

## Dedication

*I would like to dedicate this Doctoral dissertation to my family for their endless love, support and encouragement.*

*A special feeling of gratitude to my loving husband, I could not have completed this effort without his advices, his company and appreciation.*

## **Local Manufacturing Multiplier and Human Capital**

### **in Italian Local Labor Markets**

#### **PhD Thesis**

**Marta Auricchio\***

#### **Abstract**

This paper quantifies the effect of a local labor demand shock in the tradable sector on the employment in the non-tradable sector for Italy. Following Moretti (2010) and Moretti and Thulin (2013) we analyse for Italy's case the effect on the employment in tradable and non-tradable sector due to an exogenous shift in the number of jobs in the tradable sector in local labor market area. Using Italian census data at LLM level for 1981, 1991, 2001 and 2011, evidences suggest that, on average, the effect of an exogenous shift in local tradable employment upon non-tradable employment is zero. We believe that in this baseline model the absence of evidence of a positive impact of new jobs in the tradable sectors on the remaining parts of the local economy can be explained in particular focusing on excess of regulation, on labor mobility, on the lack of variability of wages, on the rigidity of housing supply and on the Italian familistic welfare system. In addition to the baseline model, we account for the technology level of the manufacturing sector using the EUROSTAT classification. We want to test if the jobs multiplier effect in the high-tech sector is significantly different/higher than for almost any other sector. High-tech workers, with their high opportunity cost of time, are expected to be net buyers of non-tradable goods. Accounting for the technology level, as Moretti, Moretti and Thulin predict, we find evidence that high-tech jobs have a positive and significant local employment multiplier of 0.7 additional jobs. These results bear important implications for the Italian growth path and its regional divide, in terms both of labor market and industry competitiveness.

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## 1. Introduction

This paper analyses the impact of the tradable sector employment on the number of jobs in a local area<sup>1</sup>. Whenever a new job in the tradable sector is created, whether because an existing manufacturing firm expands or because the local economy was able to attract a new firm, the local demand for services and locally produced goods increases, generating additional jobs in the non-tradable sector. The size of this effect depends on the workers preferences, on the technology in the non-tradable sector and on the income level of the new hired workers. This positive local employment effect also can be partially offset by general equilibrium effects produced by changing local prices and wages.

The European economy is continuing gradually along its path to recovery, albeit with regional differences. In these year of recession and stagnation the experimented job losses has been one of the most important concern of governments in developed countries. The Italian economy has been showing increasing signals of stabilisation and positive signs appear for the next month, nevertheless unemployment rate remains at critical values and it still generate a great concern.

Local governments dedicate considerable amounts of resources and fiscal incentives to promote the creation of new firms and through this channel new jobs. It means that the local employment multiplier effect has important implications for this kind of policies since the ultimate result, of attracting employers in the traded sector, is an additional positive effect on local employment. The magnitude of local multipliers is became especially relevant for countries, like Italy, for which the average levels of unemployment is higher if compared with other member states of the European Union. Empirical evidences show that the magnitude of this local multiplier effect varies enormously across countries, industries and type of jobs.

Existing evidence for US and Sweden show that the effect of increasing the number of workers in high-tech or with high level of human capital employed in the local traded sector is significantly larger than the effect of increasing the number of workers in the low-tech

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<sup>1</sup> Tradable and the non-tradable sector are identified mainly by manufacturing and local service jobs, respectively.

sector or with low human capital level in the local traded sector. These considerations can be very useful for local governments who are involved in local development politics because they can help them better use their funding and achieve their goals. The economic crisis and the Stability Pact have increased the importance of these aspects. Beside the European Union provides a significant amount of resources for place-based policies aimed to promote employment creation in low income regions. The effectiveness of these policies are not fully proven. In order to evaluate whether these policies can be fully justified the magnitude of local multipliers can be an important tool.

Following Moretti (2010) we analyse, for Italy's case, the effect on the employment in and non-tradable sector due to an exogenous shift in the number of jobs in the tradable sector in local labor market area.

In this paper, we quantify the local employment multiplier in Italy, we compare it with estimates for US and Sweden and highlight some possible explanation for our findings. We regress the growth of employment in the non-tradable sector on the growth of employment in the tradable sector at local level. Our evidences show that, at local level, the impact of employment growth in tradable upon non-tradable employment sector is zero. We also show that these estimates can bring different results when we take into account technology class.

To disclose the reason behind of our results we investigate on different possible explanations. We investigate on the peculiarity of the Italian labor market, housing market and on its socio economic the specific characteristics.

The rest of the paper is structured as follows. The next section is a brief literature review; section 3 is a simple conceptual framework, section 4 describes some Italian peculiarities, while section 5 describes the data set. Section 6 presents the model and section 7 reports the estimates. Section 8 presents the manufacturing oriented local labor market and section 9 reports the estimates. Section 10 discusses the links between market consumption and human capital. In section 11 and 12 we estimate the high-tech and low-tech local employment multiplier. In section 14 we restrict the period of analysis as a robustness check. Section 14 discusses our results and their policy implications.

## 2. Literature review

This paper aims to contribute to the recent literature, starting with Moretti (2010), trying to estimate the elasticity of local, non-tradable employment with respect to non-tradable employment.

Moretti (2010) using US census data for 1980, 1990 and 2000, finds a positive and significant local employment multiplier equal to 1.59 new jobs in the non-tradable sector for each job created in the tradable sector. Taking into account education levels and decomposing tradable employment, he also finds that skilled jobs are associated with much stronger effects on non-tradable jobs (2.52 jobs). Moretti and Thulin (2012) replicate the model proposed by Moretti (2010) using Swedish data. They find, for the Sweden's case, a lower average local employment multiplier of 0.49 non-tradable jobs per tradable job; the effect is much stronger high-tech jobs. The authors attribute the differences between the US and Swedish to two factors. On one hand, they ascribe the smaller effect to the lower labor supply elasticity in Sweden (both due to unemployment benefits and lower labor mobility). On the other hand, they consider the higher wage premium for tradable sector jobs in the US. Variations of Moretti's model have already been applied in others subsequent studies of European countries.

Magrini and Gerolimetto (2011), using US data on employment granted by the Bureau of Economic Analysis from 2001 to 2008 for 363 Metropolitan Statistical Areas (MSA), estimate local multipliers, implementing a fully non-parametric model, accounting for spatial dependencies between unit of observations. Their evidence shows that the local multiplier is increasing with LLM size and that elasticities are lower when tradable jobs are destroyed than when they are created.

Malgouyres (2013) estimates the local multiplier effect using data on local employment and wages in France, considering total hours worked and total earnings instead of number of employed individuals as outcomes. His evidences show an elasticity situated between 0.32 and 0.50, implying a job-to-job effect between 1.2 and 1.9. The author, using a parametric setting, tests for the asymmetry of the local multiplier by estimating a quadratic in tradable employment growth.

Faggio and Overman (2012) using English data at the Local Authority level applied Moretti's multiplier to public sector employment. Their findings, for the period 2003-2007, show that public sector employment has no identifiable effect on the level of total private sector employment but affect the sectorial composition of the private sector. For each new job created in the public sector the authors find a local employment multiplier equal to 0.5 jobs in the non-tradable sector and crowding out effect of 0.4 jobs in the tradable sector. In addition increasing the period of analyses (1999 to 2007) they find no multiplier effect for non-tradables and stronger crowding out for tradables.

Bashford Fernandez (2014) estimates the local employment multiplier for Spain. The author's initial evidence for the period 1995-2008 suggests a short-term (year on year) local employment multiplier effect of 1.13 jobs and long-term multiplier, as measured for the two periods 1995-2001 and 2001-2007, of 2.1 jobs.

De Blasio and Menon (2011) estimate the effect of local multiplier for the Italy's case using municipality-level census data aggregated at LLM-level for 1991 and 2001 and ASIA (Archivio Statistico delle Imprese Attive) dataset to estimate the overtime changes between 1991-2007. The authors' results show that the local impact of employment growth in the tradable sectors is zero. Following Moretti (2010), the authors use the sum of all the variation in employment in each LLM, including the own LLM, to construct the shift-share instrument. The inclusion of the LLM itself in the computation of the nationwide change violates the required exogeneity assumption of their instrumental variable. In our study we have improved the analysis using a more complete set of information and, most importantly, correcting for the endogeneity problem of Moretti's instrument using a proper exogenous shift-share instrument as proposed by Van Dijk (2014). In addition to the baseline model we implement the EUROSTAT classification for technology level of the manufacturing sector. We want to test if the multiplier effect for the high-tech industry employment is larger than the multiplier effect of employment in traditional manufacturing sectors. Our results show that, at local level, there is a positive and significant impact of attracting a high-tech job to a city. Local governments, should consider this evidence to better target their locale development strategies.

### 3. Conceptual Framework

In this section we present the framework, already discussed by Moretti (2010), employed to analyse the economic mechanism underlying the multiplier and discuss the structural parameters that affect its magnitude.

We assume that each local labor market is a competitive economy that uses labor to produce a set of nationally traded goods and a set of non-traded goods, which price is determined locally. The price of traded goods instead is assumed to be fixed on the national market. Labor is mobile across sectors within a local labor market ensuring that marginal product and wages are equalized within the same local labor market.

Local labor supply is increasing, and its slope depends on workers' preferences and on the degree of labor mobility across local labor markets. The utility level of workers depends on local wages, on the local cost of living and on idiosyncratic preferences for location. The lower is the importance of the idiosyncratic preferences for location, the higher is the geographical mobility and therefore the elasticity of labor supply. If the residents have not idiosyncratic preferences for location, their utility depends only on local wages net of local living costs and local labor supply becomes infinitely elastic. In this extreme scenario, wages net of housing costs and utility levels are the same for all workers across all local labor markets. In the baseline scenario where residents have some idiosyncratic preferences for location, however, the utility level is equalized only for the marginal employees, but not necessarily for infra-marginal ones.

To simplify the model we assume that amenities are identical in all local labor markets. Following Moretti, we assume that the local housing supply is upward sloping, with an elasticity that depends on geography and on regulation of land.

In order to estimate the multiplier we need to evaluate the effect of a permanent increase in labor demand in a given tradable industry at the local level. A higher labor demand can be generated by successfully attracting new firms or by an exogenous labor productivity shock faced by existing firms. The direct effect of this shock, in both scenarios, is an increase in employment in the traded sector. The labor demand shift in the traded sector may also affect the rest of the local economy, namely, the remaining part of the tradable sector and the non-tradable sector. Unless local labor supply and housing supply are infinitely elastic, such shock



has general equilibrium effects on local prices by increasing the wage of all workers in the city and the cost of housing.

The effect on the local non-tradable employment is certainly positive. Since the number of workers and the level of wages are higher, the city budget constraint increases pushing up the local demand for non-tradable goods. The number of jobs in sectors like restaurants, real estate, cleaning services, legal services, retail, personal services, etc. grows. The new amount of jobs is divided between former and new residents, depending on the degree of geographical mobility.

The magnitude of the multiplier effect depends on several factors. First, it depends on consumer preferences for non-tradable goods; the stronger are preferences, the larger will be the share of the city budget spent on local goods and services, and therefore the larger will be the multiplier effect. Second, it depends on the technology level in the non-tradable industry. For the same positive shock on traded sector employment, the more labor intensive the technologies in the non-tradable sector are, the larger will be the multiplier. Third, it depends on the type of new jobs generated in the tradable sector. An increase in the employment of the high-tech sector--where on average jobs require high skills workers--should have a larger multiplier effect than the same increase in sectors where low-tech jobs and jobs that require low levels of education are pervasive. Skilled workers, with their higher earnings, are likely to generate a larger increase in the demand for non-tradable goods and services. Moreover, workers with high level of human capital tend to spend a larger fraction of their income on personal services, which are largely non-traded. Fourth, it depends on the offsetting general equilibrium effects on wages and prices. The higher is the elasticity of the supply the smaller is the wage increase and therefore the larger is the multiplier. For a given increase in labor demand in the traded sector, local areas where supply of housing is more bounded will experience a larger increase in local costs of living and a lower multiplier.

The effect of an increase in labor costs determines a decline in the supply of local services and goods. This shift partially undoes the positive effect of the increase in demand for local non-tradable products. Moreover, the increase in the employment in a tradable industry partially crowds out jobs in other part of tradable sector. If labor and housing supply are very elastic at the local level, such crowding out is less significant, the increase in wages is smaller and hence the multiplier effect is larger.

The shock in a specific tradable sub-sector may also affect the rest of the manufacturing sectors. The sign of this impact is a priori uncertain and it is necessary to take into account three different forces. First, the growth of the number of jobs in a local area will increase factor prices and therefore, through this channel, hurt the competitiveness of enterprises since the tradable sector includes those industry sectors whose output in terms of goods or services could be traded nationally or internationally. Second, the increase in manufacturing production may also increase the demand for intermediate goods at local level. Third, agglomeration effects may generate positive spillovers able to attract new firms in the region.

Since labor supply is arguably more elastic at the local level than at the national level, the local multiplier for the non-tradable sector should represent an upper bound for the national multiplier for the non-tradable sector while the local multiplier for the tradable sector should represent a lower bound for the national multiplier for the tradable sector.

#### 4. Italian peculiarities

Compared to other OECD economies, Italy is characterized by a higher degree of anti-competitive regulation in the non-tradable sector (OECD 2010)<sup>2</sup>. Barone and Cingano (2010), estimating the effects of anti-competitive service regulation for OECD countries, show that those economies with less anti-competitive regulation have better economic performance in non-tradable industries. Allegra et al. (2004), analysing Italian sectorial data, find that services produced in sectors suffering from competition problems perform worse in terms of output growth. The excess of regulation for the non-tradable sector can be a barrier to entry that block potential service firms from entering a local market. The increase in demand for non-tradable goods and services may bring higher prices rather than an increase in supply. The burden of regulation and bureaucracy can consistently reduce the local employment multiplier effect.

Brunello et al. (2001), examining Italian regional disparities, analyse the unresponsiveness of wages to local labour market conditions. The nature and extent of wage rigidity for Italy is also mentioned in the IMF Mission Concluding Statements (2011). For private firms, a more

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<sup>2</sup> De Blasio and Menon (2011) already highlight some of these possible explanations.

decentralized bargaining would better adjust wages towards productivity and increase competitiveness. The lack of adjustment of wage can affect employment growth in both the developed and less developed area. In the first case the increase in local wages can be not sufficient to attract workers from outside of the local labor market area. In the second case, instead, the multiplier mechanism itself can be stopped by wages higher than the equilibrium level.

To reduce the lack of wages variability, regional differentiation of wages should be introduced also in the public sector to reflect the differences in the cost of living. This could lead to wage moderation for private jobs in regions with high public employment concentration.

The low Italian job mobility can also be explained by the rigidity of housing supply. As Cannari et al. find, the positive impact of migration from the South to the North has been offset by the housing price differential, which has steadily risen at least from the mid-1980s onwards.

Italian culture and tradition can also matter for economic outcomes. Incentives to mobility can be reduced by other additional factors related to the key role that the Italian families play in the architecture of the welfare system, acting as the main supplier of care and welfare for children and dependent individuals (Saraceno, 1994). León and Migliavacca (2013), highlight the differences related to the familistic welfare system in the Italian macroareas. In the North of the country, the culture of welfare public service is rather widespread and it decreases the familistic welfare burden. These regions, where the female participation in the labour market is high, have been making an effort to improve their long-term care system. In the southern region, instead, the care burden is carried mostly by families, with poor public support.

Italy is a strong-family country; family ties are strong and persistent (Alesina and Ichino, 2009). Unlike other OECD countries, children have a prolonged permanence in the parental home and use to continue to live close to their family. The family system in Italy offers support for child-care, education, unemployment and assistance to the elderly. Strong family ties are associated with a lower labor mobility since ties are more useful if relatives live close to each other (Alesina and Giuliano 2007). Therefore the Italian migration opportunity cost will be higher as compared to country with weaker family ties such as US and Sweden.

Finally, Alesina and Giuliano (2013) also show that strong family ties are positively correlated with household production and negatively correlated with participation in the labor market of women, young adults and elderly. Countries with a culture fostering strong family ties may have different economic outcomes than more individualistic societies.

## 5. Data

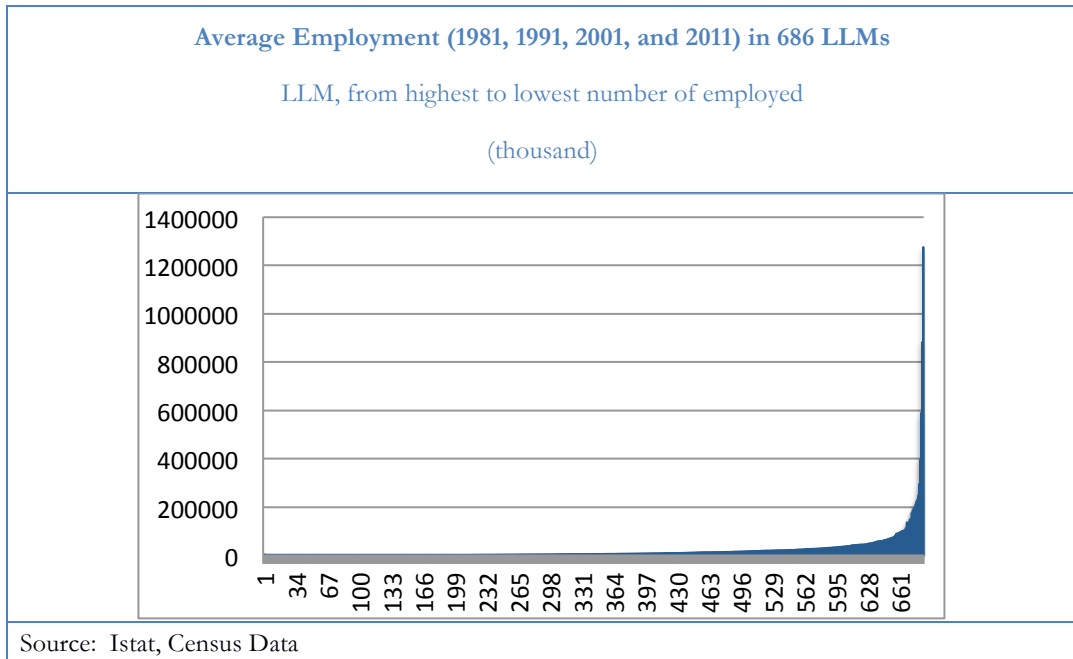
To perform the analysis we use municipality level data from the 1981, 1991, 2001 and 2011 Italian Industry and Service Census. To take into account the geographical location of different production units of the same firm, we consider local units of enterprises data (unità locali delle imprese). We aggregate all the data at Local Labor Market level (LLM). We use LLM classification as defined in the 2001 ISTAT revision. The Census data provides information on employment released at the 5 digit<sup>3</sup> ATECO for 1981, 1991 and 2001 and 2 digit ATECO for 2011. Using the census data in the baseline specification we identify the tradable sector by manufacturing (ATECO 10-33) and the non-tradable sector by services and all other industries excluding agriculture, fishing, mining, construction and public administration<sup>4</sup>. Figure 1 shows the average size distribution of LLM from the lowest to the highest number of employed. As we can see, the number of workers in the first two largest LLM (Milan, Rome) accounts for slightly less than fifteen per cent of total employment. Since the size of LLMs can affect the exogeneity of the instrument we will perform all the analysis in two different scenarios: the first one including the aforementioned LLMs, the second one excluding them. In principle, since we are assuming that the national changes in employment is exogenous to a specific local system, the shift and share instrument is expected to perform better when survey units are small enough and therefore do not affect aggregate changes.

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<sup>3</sup> In the examined period the structure of census data ATECO 1991 was changed to get to ATECO 2002 and then again to ATECO 2007. We rebuilt the structure to have a homogeneous data set on the basis of ATECO 2007.

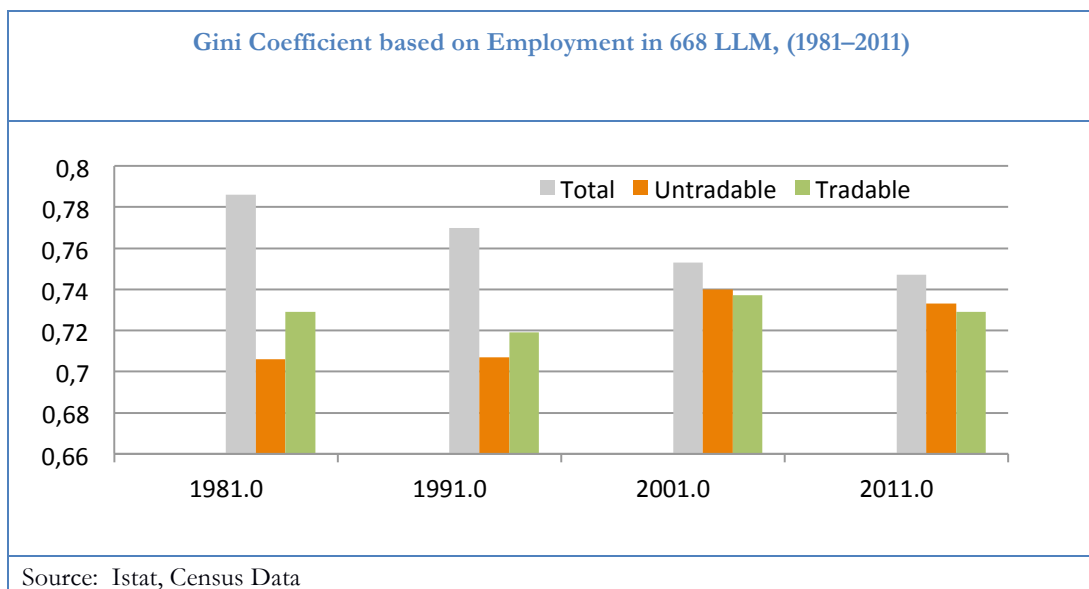
<sup>4</sup> In a second specification we include construction among the non tradable sectors.

Figure 1



In order to consider the evolution of the geographical concentration of tradable and non-tradable jobs in the LLMs we estimate the Gini coefficient in the four periods of analysis. In the last forty years the Gini coefficient for the economy -tradable and non-tradable- has declined, instead the geographical concentration of non-tradable jobs, in the overall period, slightly increased.

Figure 2



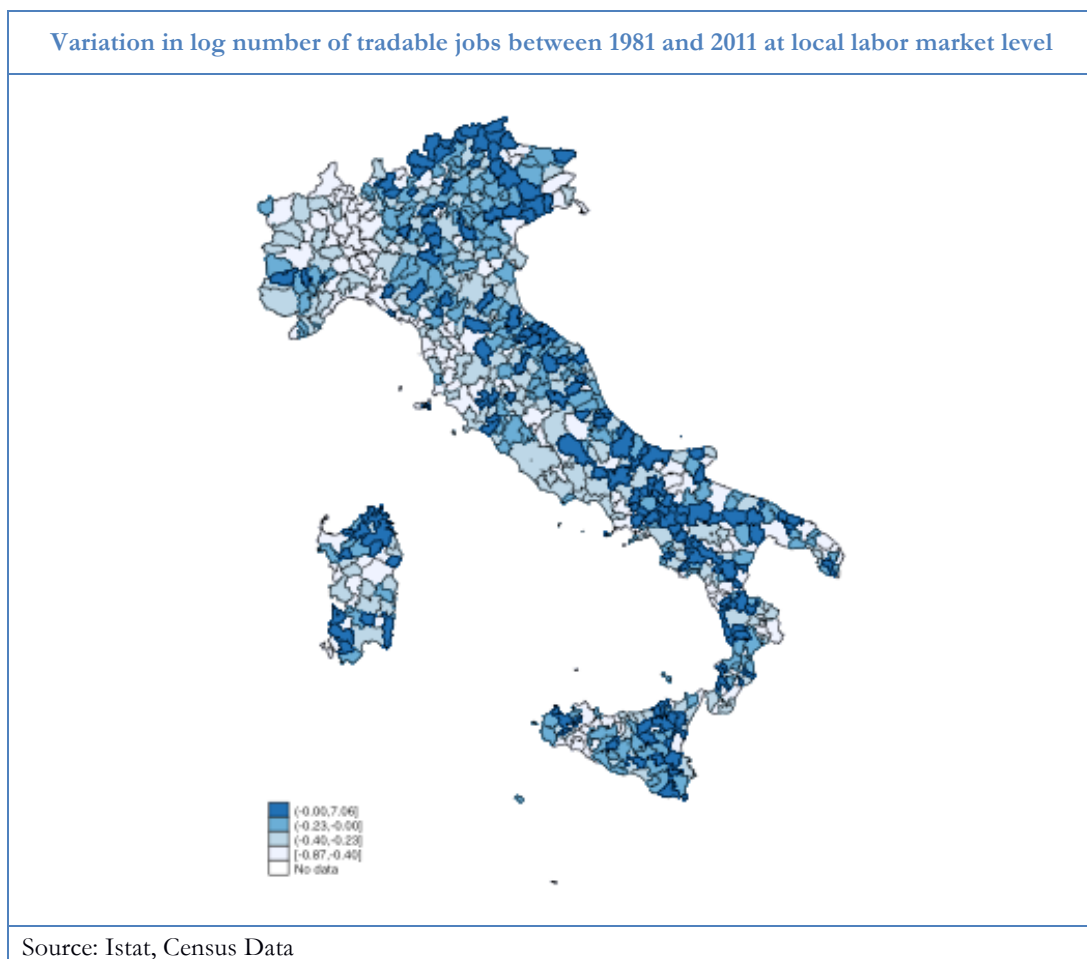
In Italy between 1981 and 2011 the number of tradable jobs has steadily decreased while the number of non-tradable jobs has experienced a different dynamic (Fig.3). In 1991, excluding agriculture, fishing, mining, construction and government from the service sector, about two fifths of total employment were in the tradable sector; after 20 years the share of tradable jobs is slightly more than one fifth. Moretti and Thulin describe a similar dynamic for Sweden.

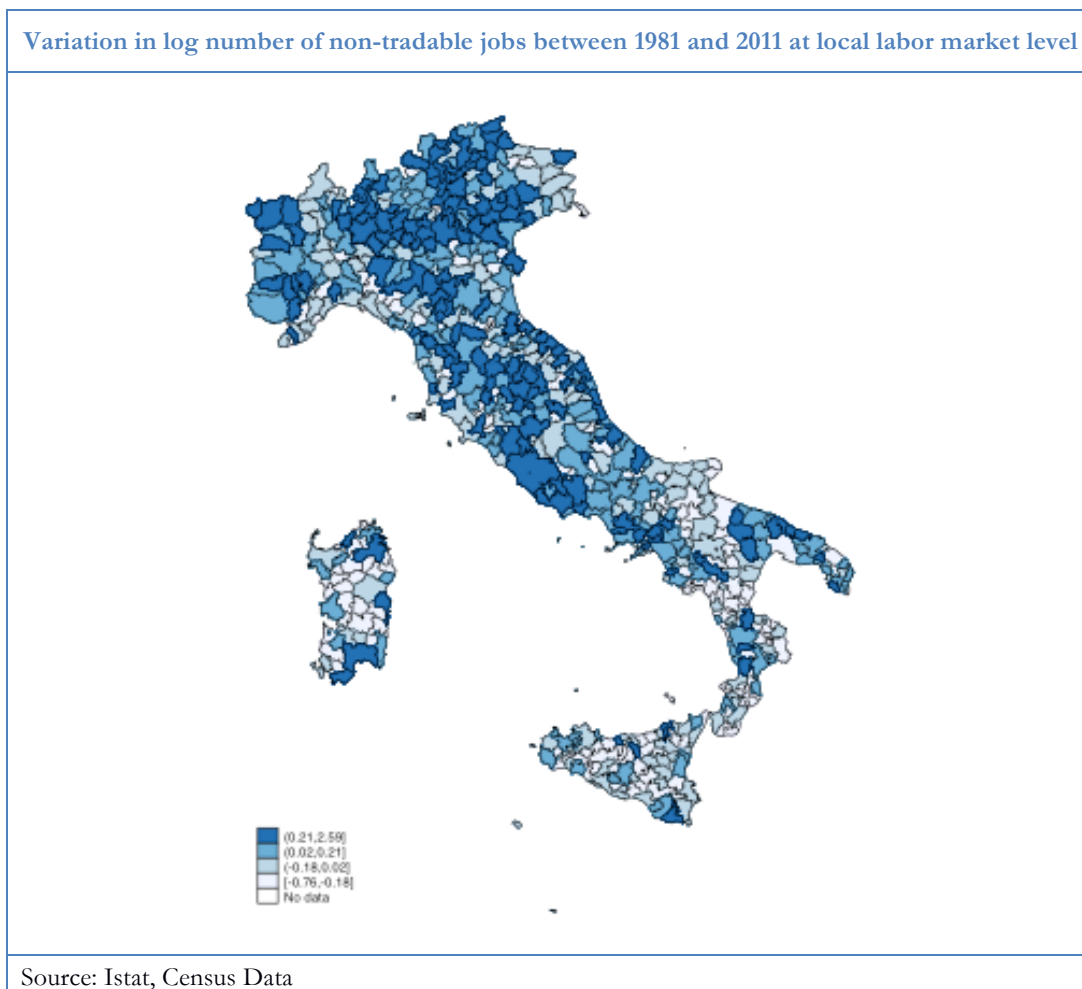
Figure 3



In the last forty years the recent economic crisis has affected the most the manufacturing sector and it has contributed to further reduce its relative weight. The decline of the number of jobs in the tradable sector already started during the eighties as it is shown in Figure 3. Between 1981 and 2011 the number of workers in the local units decreased by 7.0 percent. Over the entire period the negative trend only affects the performance of tradable sector. The number of tradable jobs has fallen in all the Italian macroareas, especially in the North West and South of the country. The level of employment in the non-tradable sector increased, instead, in all the main areas with the exception of the southern regions. Within each LLM area, however, different dynamics took place. Figure 4 and 5 show such dynamics as expressed by the change over time in the log number of jobs in each LLM.

Figure 4





## 6. Empirical Method

Using Census data we estimate a version of the model proposed by Moretti (2010) as defined by:

$$\Delta N_{p,t}^{NT} = \alpha + \beta \Delta N_{p,t}^T + \gamma d_t + \Delta \varepsilon_{p,t} \quad (1)$$

where  $\Delta N_{p,t}^{NT}, \Delta N_{p,t}^T$  are the log-differences of tradable and non-tradable jobs in the LLM  $p$  at time  $t$ . For each LLM we have three different observations over time, accounting respectively for the three time intervals of the analysis (1981-1991, 1991-2001 and 2001-



2011). We also add an intercept  $\alpha$ , time dummy variables  $d_t$ —introduced to capture any time fixed effects—and  $\mu_p$ , an unobservable LLM-specific fixed effect. In this first specification the  $\beta$  coefficient is going to capture not only the causal effect of employment in the tradable sector on the number of jobs in the non-tradable sector, but also the effect of employment in the non-tradable sector on the tradable jobs. In order to take into account the reverse causality problem and disentangle the causal effect of the change in the number of jobs in the tradable sector on the number of non-tradable jobs, we use an instrumental variable constructed according to the well-established shift-share approach introduced by Bartik (1991).

$$Instrument = \sum_{j \in T} \left\{ \frac{N_{j,p,t-s}}{N_{p,t-s}^T} \left[ \ln \left( \sum_{p' \in P/p} N_{j,p',t} \right) \right] \right\} \quad (2)$$

Where  $\frac{N_{j,p,t-s}}{N_{p,t-s}^T}$  is the share of tradable jobs in industry  $j$  in LLM  $p$  at time  $t$  and the term in square brackets approximate the national growth of tradable jobs in industry  $j$  between  $t-1$  and  $t$ .

In the proposed model  $\beta$  represents the elasticity between jobs in the tradable sector and employment in the non-tradable sector. Therefore, in order to calculate the local multiplier in terms of number of jobs, rather than as a proportion, we need to measure the size of the non-tradable sector relative to the size of the tradable sector. That is:

$$relative\ size = \frac{N_{1981}^{NT} + N_{1991}^{NT} + N_{2001}^{NT} + N_{2011}^{NT}}{N_{1981}^T + N_{1991}^T + N_{2001}^T + N_{2011}^T} \quad (3)$$

where  $N_i^{NT}$ ,  $N_i^T$  are the total number of workers in the non-tradable and in the tradable sector in each period. One additional job in the tradable sector will create  $\beta$  jobs in the non-tradable sector. Table 1 shows that on average there are almost two non-tradable jobs for each tradable job.

Table 1

Employment share in LLM			
Census year	Tradable	Non-tradable	Relative Size
1981	42,79	57,21	1,34
1991	36,58	63,42	1,73
2001	38,59	61,41	1,59
2011	29,39	70,61	2,40
Source: Istat, Census Data			

## 7. Overall Estimates

For this first part of the analysis, our estimates are reported in Table 2. The national wide average effect of an exogenous shift in local employment in tradable sector is represented by  $\beta$ . The entries for OLS are positive and statistically different from zero. The instrumental variable estimations suggest that the average multiplier effect for Italy is zero.

Table 2

Local Multiplier						
	LLM			LLM (without Milan and Rome)		
	OLS	IV		OLS	IV	
		1st stage	2nd stage		1st stage	2nd stage
$\Delta$ jobs in tradables	0.129*** (0.037)		-0.601 (1.969)	0.129*** (0.037)		-0.602 (1.950)
Instrument		-4.801 (3.243)			-4.855 (3.248)	
Constant	0.280*** (0.007)	-0.144 (0.156)	0.189 (0.245)	0.280*** (0.007)	-0.144 (0.156)	0.189 (0.245)
Year						
1991	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)
2001	-0.453*** (0.013)	-0.021 (0.015)	-0.435*** (0.051)	-0.454*** (0.013)	-0.021 (0.015)	-0.435*** (0.051)
2011	0.061*** (0.010)	-0.177*** (0.016)	-0.061 (0.332)	0.061*** (0.010)	-0.177*** (0.016)	-0.061 (0.329)
Province f.e.	YES	YES	YES	YES	YES	YES
Notes: The dependent variable is the proportional change in the number of jobs in the non-tradable sector. Census data. Robust Clustered Standard errors in parenthesis. * = $p < 0.10$ ; ** = $p < 0.05$ ; *** = $p < 0.01$ .						

As a robustness check we perform the analysis using more restricted definitions of the tradable and non-tradable sectors. Also in these scenarios we do not find a significant evidence of a positive multiplier effect.

These results contrast with the evidences found for US and for Sweden (Moretti, Moretti and Thulin, J.J van Dijk). On the other hand, they confirm what de Blasio and Menon have already pointed out--using a slightly different data set and a shorter period of analysis--for the Italian's case. The absence of a positive and significant multiplier effect can be mostly explained by regulation, lower labor mobility and several other reasons that we have briefly discussed in section 3 and 4 of this work.

## 8. Manufacturing oriented LLMs

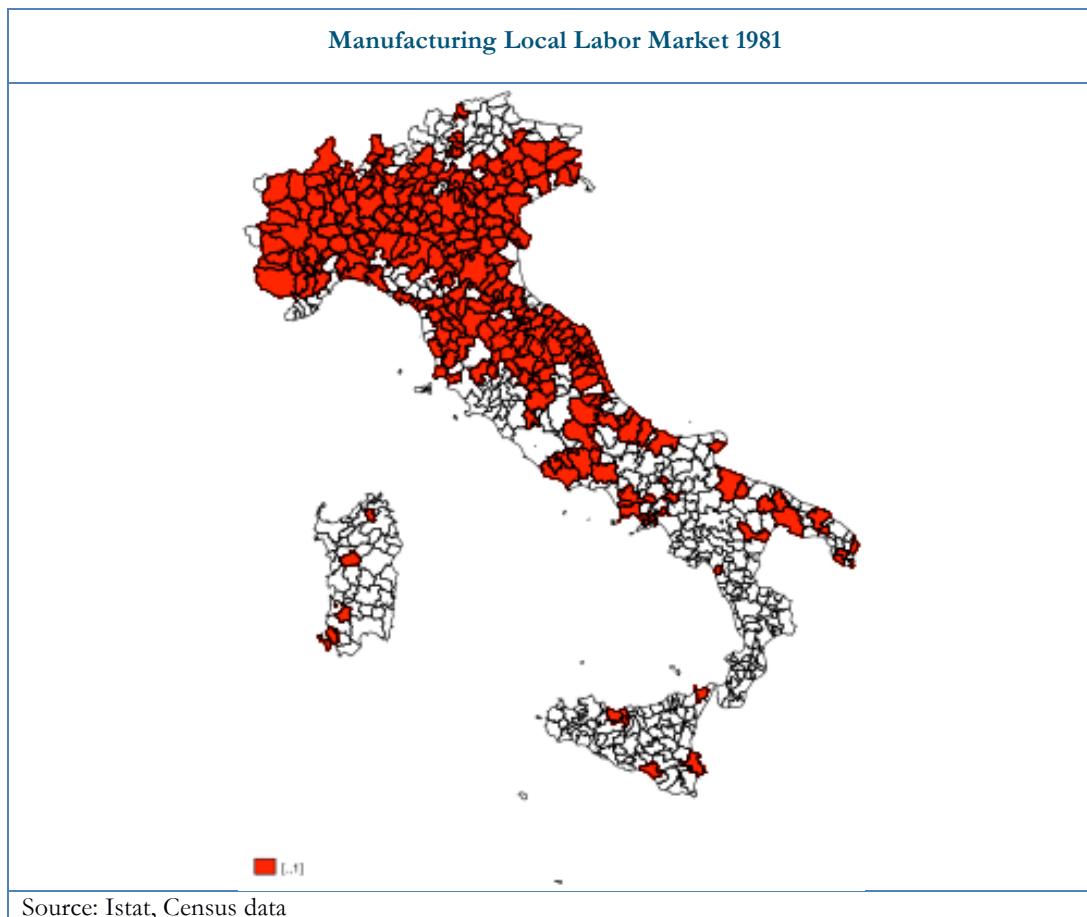
As the second step of our analysis we examine the method chosen by Istat to define the LLMs and we check whether all LLMs are eligible candidates for our study. Istat describes two main types among LLM systems: those that can be defined as manufacturing and those that can be defined as touristic. In the case of touristic LLMs, it is reasonable to expect that the number of workers in the non-tradable sector is not affected by the local demand for services but is mainly driven by the tourists demand for the same services. The dynamic of the number of employees in the service sector--in a marine area for example--will be mainly determined by the flow of domestic and international tourists and only residually by local demand. For these locations, ascribing the change in the number of jobs of the non-tradable sector to local demand would be incorrect and misleading. To perform a more accurate analysis and to be able to capture the effect of tradable on non-tradable jobs, we restrict the sample considering only the manufacturing oriented LLMs.

The manufacturing LLMs are defined according to the geographical concentration of workers in the manufacturing industry. As a consequence, ISTAT defines as the manufacturing oriented LLMs those areas identified by the following condition:

$(LLM_{employment,tradable} / LLM_{employment,tot}) / (ITA_{employment,tradable} / ITA_{employment,tot}) \geq 1$ . To reduce the number of observations excluded from our analysis, we decide to use a less binding condition. From now on we only consider as manufacturing the LLMs for which the following condition holds:

$(LLM_{employment,tradable} / LLM_{employment,tot}) / (ITA_{employment,tradable} / ITA_{employment,tot}) > 0.75$ . The 290 LLM identified by the previous inequality are shown in Figure 5. As a robustness check we replicate the analysis also using weaker and tighter condition to identify manufacturing LLMs. Figure 6 shows that, using Istat methodology, we are not only excluding the proper touristic areas but also the underdeveloped areas of the South.

Figure 6



Using this subset the relative size between the two sectors has changed (Table 3). In particular, in the manufacturing oriented LLMs the ratio between non-tradable and tradable jobs has decreased as expected.

Table 3

Employment share in manufacturing oriented LLM			
Census year	Tradable	Non-tradable	Relative Size
1981	49,97	50,03	1,00
1991	43,12	56,88	1,32
2001	44,12	55,88	1,27
2011	34,40	65,60	1,91

Source: Istat, Census Data

## 9. Manufacturing oriented LLMs Estimates

In this section we estimate the same model using the sub sample of manufacturing LLMs. For this second part of the analysis our main estimates are reported in Table 4. In Table 4 we show the effect of an exogenous shift in local employment in tradable sector for the 290 manufacturing oriented LLMs.

Table 4

Manufacturing Local Multiplier						
	Manufacturing LLM			Manufacturing LLM (without Milan)		
	OLS	IV		OLS	IV	
		1st stage	2nd stage		1st stage	2nd stage
$\Delta$ jobs in tradables	0.213** (0.102)		0.131 (0.364)	0.214** (0.102)		0.132 (0.364)
Instrument		22.975*** (6.651)			22.883*** (6.661)	
Constant	0.258*** (0.010)	-0.071 (0.103)	0.252*** (0.031)	0.259*** (0.010)	-0.071 (0.103)	0.252*** (0.031)
Year						
1991	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)
2001	-0.352*** (0.016)	0.077*** (0.015)	-0.347*** (0.026)	-0.353*** (0.016)	0.077*** (0.015)	-0.347*** (0.026)
2011	0.061*** (0.010)	-0.137*** (0.016)	0.050 (0.060)	0.064*** (0.010)	-0.137*** (0.017)	0.051 (0.061)
LLM f.e.	YES	YES	YES	YES	YES	YES

Notes: The dependent variable is the proportional change in the number of jobs in the non-tradable sector. Census data. Robust and Clustered Standard errors in parenthesis. \* =  $p < 0.10$ ; \*\* =  $p < 0.05$ ; \*\*\* =  $p < 0.01$ .

The OLS estimations indicate that there is a significant effect of tradable jobs on non-tradable ones. As in the previous sections since the entries in columns 2 and 5 can be biased due to reverse causality, omitted variables and measurement error we replicate the estimates using the instrument proposed. The instrumental variable estimates suggest that the average multiplier effect across all sectors is still not statistically different from zero.

## 10. Technology, human capital and local market consumption

The idea behind Moretti's multiplier is based on the prediction that manufacturing employees are expected to be net buyers of local market services. In this section we test the hypothesis that the type of new jobs created in the tradable sector affects the magnitude of the multiplier. Clearly, jobs created in high-sector high will generate an increasing demand for high-skill workers. In particular as Mazzolari and Ragusa (2004) have pointed out, we expected that jobs in the high-tech sectors, considering high opportunity cost of time of skilled workers, should determine a larger multiplier effect. An increase in the number of high-tech jobs has to consistently raise the demand for outsourced home production activities and other services offered at local level. We can test this prediction using data from the Household Budget Surveys (HBS) carried out regularly under the responsibility of Istat. The survey provides information about household consumption expenditures on goods and services with considerable details; possession of consumer durable goods and cars; basic information on housing and many demographic and socio-economic characteristics (e.g. family size and composition, age, gender, relationship to the reference person, education, income, rental amount). The survey consists of two separate parts, one based on retrospective interviews about expenditures in the previous months and one based on weekly diaries. In this paper we use data drawn from both sections. For each household we construct a measure of monthly total expenditure in goods and services produced at local level. To deeply investigate the decision choice of skilled we focus the attention only on those expenditures related to outsourced home production activities. All the voices taking in to account are reported in Table 5. Since we have information on the income level only in the first period of the survey, we construct a proxy using the information related to the rental cost of the house-sustained or ascribed-. This measure can be considered as a standard approximation.

Table 5

Household Budget Surveys (HBS)	
Consumer Expenditure Survey	Diary Survey
Dentist	Bars, bakeries, kiosks, etc.
Clinical Analysis	Restaurants, taverns, eateries, etc.
Radiological examinations, etc.	Canteens, school canteens, etc.
Expenses for private garage, etc.	Barber, hairdresser, beauty salon, etc.
Sports: frequency in swimming pools, gyms, tennis courts, etc.	Cab, etc.
Subscriptions to sporting events	Tickets for cinema, theater, concerts
Subscriptions to concerts, theaters, cultural centers, etc.	Tickets for museums, sporting events and various
School fees (including language courses, computer, etc.)	Laundry and dry cleaning
School bus with school bus	Shoe repair
Private lessons and repetitions	Clothing repair
Driving lessons	Furniture Repair
Fees for accountants, tax consultants	Repair of household linen
Fees for lawyers, notaries, architects, etc.	

Figure 7.a plots fitted values of per capita nominal monthly expenditures, by year and education level. In the overall period the service expenditures for high skilled families<sup>5</sup> are almost twice the expenditures for low skilled families; also the slopes differ. In 1997 the average per capita monthly expenditure for non-tradable service was 106 euro for high skilled families and 61 for the low skilled ones (Table 1A). The fitted values for each region are shown in Fig 1 A.

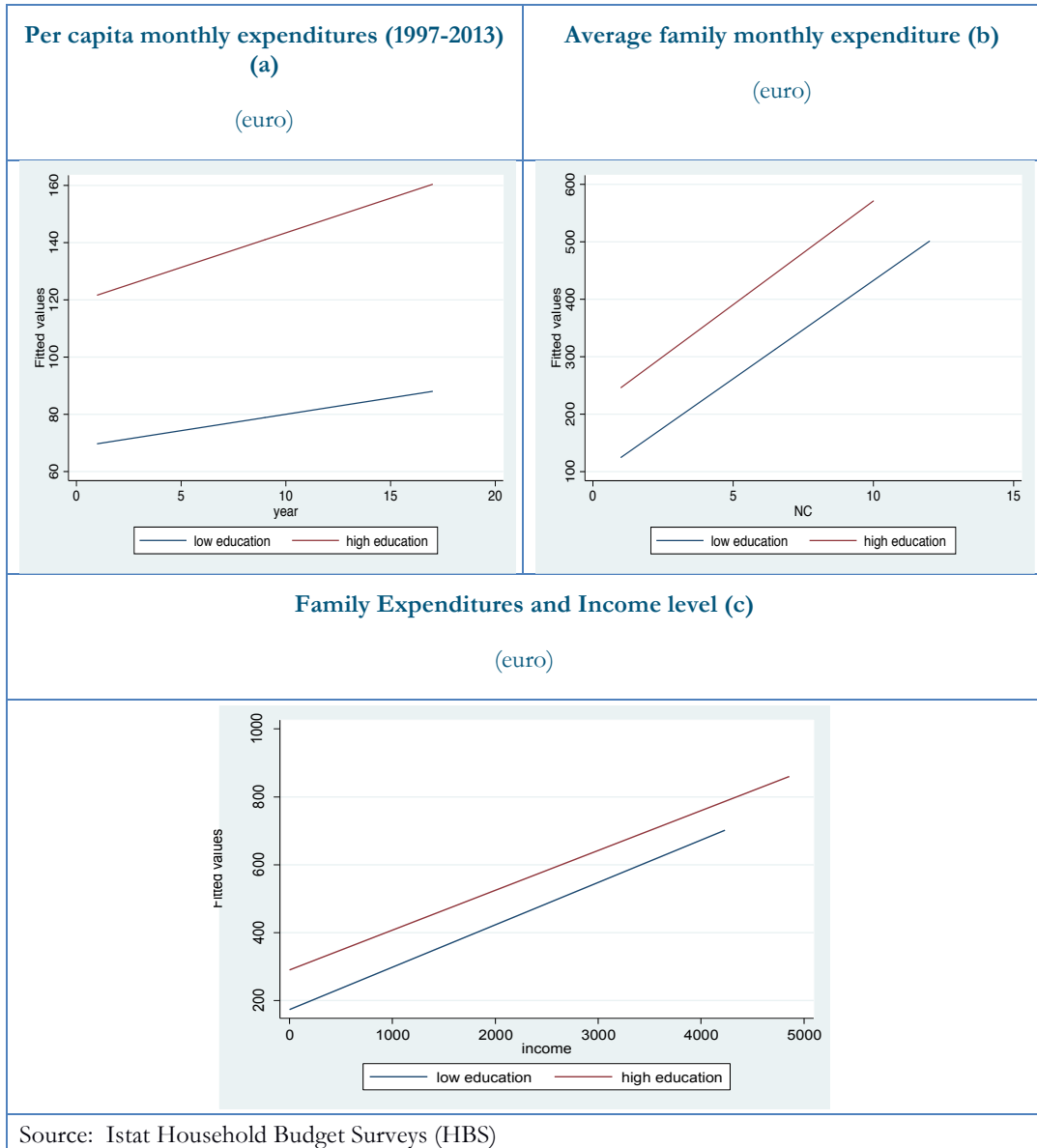
Figure 7.b shows relationship between monthly expenditures, educational level and family size. The average family's monthly expenditures increase with the number of components for skilled and not skilled families; for the same level of family size the average nominal monthly expenditures for high skilled families are almost 1/3 higher than the low skilled. As we show in the table A.2 the family size differs between the two groups.

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<sup>5</sup> We define as skilled families those for which the householder has at least a college degree.

Figure 7.c plots fitted values of families' monthly expenditures by income level. For the same income level the average expenditure for high skilled is always higher than for low skilled families.

Figure 7





## 11. High-tech and Low-tech Multiplier

To disentangle the average multiplier effect across sector we adopt the classification of manufacturing industries into categories based on the classification made by EUROSTAT. Using this classification we split the tradable sector in two groups of industries (Table 6).

Table 6

High-Medium High technology industries	Low-Medium Low technology industries
Aircraft and spacecraft	Building and repairing of ships and boats
Pharmaceuticals	Rubber and plastics products
Office, accounting and computing machinery	Coke, refined petroleum products and nuclear fuel
Radio, TV and communications equipment	Other non-metallic mineral products
Medical, precision and optical instruments	Basic metals and fabricated metal products
Electrical machinery and apparatus, n.e.c.	Manufacturing, n.e.c.; Recycling
Motor vehicles, trailers and semi-trailers	Wood, pulp, paper, paper products, printing and publishing
Chemicals excluding pharmaceuticals	Food products, beverages and tobacco
Railroad equipment and transport equipment, n.e.c.	Textiles, textile products, leather and footwear
Machinery and equipment, n.e.c.	
Source: OECD	

In order to convert the estimated elasticity in number of jobs we estimate the relative size between all non-tradable and high-tech tradable and all non-tradable and low-tech tradable<sup>6</sup>. In this set up the measures of the relative size of the non-tradable sector to tradable sector are the following.

$$rh = \frac{N_{1981}^{NT} + N_{1991}^{NT} + N_{2001}^{NT} + N_{2011}^{NT}}{N_{1981}^{Th} + N_{1991}^{Th} + N_{2001}^{Th} + N_{2011}^{Th}} \quad (4)$$

$$rl = \frac{N_{1981}^{NT} + N_{1991}^{NT} + N_{2001}^{NT} + N_{2011}^{NT}}{N_{1981}^{Tl} + N_{1991}^{Tl} + N_{2001}^{Tl} + N_{2011}^{Tl}} \quad (5)$$

---

<sup>6</sup> In this section we will present the results obtained excluding Rome and Milan from the sample As a robustness check the statistics for the full sample are reported in the appendix

## 12.High-tech and Low-tech Estimates

Table 7 reports the estimates of the average multiplier effect across high-tech and low-tech industries<sup>7</sup>.

Table 7

High and Low-tech Local Multiplier without Milan and Rome						
	High-tech			Low-tech		
	OLS	IV		OLS	IV	
		1st stage	2nd stage		1st stage	2nd stage
Δ jobs in tradable	0.016** (0.008)		0.061 (0.046)	0.132*** (0.032)		0.287 (0.867)
Instrument		34.003*** (6.088)			6.421* (3.472)	
Constant	0.270*** (0.007)	-0.584 (0.662)	0.196*** (0.042)	0.274*** (0.006)	-0.048*** (0.162)	0.285*** (0.064)
Year						
1991	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)
2001	-0.438*** (0.015)	-0.426*** (0.060)	-0.393 (0.029)	-0.453 (0.013)	0.020 (0.015)	-0.457** (0.023)
2011	0.048*** (0.010)	-0.503*** (0.056)	0.079 (0.024)	0.061*** (0.010)	-0.148*** (0.140)	0.087 (0.140)
LLM f.e.	YES	YES	YES	YES	YES	YES

Notes: The dependent variable is the proportional change in the number of jobs in the non-tradable sector. Census data. Robust and Clustered Standard errors in parenthesis. \* = p<0.10; \*\* = p<0.05; \*\*\* = p<0.01.

The instrumental variable estimates suggest that the average multiplier for high-tech workers is positive but not significant. The local employment multiplier for low-tech jobs also is not statistically significant.

When we considered the subsample of manufacturing LLM our results lightly change as Table 8 shows<sup>8</sup>.

<sup>7</sup> See also Table A3 of the appendix.

<sup>8</sup> See also Table A4 of the appendix.

Table 8

High and Low-tech Local Manufacturing Multiplier without Milan						
	High-tech			Low-tech		
	OLS	IV		OLS	IV	
		1st stage	2nd stage		1st stage	2nd stage
Δ jobs in tradable	0.026 (0.022)		0.101* (0.057)	0.151** (0.072)		-0.143 (0.336)
Instrument		57.769*** (8.643)			22.843*** (7.000)	
Constant	0.231*** (0.011)	0.374 (0.337)	0.207*** (0.020)	0.256*** (0.010)	-0.110 (0.116)	0.211*** (0.043)
Year						
1991	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)
2001	-0.332*** (0.017)	-0.057*** (0.053)	-0.317*** (0.021)	-0.345*** (0.015)	0.037*** (0.017)	-0.332 (0.021)
2011	0.034*** (0.011)	-0.216*** (0.050)	0.047*** (0.014)	0.058*** (0.018)	-0.153*** (0.020)	0.002*** (0.064)
LLM f.c.	YES	YES	YES	YES	YES	YES

Notes: The dependent variable is the proportional change in the number of jobs in the non-tradable sector. Census data. Robust and Clustered Standard errors in parenthesis. \* =  $p < 0.10$ ; \*\* =  $p < 0.05$ ; \*\*\* =  $p < 0.01$ .

A ten percent increase in the number of tradable high-tech jobs in a LLM is associated with a 1.0 percent increase in employment in non-tradable sector. Adding one additional job in tradable high-tech sector yields 0.7 jobs in the non-tradable sector. The multiplier for firms operating in low-tech sector is still not statistically different from zero.

High-tech industries tend to pay workers higher wages. A higher wage means a higher opportunity cost of time. Our result confirms the evidence that higher wage workers buying more goods and services can increase the employment level in the non-tradable sectors. These results are in line with the results proposed by Moretti and Moretti and Thulin for United States and Sweden;<sup>9</sup>

<sup>9</sup> Also J.J van Dijk challenged these results. Using a proper exogenous instrument these evidences disappear.

### 13. Additional robustness check

In this paragraph in order to test the sensitivity of our result to the time interval chosen we estimate the model using only data from 1991 to 2011.

Table 9

Manufacturing Local Multiplier 1991						
	LLM			Manufacturing LLM		
	OLS	IV		OLS	IV	
		1st stage	2nd stage		1st stage	2nd stage
$\Delta$ jobs in tradables	0.136** (0.063)		0.181 (0.711)	0.280* (0.150)		0.812 (3.451)
Instrument		-12.384*** (4.368)				
Constant	-0.096*** (0.001)	0.004 (0.201)	-0.099** (0.036)	-0.090*** (0.016)		-0.144 (0.350)
Year						
2001	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)		0 (omitted)
2011	0.516*** (0.018)	-0.208*** (0.016)	-0.525*** (0.097)	0.432*** (0.036)		0.556*** (0.800)
LLM f.e.	YES	YES	YES	YES	YES	YES
High and Low-tech Local Manufacturing Multiplier 1991						
	High-tech			Low-tech		
	OLS	IV		OLS	IV	
		2nd stage			2nd stage	
$\Delta$ jobs in tradable	0.034 (0.040)		0.188** (0.103)	0.232** (0.128)		-0.801 (2.082)
Instrument		47.427*** (10.046)			13.663 (12.856)	
Constant	0.072*** (0.007)	0.455 (0.375)	-0.118 (0.033)	0.064*** (0.009)	0.007 (0.151)	-0.057** (0.019)
Year						
2001	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)
2011	-0.366*** (0.019)	-0.144*** (0.053)	0.366 (0.022)	-0.422*** (0.032)	-0.208*** (0.030)	-0.180 (0.481)
LLM f.e.	YES	YES	YES	YES	YES	YES
Notes: The dependent variable is the proportional change in the number of jobs in the non-tradable sector. Census data. Robust Clustered Standard errors in parenthesis. * = p<0.10; ** = p<0.05; *** = p<0.01. Milan is out of the sample.						

Table 9 shows that our results slightly change. The average multiplier and manufacturing multiplier local effect are still not different from zero. In the high-tech sector adding one additional tradable job yields 1.2 jobs in the non-tradable sector. The multiplier for firms operating in low-tech sector is still not statistically different from zero.

## 14. Conclusion

In this work we focus on the local multiplier as proposed by Moretti (2010), paying particular attention to the workers consumption choices behind the idea of that mechanism. As J.J. van Dijk (2014) has already pointed out, Moretti estimates for U.S. suffer of overestimation due to an endogeneity problem in the proposed instrument. Using a proper, exogenous, instrument, van Dijk shows that the local U.S. multiplier is 1.02 and not 1.6; this means that for each job in the tradable sector a U.S. city is able to attract, another job is created in the non-tradable sector in the same city. Even if less strong, the effect is still positive and statistically significant. Replicating the analysis for Italy we have found different results. As we have already pointed out, in the first part of this work, there are many possible reasons that can contribute to explaining these differences. We believe that in the baseline model the absence of a positive local multiplier effect can be explained by focusing on excess of regulation, low labor mobility, the rigidity of housing supply and others Italian peculiarities. In Italy the greater burdens of regulation, as compared to other European Countries and to the U.S., may limit the possibility for service activities to start up quickly and in proximity to new demand. The magnitude of the local multiplier also depends largely on the elasticity of labor supply at the local level. This evidence implies that for countries with a lower labor mobility the local employment effect could be weaker. Different studies also have already underlined the relevance of the Italian "familistic" welfare system for labor mobility. All these intuitions can contribute to explain our general results.

In fact, when we take into account industries' technology levels, our results change in a substantive way. More specifically, the multiplier effect is positive and significant for high-tech traded jobs. Adding a high-tech job to the traded sector of a local labor market area results in the creation of 0.7 additional jobs in the non-traded sector. Our evidences are stronger for the period 1991-2011. These findings suggest that the employment opportunities of workers in local non-tradable sectors depend mainly on the demand of high-tech employers. These findings have important policy implications for local

development policies. In order to increase the level of local employment, in the short run, regional policies should target employers demanding relatively more workers with high levels of human capital. Moreover, in general, our former results highlight the necessity for local development policies to reduce the burden of regulation, improve labor mobility and promote education.

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## 1. Appendix

Table A1

Per capita monthly expenditures (1997-2013) (euro)		
Year	High Skilled	Low Skilled
1997	106	61
1998	98	60
1999	99	58
2000	96	61
2001	103	64
2002	101	63
2003	113	66
2004	108	68
2005	118	72
2006	116	70
2007	117	73
2008	118	71
2009	117	70
2010	115	71
2011	118	71
2012	115	67
2013	116	63

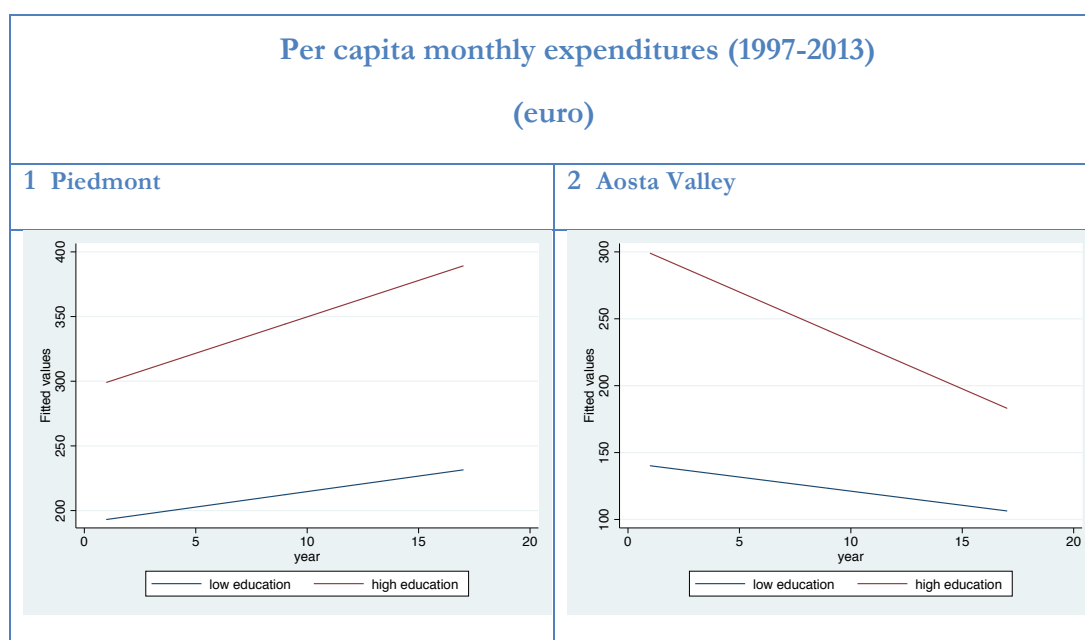
Source: Istat Household Budget Surveys (HBS)

Table A2

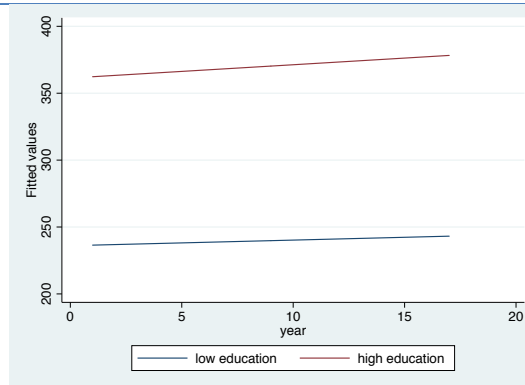
Average family monthly expenditure (euro)		
Number of Component	High Skilled	Low Skilled
1	114	-
2	262	153
3	296	205
4	331	235
5	331	220
6	335	215
7	374	210
8	488	220
9	198	295
10	-	197
11	-	245
12	-	311

Source: Istat Household Budget Surveys (HBS)

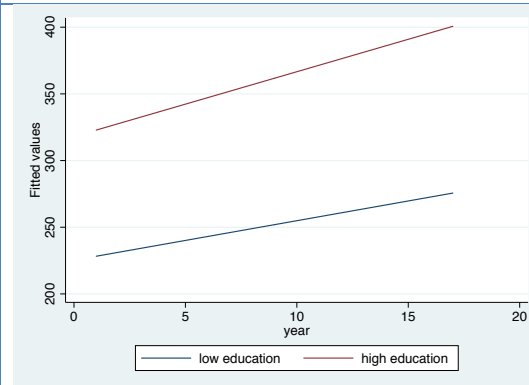
Figure A1



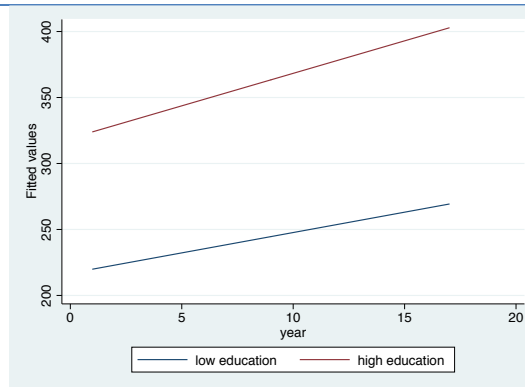
### 3 Lombardy



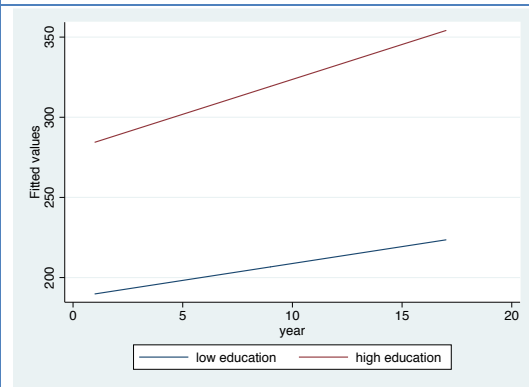
### 4 Trentino-Alto Adige/Südtirol



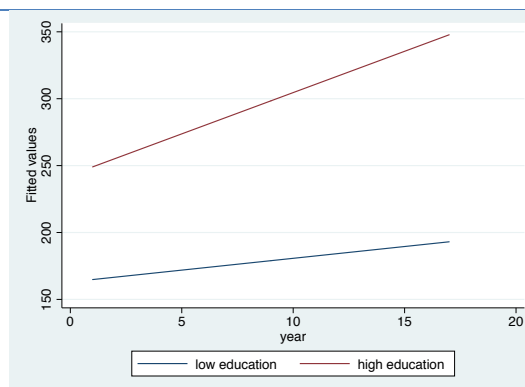
### 5 Veneto



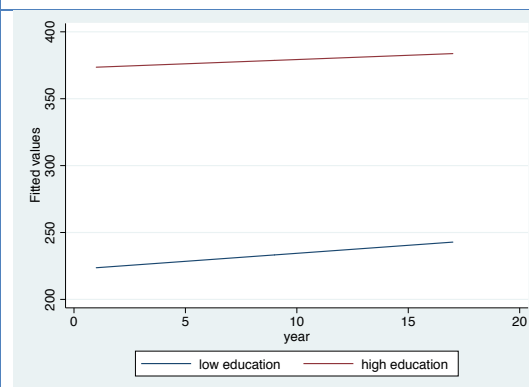
### 6 Friuli-Venezia Giulia

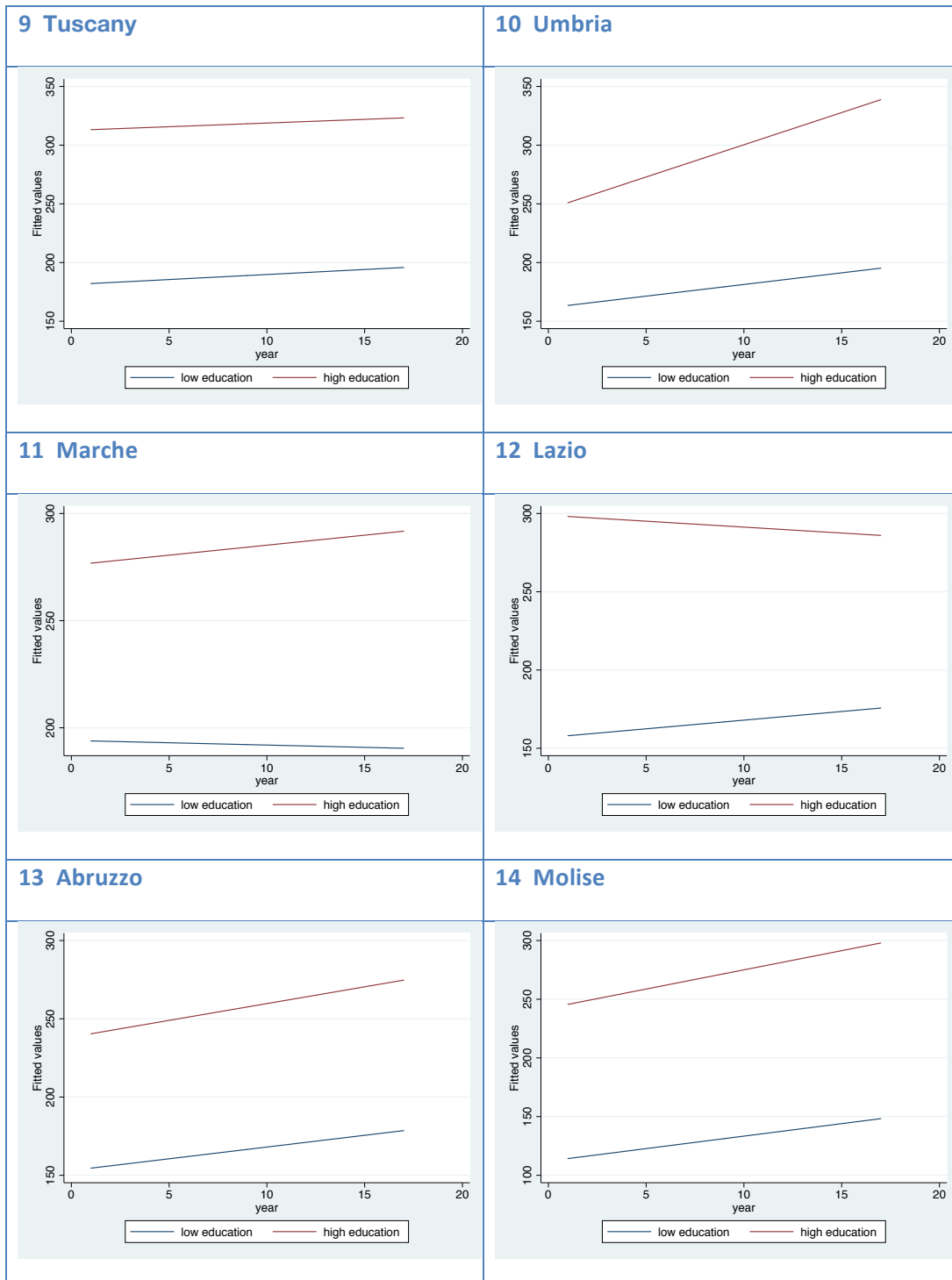


### 7 Liguria



### 8 Emilia-Romagna





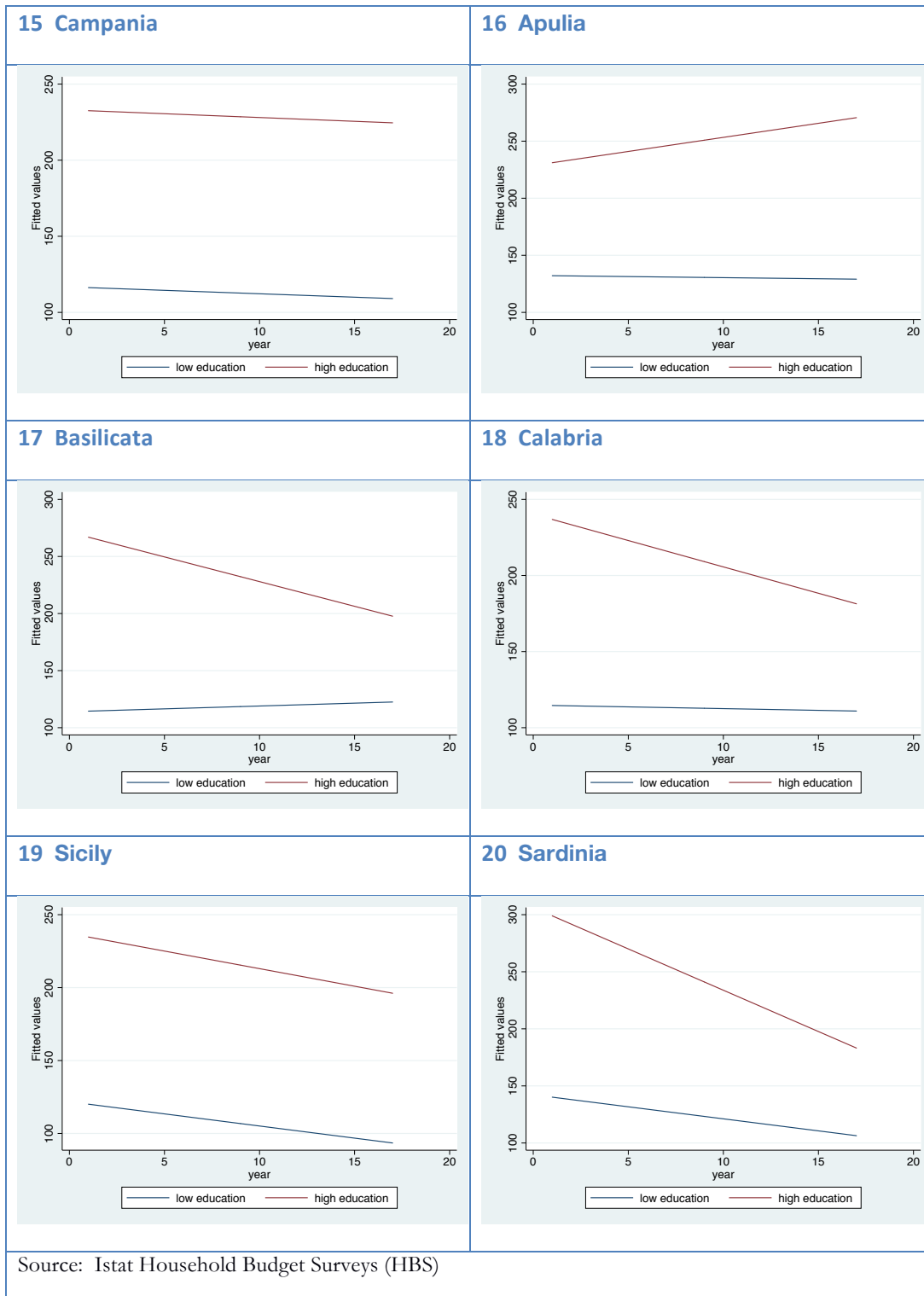


Table A3

High and Low-tech Local Multiplier						
	High-tech			Low-tech		
	OLS	IV		OLS	IV	
		1st stage	2nd stage		1st stage	2nd stage
Δ jobs in tradables	0.016** (0.008)		0.062 (0.046)	0.132*** (0.032)		0.279 (0.862)
Instrument		33.976*** (6.078)			6.461* (3.466)	
Constant	0.270*** (0.007)	-0.584 (0.667)	0.196*** (0.043)	0.274*** (0.006)	-0.048*** (0.163)	0.2854** (0.064)
Year						
1991	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)
2001	-0.437*** (0.015)	-0.425*** (0.060)	-0.391 (0.029)	-0.452 (0.013)	0.020 (0.015)	-0.456** (0.024)
2011	0.048*** (0.010)	-0.501*** (0.056)	0.079 (0.024)	0.061*** (0.010)	-0.148*** (0.140)	0.085 (0.140)
LLM f.e.	YES	YES	YES	YES	YES	YES

Notes: The dependent variable is the proportional change in the number of jobs in the non-tradable sector. Census data. Robust and Clustered Standard errors in parenthesis. \* =  $p < 0.10$ ; \*\* =  $p < 0.05$ ; \*\*\* =  $p < 0.01$ .

Table A4

High and Low-tech Local Manufacturing Multiplier						
	High-tech			Low-tech		
	OLS	IV		OLS	IV	
		1st stage	2nd stage		1st stage	2nd stage
Δ jobs in tradables	0.026 (0.022)		0.101* (0.057)	0.151** (0.072)		-0.145 (0.335)
Instrument		57.749*** (8.628)			22.947*** (6.990)	
Constant	0.231*** (0.011)	0.374 (0.336)	0.207*** (0.020)	0.260*** (0.010)	-0.110 (0.116)	0.211*** (0.043)
Year						
1991	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)	0 (omitted)
2001	-0.331*** (0.017)	-0.057*** (0.053)	-0.316*** (0.021)	-0.344*** (0.015)	0.038*** (0.017)	-0.331 (0.021)
2011	0.035*** (0.011)	-0.216*** (0.050)	0.048*** (0.014)	0.058*** (0.018)	-0.152*** (0.020)	0.002*** (0.064)
LLM f.c.	YES	YES	YES	YES	YES	YES

Notes: The dependent variable is the proportional change in the number of jobs in the non-tradable sector. Census data. Robust and Clustered Standard errors in parenthesis. \* = p<0.10; \*\* = p<0.05; \*\*\* = p<0.01.