Giulio Cainelli, Roberto Ganau and Anna Giunta

Spatial agglomeration, global value chains, and productivity: micro-evidence from Italy and Spain

Article (Accepted version) (Refereed)

Original citation:
Cainelli, Giulio and Ganau, Roberto and Giunta, Anna (2018) *Spatial agglomeration, global value chains, and productivity: micro-evidence from Italy and Spain*. Economics Letters. ISSN 0165-1765 (In Press)
DOI: 10.1016/j.econlet.2018.04.020

Accepted Manuscript

Spatial agglomeration, global value chains, and productivity.
Micro-evidence from Italy and Spain

Giulio Cainelli, Roberto Ganau, Anna Giunta

PII: S0165-1765(18)30149-6
DOI: https://doi.org/10.1016/j.econlet.2018.04.020
Reference: ECOLET 8019

To appear in: *Economics Letters*

Received date : 8 January 2018
Revised date : 13 April 2018
Accepted date : 18 April 2018

Spatial Agglomeration, Global Value Chains, and Productivity. Micro-Evidence from Italy and Spain

Highlights:

- We analyze the agglomeration-productivity nexus for firms in Italy and Spain.
- We account for firms' heterogeneity in Global Value Chain positioning.
- We find that agglomeration affects positively only suppliers' labor productivity.
- This effect is quite robust because it holds for both Italian and Spanish firms.

Spatial Agglomeration, Global Value Chains, and Productivity. Micro-Evidence from Italy and Spain

Giulio Cainelli

Department of Economics and Management "Marco Fanno", University of Padua

Via del Santo 33, 35123 Padova, Italy

E-mail: giulio.cainelli@unipd.it

Roberto Ganau*

Department of Economics and Management "Marco Fanno", University of Padua

Via del Santo 33, 35123 Padova, Italy

Tel: (0039) 0498274227 - Fax: (0039) 0498274221 - E-mail: roberto.ganau@unipd.it

Department of Geography and Environment, London School of Economics and Political Science

Houghton Street, London WC2A 2AE, United Kingdom

E-mail: r.ganau1@lse.ac.uk

Anna Giunta

Department of Economics and Manlio Rossi-Doria Centre for Economic and Social Research,

Roma Tre University

Via Silvio D'Amico 77, 00145 Roma, Italy

E-mail: anna.giunta@uniroma3.it

Abstract: We investigate the relationship between spatial agglomeration and firms' labor productivity in Italy and Spain, examining firm-level heterogeneity in Global Value Chain positioning. We analyze a sample of 4,025 manufacturing firms during the period from 2010 to 2014 and employ a shift-share instrumental variable approach. We find that agglomeration has a positive effect on labor productivity for suppliers but not for final firms.

Keywords: Agglomeration; Firm Productivity; Global Value Chain; Italy; Spain.

JEL Codes: C26; D24; F61; L23; R12.

* Corresponding author.

Spatial Agglomeration, Global Value Chains, and Productivity. Micro-Evidence from Italy and Spain

Giulio Cainelli

Department of Economics and Management "Marco Fanno", University of Padova, Italy

Roberto Ganau*

Department of Economics and Management "Marco Fanno", University of Padova, Italy

Department of Geography and Environment, London School of Economics and Political Science , United Kingdom

Anna Giunta

Department of Economics and Manlio Rossi-Doria Centre for Economic and Social Research, Roma Tre University, Italy

Abstract: We investigate the relationship between spatial agglomeration and firms' labor productivity in Italy and Spain, examining firm-level heterogeneity in Global Value Chain positioning. We analyze a sample of 4,025 manufacturing firms during the period from 2010 to 2014 and employ a shift-share instrumental variable approach. We find that agglomeration has a positive effect on labor productivity for suppliers but not for final firms.

Keywords: Agglomeration; Firm Productivity; Global Value Chain; Italy; Spain.

JEL Codes: C26; D24; F61; L23; R12.

* Corresponding author: Roberto Ganau, Department of Economics and Management "Marco Fanno", University of Padova, Via del Santo 33, 35123 Padova, Italy; Tel: (0039) 0498274227; Fax: (0039) 0498274221; E-mail: roberto.ganau@unipd.it. Department of Geography and Environment, London School of Economics and Political Science, Houghton Street, London WC2A 2AE, United Kingdom; E-mail: r.ganau1@lse.ac.uk.

1. Introduction

The economics literature suggests that spatial agglomeration increases firm productivity and attributes this effect to mechanisms such as labor market pooling, input sharing, and knowledge spillovers, which help to lower production costs and thus improve performance (Puga and Duranton, 2004).

We contribute to this literature in two ways: (i) by comparing two southern European countries, Italy and Spain, where the geographical concentration of production is quite significant (Cainelli 2008; Boix, 2009) and (ii) by considering firm heterogeneity in Global Value Chain (GVC) positioning. The term GVC refers to the current fragmentation of production, via which production stages are allocated to different firms in different countries (Amador and di Mauro, 2015). Both Italy and Spain are deeply involved in GVCs (OECD, 2012). The heterogeneity of firms – the co-existence of firms that differ in size, productivity, and technology – is a feature common to many agglomerated areas (Wang, 2015). Firms with different characteristics differ in their capability to absorb local externalities, which affects the impact of agglomeration on productivity (Cainelli and Ganau, 2017).

We further qualify this evidence by considering firm heterogeneity in GVC positioning within the "agglomeration-productivity" perspective. We distinguish between final firms, i.e., producers that serve end markets, and suppliers, which sell to other firms. This distinction is relevant for several reasons. First, suppliers are generally described as suffering from a productive discount in comparison with final firms, which operate in the most highly rewarding GVC stages (Razzolini and Vannoni, 2011). Second, suppliers make up the bulk of the industrial structure in several countries, Italy and Spain among them.

We estimate the impact of spatial agglomeration on labor productivity in Italian and Spanish manufacturing firms by accounting for their heterogeneity in GVC positioning. The results support our theory because there is evidence of differential effects that are determined by firm position within GVCs.

2. Data and methodology

2.1. The data

We employ firm-level data drawn from the EFIGE dataset (Bruegel) and the Amadeus database (Bureau Van Dijk). We cleaned the EFIGE sample to include only active manufacturing firms located in Italy and Spain. In order to determine firms' GVC positioning, we used the available information on produced-to-order goods (Agostino et al., 2015; Accetturo and Giunta, 2016), thus classifying a firm as a supplier if it sold produced-to-order goods exclusively to other firms and as a final producer if it served end markets. We then integrated EFIGE's balance-sheet data on value added and employment with updated data drawn from Amadeus. Finally, we excluded firms without information at geographical level 3 of the *Nomenclature des Unités Territoriales Statistiques* (NUTS).

We obtained a panel of 2,235 Italian and 1,790 Spanish firms reporting strictly positive values for value added and employment for at least three consecutive years between 2010 and 2014. A detailed description of the data and the final sample is available in Online Appendix A.

2.2. Econometric modeling

We model the relationship between agglomeration and firm labor productivity as follows:

$$\log(LP_{ipct}) = \alpha + \beta \log(Agglomeration_{pct}) + \sum_{k=1}^{K}(\gamma_k X_{ipct}^k) + \delta_i + \zeta_t + \varepsilon_{ipct} \quad (1)$$

where LP_{ipct} is the labor productivity (deflated value added per employee) of firm i in province p in country c at time t.

The term $Agglomeration_{pct}$ captures the density of local units (LU) operating in the manufacturing and knowledge-intensive business services (KIBS) sectors. It serves as a proxy for agglomeration forces arising from the local availability of economic actors in sectors with which manufacturing firms are likely to interact through both market transactions and knowledge spillovers. The variable is defined as follows (Ciccone and Hall, 1996; Ciccone, 2002):

$$Agglomeration_{pct} = \frac{\sum_{g=1}^{G} LU_{gpct}}{Surface_{pc}} \tag{2}$$

where $g = 1, \dots, G$ denotes the two-digit manufacturing and KIBS sectors. The data on LUs are taken from the ASIA archive (Istat, Italy) and the *Directorio Central de Empresas* (INE, Spain). The data on land area are taken from Eurostat.

The vector X_{ipct}^{k} is comprised of firm-specific, log-transformed variables for size (number of employees) and age (year of observation minus year of incorporation). The terms δ_i and ζ_t capture fixed effects (FEs) for firm and time, respectively, and ε_{ipct} is the error term. For descriptive statistics, see Online Appendix B.

Equation (1) is estimated based on the entire sample to determine whether agglomeration boosts firm productivity overall, as well as on the two sub-samples of final firms and suppliers to test for heterogeneity in terms of GVC positioning.

The FE estimator overcomes omitted-variable problems, but the density variable may experience endogeneity due to the reverse causality between agglomeration and productivity

(Graham et al., 2010). Accordingly, we employ a two-stage least squares (TSLS) estimator.

We adopt a shift-share approach à la Bartik (1991). The instrumental variable (IV) considers the two-digit sector shares of LUs at the province level at time $T = 2007$, generally identified as a pre-crisis year, and sector-specific national changes over the period $t - T$, with $t = 2010, \dots, 2014$, to instrument our agglomeration variable.

The rationale for this is that each province experienced a change in its industrial structure over the period $t - T$ that is proportional to its pre-crisis configuration in the absence of province-specific shocks induced by the Great Recession. Thus, the identification strategy relies on the pre-crisis composition of the local industrial structure, together with sector-specific national changes during the crisis, to exploit the geographical heterogeneity, in terms of firm demography, induced by the Great Recession. The idea is that provinces in which the pre-crisis industrial structure was more heavily dependent on those sectors that were more exposed to international markets and thus more likely to be affected by the Great Recession could have experienced a deeper process of local industrial re-configuration during the crisis, influencing the province-specific agglomeration structure.

The exogeneity of the IV is strengthened by excluding the province-specific contribution to national changes (Faggio and Overman, 2014), using lagged shares (de Blasio *et al.*, 2016) and defining the nationwide shocks with respect to pre-crisis conditions so as not to impose time constraints on the processes of industrial re-configuration. The IV is constructed as follows:

$$IV_{pct} = \sum_{g=1}^{G} \left\{ \left(\frac{LU_{gpcT}}{\sum_{g=1}^{G} LU_{gpcT}} \right) \times \left[\log\left(LU_{g(-p)ct}\right) - \log\left(LU_{g(-p)cT}\right) \right] \right\} \tag{3}$$

where all terms are defined as above.

3. Results and discussion

Panel A in Table 1 reports the FE estimation coefficients of the agglomeration variable. As seen in Columns (1) to (3), agglomeration is positively associated with firm-level labor productivity, and the estimated coefficient for suppliers is much higher than that for final firms. However, a more detailed analysis of the sample, broken down by both firm type and country, indicates that agglomeration economies accrue only to supplier firms. In particular, the estimated coefficient is 0.51 for Italian suppliers, while it is 0.84 for Spanish suppliers.

Panel B reports the FE-TSLS results. Firstly, the first-stage F-statistics for the IV are higher than the conservative cut-off value of 10. Secondly, the results confirm and reinforce the previous findings, that is, only suppliers obtain a productivity gain from spatial agglomeration. In particular, a 1% increase in local agglomeration leads to a 2.30% increase in Italian and a 2.33% increase in Spanish suppliers' productivity.

[--- Table 1 ---]

The results suggest three interesting economic interpretations. First, firms located within more highly agglomerated areas appear to differ in their capability to absorb local externalities. This implies a more complex relationship between agglomeration and firm-level productivity, which can be better understood by taking the different forms of firm heterogeneity into account. Second, a direct link between agglomeration and productivity is found only for supplier firms, i.e., the relatively weak type of firm operating within GVCs. This is an important result in the era of production globalization because a lack of positive agglomeration externalities, in tandem with relatively small operational size, can be expected to increase the probability of suppliers exiting the market. Third, our evidence indicates that the effect of agglomeration on final firms is most likely only indirect; i.e., it stems from vertical relationships between suppliers and final firms within the agglomerated area. More efficient local suppliers may transfer a part of their agglomeration benefits to final firms, thus boosting the aggregate productivity of the local system and impeding further territorial dis-embeddedness.

4. Conclusions

This paper contributes to the literature on spatial agglomeration by investigating its effect on firm labor productivity in Italy and Spain, particularly by considering firms heterogeneity in GVC positioning as a factor. We find that in both countries, agglomeration results in a productivity benefit only for supplier firms. The effect for final firms is negligible. These results support earlier theory and confirm previous empirical evidence suggesting that firm-level heterogeneity is a significant factor in the economic returns of agglomeration externalities.

Acknowledgements

We would like to thank the editor in charge, Badi H. Baltagi, and two anonymous reviewers for suggestions and recommendations that have helped to improve the article. The article has also benefited from the comments of participants at the 5th Workshop on Global Value Chains (Roma Tre University). The usual disclaimers apply.

References

Accetturo, A., Giunta, A., 2016. Value chains and the Great Recession: Evidence from Italian and German firms. Questioni di Economia e Finanza, No. 304, Bank of Italy, Rome.

Agostino, M., Giunta, A., Nugent J. B., Scalera, D., Trivieri, F., 2015. The importance of being a capable supplier: Italian industrial firms in Global Value Chains. *Int. Small. Bus. J.* 33, 708–730.

Amador, J., di Mauro, F., 2015. *The Age of Global Value Chains: Maps and policy issues*, VOX, CEPR's Policy Portal, e-Book, CEPR Press.

Bartik, T.J., 1991. Who benefits from state and local economic development policies? W.E. Upjohn Institute for Employment Research, Kalamazoo, MI.

Boix, R., 2009. The empirical evidence of industrial districts in Spain, in: Becattini, G., Bellandi, M, De Propis, L. (Eds.), *A Handbook of Industrial Districts*. Edward Elgar, Cheltenham, pp. 343–359.

Cainelli, G., 2008. Industrial districts. Theoretical and empirical insights, in: Karlsson, C. (Ed.), *Handbook of Research on Cluster Theory*. Edward Elgar, Cheltenham, pp. 189–202.

Cainelli, G., Ganau, R., 2017. Distance-based agglomeration externalities and neighbouring firms' characteristics. *Reg. Stud.* DOI: 10.1080/00343404.2017.1360482.

Ciccone, A., 2002. Agglomeration effects in Europe. *Eur. Econ. Rev.* 46, 213–227.

Ciccone, A., Hall, R.E., 1996. Productivity and the density of economic activity. *Am. Econ. Rev.* 86, 54–70.

de Blasio, G., Maggio, G., Menon, C., 2016. Down and out in Italian towns: Measuring the impact of economic downturns on crime. *Econ. Lett.* 146, 99–102.

Faggio, G., Overman, H., 2014. The effect of public sector employment on local labour markets. *J. Urban Econ.* 79, 91–107.

Graham, D.J., Melo, P.C., Jiwattanakulpaisarn, P., Noland, R.B., 2010. Testing for causality between productivity and agglomeration economies. *J. Regional Sci.* 50, 935–951.

OECD, 2012. *Mapping Global Value Chains*. OECD Publishing, Paris.

Puga, D., Duranton, G., 2004. Micro-foundations of urban agglomeration economies, in:

Henderson, J.V., Thisse, J.F. (Eds.), *Handbook of Regional and Urban Economics*, 4. Elsevier, North-Holland, pp. 2063–2117.

Razzolini, T., Vannoni, D., 2011. Export premia and subcontracting discount: Passive strategies and performance in domestic and foreign markets. *World Econ.* 34, 984−1013.

Wang, C.C., 2015. Geography of knowledge sourcing, search breadth and depth patterns, and innovative performance. A firm heterogeneity perspective. *Environ. Plan. A.* 47, 744−761.

Table 1: Agglomeration and firm-level productivity.

Country	Italy and Spain			Italy			Spain		
GVC Positioning	Whole Sample	Final Firms	Suppliers	Whole Sample	Final Firms	Suppliers	Whole Sample	Final Firms	Suppliers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: FE Estimates									
$\log(\text{Agglomeration}_{pct})$	1.010***	0.662**	1.060***	0.432*	0.227	0.505*	0.706***	0.505	0.836**
	(0.215)	(0.316)	(0.255)	(0.258)	(0.633)	(0.276)	(0.256)	(0.358)	(0.366)
F Statistic [p-value]	43.14 [0.000]	23.98 [0.000]	38.17 [0.000]	39.58 [0.000]	11.46 [0.000]	32.78 [0.000]	27.89 [0.000]	23.34 [0.000]	38.17 [0.000]
Panel B: FE-TSLS Estimates									
$\log(\text{Agglomeration}_{pct})$	2.457**	1.445	2.425**	2.184**	0.223	2.295**	2.479***	0.940	2.329***
	(1.158)	(1.627)	(1.147)	(0.979)	(0.944)	(1.130)	(0.759)	(0.758)	(0.832)
F Statistic [p-value]	41.41 [0.000]	24.50 [0.000]	32.95 [0.000]	39.32 [0.000]	15.82 [0.000]	31.65 [0.000]	17.59 [0.000]	20.34 [0.000]	11.48 [0.000]
First-stage F Statistic [p-value]	33.16 [0.000]	14.72 [0.000]	36.15 [0.000]	30.00 [0.000]	63.75 [0.000]	30.93 [0.000]	73.39 [0.000]	23.76 [0.000]	77.19 [0.000]
Observations	18,757	4,004	14,753	10,182	1,346	8,836	8,575	2,658	5,917
Firms	4,025	851	3,174	2,235	297	1,938	1,790	554	1,236

Notes: * p<0.1; ** p<0.5; *** p<0.01. Standard errors (in parentheses) are clustered at the province level. All specifications include firm-level controls, firm FEs, and time FEs.

The Online Appendix A presents a description of the original data, the cleaning procedure, as well as a series of descriptive statistics on the structure of the sample. The Online Appendix B presents descriptive statistics and the correlation matrix of the variables used in the empirical analysis.