, share of illiterates, early school dropout, share of adult with high school attainment, level of education in the 15-19 age range. (4) First principal component of variables proxying the quality of infrastructures (incidence of population who (i) commute daily outside the municipality of residence for work; (ii) use public transportation; (c) commute daily for study or work for longer than 60 minutes) and variable proxying the supply of residential housing (share of home ownership, share of residential buildings in the area increase in residential construction, residential mobility).

Table 7: Determinants of the levels of productivity: Services (principal components)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Urban areas	0.155***	0.028*	0.032***	0.033***	0.028***	0.023***	0.0144**
	[0.036]	[0.015]	[0.010]	[0.009]	[0.008]	[0.007]	[0.007]
Sales		0.334***	0.032***	0.331***	0.330***	0.330***	0.328***
		[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Urban			0.025***	0.025***	0.020***	0.020***	0.015***
economies (1)			[0.003]	[0.003]	[0.002]	[0.002]	[0.002]
Size of local mkt				-0.003	-0.002	0.007	0.000
& demography (2)				[0.004]	[0.003]	[0.005]	[0.003]
Education (3)					0.020***	0.017***	0.019***
					[0.002]	[0.002]	[0.002]
Mobility						0.013***	-0.001
& RE (4)						[0.002]	[0.002]
Labor mkt							0.009***
participation							[0.001]
Obs.	7562403	7562403	7562403	7562403	7562403	7562403	7562403
R^2	0.011	0.353	0.355	0.355	0.356	0.356	0.357

Source: Authors' computation on data from Archivio statistico delle imprese attive (ASIA).

Notes: Clustered SE in parenthesis at LLM level. * significant at 10 per cent, ** at 5 per cent, *** at 1 per cent. (1) First principal component of sector composition (shares of real value added) of the area, average firm sales, specialization (Herfindhal-Hirschman index of real sales). (2) First principal component of population, population density, elders' dependency ratio, share of foreign residents, index of residential mobility of foreigners, school attendance of foreigners. (3) First principal component of the gender gap in high school attainment, share of illiterates, early school dropout, share of adult with high school attainment, level of education in the 15-19 age range. (4) First principal component of variables proxying the quality of infrastructures (incidence of population who (i) commute daily outside the municipality of residence for work; (ii) use public transportation; (c) commute daily for study or work for longer than 60 minutes) and variable proxying the supply of residential housing (share of home ownership, share of residential buildings in the area increase in residential construction, residential mobility).

Table 8: Determinants of the levels of productivity: interactions

	Manufacturing (1)	Services (2)
Density	-0.0174***	0.0075
	[0.006]	[0.005]
Urban economies (1)	-0.0118	-0.0145**
	[0.009]	[0.007]
Urban Economies X density	0.0039**	0.0043***
	[0.002]	[0.001]
Size of loc mkt & demography (2)	-0.0238*	-0.0339**
	[0.012]	[0.014]
Size of loc mkt & demography (2) X density	0.0018	0.0040*
	[0.002]	[0.002]
Education (3)	0.0167**	0.0081
	[0.008]	[0.006]
Education (3) X density	0.0019	0.0022**
	[0.001]	[0.001]
Mobility & RE (4)	0.0193*	0.0263***
	[0.011]	[0.009]
Mobility & RE (4) X density	-0.0025	-0.0036**
	[0.002]	[0.002]
Lab mkt participation	0.0107***	0.0092***
	[0.001]	[0.001]
Lab mkt participation X density	0.0003**	-0.0000
	[0.000]	[0.000]
Sales	0.2564***	0.3281***
	[0.002]	[0.004]
Obs.	1333035	7562403
R^2	0.386	0.356

Source: Authors' computation on data from Archivio statistico delle imprese attive (ASIA).
Notes: Clustered SE in parenthesis at LLM level. * significant at 10 per cent, ** at 5 per cent, *** at 1 per cent. (1) First principal component of sector composition (shares of real value added) of the area, average firm sales, specialization (Herfindhal-Hirschman index of real sales). (2) First principal component of population, population density, elders' dependency ratio, share of foreign residents, index of residential mobility of foreigners, school attendance of foreigners. (3) First principal component of the gender gap in high school attainment, share of illiterates, early school dropout, share of adult with high school attainment, level of education in the 15-19 age range. (4) First principal component of variables proxying the quality of infrastructures (incidence of population who (i) commute daily outside the municipality of residence for work; (ii) use public transportation; (c) commute daily for study or work for longer than 60 minutes) and variable proxying the supply of residential housing (share of home ownership, share of residential buildings in the area increase in residential construction, residential mobility).

Table 9: Blinder-Oaxaca decomposition: Manufacturing

	average productivity	p-value	Observations
overall			1,333,035
non urban	0.021	0.028	648,660
urban	0.073	0.002	684,375
difference	-0.053	0.035	
endowments	-0.038	0.116	
coefficients	-0.019	0.098	
interaction	0.004	0.639	

	Endowments effect		Coefficient effect		Interaction	
	coeff.	p-value	coeff	p-value	coeff.	p-value
fatt	-0.024*	0.059	-.000	0.740	.000	0.740
UrbanEc	-0.001	0.177	-.000	0.859	.000	0.858
edu	-0.017**	0.003	-.001	0.387	.002	0.351
cong	-0.000	0.929	-.001	0.456	.002	0.334
pop	0.003	0.518	-.003	0.355	.006	0.342
lab	-0.011**	0.048	-.000	0.871	.000	0.871
elC	0.005	0.298	-.000	0.842	.001	0.841
elF	-0.001	0.773	-.002	0.365	.003	0.350
elG	0.000	0.704	-.000	0.847	.000	0.768
elH	0.004	0.210	.002	0.391	-.004	0.266
elI	0.003	0.825	-.001	0.618	.000	0.617
elJ	0.004	0.238	.004	0.210	-.008	0.110
elM	omitted		-.000	0.928	.000	0.928
elN	-0.000	0.968	-.000	0.968	.000	0.968
const			-.017	0.085		

Source: Authors' computation on data from Archivio statistico delle imprese attive (ASIA).

Notes: Clustered SE in parenthesis at LLM level. * significant at 10 per cent, ** at 5 per cent, *** at 1 per cent. 5 dgts sector FE absorbed.

Table 10: Blinder-Oaxaca decomposition: Services

	average productivity	p-value	Observations
overall			7,562,403
non urban	0.004	0.532	3,152,969
urban	0.084	0.000	4,409,434
difference	-0.079	0.001	
endowments	-0.067	0.005	
coefficients	-0.026	0.012	
interaction	0.016	0.154	

	Endowments effect		Coefficient effect		Interaction	
	coeff.	p-value	coeff	p-value	coeff.	p-value
fatt	-.046***	0.000	.003**	0.011	-.004**	0.002
UrbanEc	-.003*	0.058	-.000	0.578	.000	0.526
edu	-.016**	0.004	-.003	0.198	.005	0.060
cong	-.004	0.254	-.002	0.244	.006	0.163
pop	-.004	0.606	-.006	0.122	.015	0.084
lab	-.008	0.096	-.001	0.464	.002	0.415
elC	.005	0.198	.000	0.927	-.000	0.926
elF	.001	0.792	-.002	0.223	.005	0.193
elG	-.001	0.643	-.000	0.699	.001	0.655
elH	.005	0.153	.003	0.403	-.007	0.123
elI	.007**	0.004	-.001	0.290	.003	0.283
elJ	.004	0.132	.007	0.233	-.015**	0.019
elM	omitted		.001	0.305	-.002	0.280
elN	-.006	0.220	-.002	0.253	.006	0.220
const			-.021	0.003		

Source: Authors' computation on data from Archivio statistico delle imprese attive (ASIA).

Notes: Clustered SE in parenthesis at LLM level. * significant at 10 per cent, ** at 5 per cent, *** at 1 per cent. 5 dgts sector FE absorbed.

Table 11: Decomposition of the dynamics of productivity

	Before the crisis: 2005-2008				During the crisis: 2008-2013			
	Manufacturing		Services		Manufacturing		Services	
	Non urban	Urban	Non urban	Urban	Non urban	Urban	Non urban	Urban
i) Selection	0.8	0.7	-5.3	0.5	2.6	2.5	2.4	2.7
Entry	-3.6	-3.4	-5.2	-6.5	-4.7	-4.4	-7.7	-7.7
Exit	4.4	4.1	-0.1	7.0	7.3	6.9	10.1	10.4
ii) Relocation	-0.1	0.0	0.1	0.1	-0.3	0.0	0.2	-0.2
to	0.1	-0.1	0.5	-0.1	-0.3	-0.1	1.0	-0.2
from	-0.2	0.1	-0.4	0.1	0.0	0.1	-0.7	0.1
iii) Riallocation	7.6	4.6	-3.8	-2.3	17.6	18.0	6.9	6.3
Average productivity	-1.7	0.6	0.4	5.1	-15.0	-18.7	-20.2	-18.0
Total dynamics	6.5	5.9	-8.6	3.4	5.0	1.8	-10.7	-9.1

Source: Authors' computation ASIA dataset, 2005-2013.

Notes: percent cumulate changes over the reference period.