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DISCUSSION PAPER 21

Agglomeration Economies, Globalization and Productivity

Firm level evidence for Slovenia

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Agglomeration Economies, Globalization and Productivity: Firm level evidence for Slovenia

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Abstract

This paper analyzes the impact of agglomeration economies on firm level performance measured by total factor productivity for Slovenia. To estimate total factor productivity, we use a control function approach to capture endogenous input choices and self selection. In contrast to most of the literature, we introduce agglomeration economies that are linked to globalization. In particular, we distinguish between knowledge spillovers related to domestic and foreign sources of agglomeration effects and analyze the impact of regional export market exposure, which we call international market access. We find positive effects of regional knowledge spillovers and international market access on firm level total factor productivity. These effects are stronger for micro and small firms and for firms operating in service sectors. We also show that knowledge spillovers are amplified when there are more foreign multinationals in a region.

JEL: R10, R15

Key words: total factor productivity, agglomeration economies, globalization

1. Introduction

The riddle of unequal spatial development both within countries and across the world has drawn increased attention from policy makers in recent years[1]. The economic geography literature attributes the regional concentration of economic activity to a delicate trade-off between agglomeration forces and dispersion forces[2]. Agglomeration forces emerge for a number of reasons. Firms want to locate in large markets, close to customers, to reduce trade costs. But by locating in a large market, they make the market larger because workers spend their wages locally, firms buy from each other, etc. In addition, positive knowledge spillovers can occur due to regional specialization when firms operating in the same sector locate close to each other. This is what is usually called Marshallian externalities and is mostly measured by the size of labor pooling in a region or a sector within a region. Apart from these regional Marshallian externalities, there could also emerge agglomeration economies because of strong local demand. Firms want to be close to customers, which results in higher demand. This in turn increases wages of local workers, which amplifies the effect of regional externalities (Krugman, 1991).

However, due to the lack of good data sets, the new economic geography literature has remained rather a theoretical concept, with only a small, but growing, number of papers that have attempted to measure the impact of agglomeration economies. For instance, Glaeser et al. (1992) analyze the growth of cities, Ciccone and Hall (1996) measure productivity premia by regressing regional value added on employment density for U.S. states, and Ciccone (2002) performs a similar exercise for the European NUTS2 regions. Combes (2000) shows how local economic structure (specialization, diversity and degree of competition) influences regional employment growth. Cingano and Schivardi (2004) on the other hand, argue that using regional employment growth results in an identification problem, as the underlying assumption of exogeneity of changes in labor supply as a reaction to changes in local conditions is unlikely to hold. Therefore, the authors use regional TFP to avoid this issue. Also Combes, Duranton and Gobillon (2010) point out the econometric difficulty of identifying agglomeration economies and propose a number of solutions. Brülhart and Mathys (2008), for instance, extend the work of Ciccone (2002) by introducing dynamics, which allows them to identify and estimate long-run effects. Most of these papers find evidence for positive agglomeration economies, in particular, a doubling of the agglomeration variables is associated with an increase in regional productivity or wages of between 1 to 13 percent.

[1] For instance, the World Development Report of 2009 was entirely devoted to the role of economic geography and the unequal spatial development within the European Union has been at the basis of the European Commission structural fund program.

[2] For an excellent overview of the theoretical models see Combes, Mayer and Thisse (2008).

Largely overlooked in this literature, however, has been the role of globalization in measuring agglomeration economies. For instance, the literature on foreign direct investment (FDI) has demonstrated important technological and knowledge spillovers to domestic firms from the presence of foreign firms (e.g. Javorcik, 2004; Aitken and Harrison, 1999; Damijan et al, 2003).

FDI can also be shown to contribute to faster adjustment of relative regional production (and wages) in regions more heavily affected by trade liberalization. The new economic geography literature represented by two workhorse models by Krugman (1991) and Krugman & Venables (1995) predicts that after a small country liberalizes trade international agglomeration forces reinforced by low trade cost will lead to a shift of the production from the small to a large country. Similarly, in order to optimize the production capacities according to the changed trade cost, within a country production facilities will move either to the central region or to the border region with a big country. This was empirically confirmed by Hanson (1997) for Mexico, who demonstrates that after the NAFTA Mexico city and maquiladoras at the US border gained in terms of production concentration. The Krugman (1991) model assumes perfect labor mobility, which leads to a monotonic shift of production away from the periphery. The Krugman & Venables (1995) model, however, assumes imperfect labor mobility leading to a kind of U-shaped evolution of regional production concentration. Specifically, after a certain point wages in the periphery fall enough, which makes the periphery more attractive for firms in the core region and leads to attracting back some of the production facilities. Damijan and Kostevc (2011) demonstrate this pattern for five new EU member states. FDI inflows, are attracted to harmed poor regions due to low labor costs, which led to a reversal of the international agglomeration forces after trade liberalization took place in the new EU member states. This led to regional convergence in terms of economic activity and relative regional wages within the European Union. Thus the stronger the presence of foreign affiliates in a region, the stronger will be knowledge spillovers for firms clustered in a region. In a large region, a bigger presence of FDI amplifies the agglomeration effects, while in a smaller region this may work against the international agglomeration forces.

Likewise, recent work analyzing the effects of firm level trade on productivity suggests that there are learning effects, reflected in higher productivity premia from exporting (e.g. Bernard et al, 1999; De Loecker,2007; ISGEP, 2007). Firms that are regionally clustered may therefore benefit more from such export externalities, which could be due to sharing of common infrastructure and due to common input-output linkages among firms sharing the same specialized suppliers' networks. Market access through exports does not only generate learning effects, but international trade also allows firms to have access to larger markets, which implies that regional agglomeration economies may be amplified through international market access. Two opposing effects can result. If export markets are important, the local market becomes less important, which would work against regional clustering. In contrast, strong export demand can also raise wages of workers locally, which in turn strengthens local demand and hence this is strengthening agglomeration economies.

This paper contributes to the emerging empirical literature that attempts to identify and measure agglomeration economies in a number of ways. First, we make a distinction between knowledge spillovers emerging from domestic firms versus those that emerge from foreign firms. It is often claimed that multinational companies (MNCs) have access to better technology and know-how and therefore knowledge spillovers are more likely to emerge when there are more MNCs in a region (e.g. Javorcik, 2004). Second, we analyze how regions that are characterized by firms with more export market exposure may benefit more from export activity through learning spillovers. In this context we explore whether market access through export markets generates additional agglomeration economies at the firm level. Third, we analyze the impact of agglomeration economies according to firm size, to capture heterogeneous firm responses. A final contribution lies in the empirical methodology that we develop. In particular, we estimate total factor productivity using a control function approach, which allows us to control for the endogeneity of input choices and self selection.

The rest of the paper is structured as follows. In the next section we discuss the empirical methodology, the agglomeration measures and describe the data. Section 3 provides the results. We conclude in section 4.

2. Empirical Approach and Data

2.1. Empirical approach and measurement

We will analyze the impact of agglomeration economies using a firm-level productivity approach. In a first stage, firm-level total factor productivity is estimated, while in a second stage we analyze how agglomeration economies may affect firm level total factor productivity.

As is mostly done, we assume a simple Cobb-Douglas log-linear value added production function and use as an estimation method the algorithm developed by Levinsohn and Petrin (2003), which builds further on Olley and Pakes (1996). While this approach allows us to control for the endogeneity of the input decisions of firms that are potentially affected by agglomeration economies, it does not capture potential selection effects in terms of initial location of firms. However, in the second stage of our analysis we control for firm fixed effects, which is one way to correct for initial location selection effects[3].

In the first stage of our approach we estimate production functions for each 2-digit NACE sector separately. This allows us to take into account that different sectors face different factor shares emedded in the technology they use. Total factor productivity of a firm is then defined as the estimated residual term in the production function, i.e. the variation in firm level output not explained by the variation in its input factors. We follow Levinsohn and Petrin (2003) and estimate a standard Cobb-Douglas value added production function or:

$$y_{it} = \beta_0 + \beta_1 l_{it} + \beta_2 k_{it} + \omega_{it} + \varepsilon_{it} \quad (1)$$

where y stands for the log of (deflated) value added of firm i at time t, net of intermediate inputs (m), l represents the log of firm level employment, k is the log of (deflated) tangible fixed assets. The error has two components, the transmitted productivity component(ω) and ε that is uncorrelated with input choices. Employment (l) is considered as a freely variable input, while capital is a state variable and hence, just like the productivity shock (ω), it impacts on firms' decision rules. Demand for the intermediate input (m) is assumed to depend on the firm's state variables k and ω or :

$$m_{it} = m_{it}(k_{it}, \omega_{it}) \quad (2)$$

Levinsohn and Petrin (2003) show that the demand function for intermediate inputs is monotonically increasing in ω, which allows inversion of (2) such that

$$\omega_{it} = \omega_{it}(k_{it}, m_{it}) \quad (3)$$

Expression (3) show that the unobservable productivity term is now a function of two observable inputs. A final assumption that is required for identificatuion of the input parameters is that the productivity term (ω) follows a first order Markov process. Substituting (3) into (1) and by proxying (3) by a third order polynomium in the observed input factors allows consistent estimation of the coefficient of the freely available labor input. Using the timing assumption governing ω, i.e. a first order Markov process, permits to obtain an estimate of ω. This results in a final step to come up with a consistent estimate of the capital coefficient. For further

[3] Including firm level fixed effects is equivalent to including the inverse Mills ratio that results from a Heckman selection equation, since the probability of choosing a location for a particular firm is likely to stay constant during the sample period, which is relatively short.

details of the implementation of the estimation algorithm we refer to Petrin, Levinsohn and Poi (2003). We apply this algorithm to all firms in each 2-digit NACE sector and we include year dummies to control for unobserved aggregate shocks. Using the estimates of the production coefficients, we define the log of measured TFP of firm *i* at time *t* for industry *k*, denoted by tfp_{it}^{k}, as:

$$tfp_{it}^{k} = y_{it}^{k} - \widehat{\beta_l^k} l_{it}^{k} - \widehat{\beta_k^k} k_{it}^{k} \tag{4}$$

In a second stage, we regress firm level total factor productivity on our agglomeration measures. As a robustness check, we will also report results using simple proxies for productivity, such as real value added per employee. We will focus on mainly two sources of externalities. The first are the Marshallian knowledge spillovers, the second is the role of market access (Krugman, 1991). Marshall (1890) argued that knowledge externalities were industry specific and were likely to emerge from interpersonal interaction between workers employed within one specific industry. The most appropriate proxy for this channel that has been used in the literature is regional industry-employment. We construct such an intra-industry knowledge spillover measure (*IIS*) by taking the total number of regional employees in particular industry defined at the 2-digit NACE Rev. 1 level. Own firm employment is subtracted to avoid possible endogeneity and 1 is added to ensure that not every observation where the firm may potentially be the only regional representative of its industry is dropped[4]. Or our measure is defined as (where *j* stands for firm *j*, in sector *i*, and region *r*) and varies over time *t*:

$$IIS_{jirt} = \ln\left[\sum_{j \in i \cup r} E_{jirt} - E_{jirt} + 1\right] \tag{5}$$

A novel feature of our approach is that in defining *IIS* we make a further distinction between domestic and foreign firms. Domestic knowledge spillovers (*IIS*) refer to the total regional sectoral employment accounted for by domestic firms, while foreign knowledge spillovers (*IIS_For*) refer to total regional sectoral employment accounted for by foreign firms. We would expect the latter to have a bigger impact, given that typically multinational enterprises embody more technological know-how and that there exists ample evidence of positive externalities emerging from foreign direct investment.

[4] Since the logarithm of zero is undefined.

Our second measure of agglomeration economies is related to measuring the impact of market access for firms. In particular, we tune in on the importance of scale effects firms can reach from having access to export markets. In doing so, we assume there are two effects to capture. The first is a pure scale effect for the individual firm, the second is related to learning spillovers. To capture the former, we include the export share at the level of the firm (*Exsh*) for those firms that export and zero for those that do not. To capture learning effects we assume firms that operate in regions with more export exposure are more likely to benefit from the export activity from exporting firms. The learning effects that have been identified in the literature from exporting are therefore likely to spill over to the entire region. As argued above, this can be either due a number of factors, like sharing common knowledge and expertise, the sharing same specialized suppliers networks and export platforms. We therefore define our export externality stemming from increased market access (*MA*), as the share of regional exports (*X*) in total regional sales (*Y*), but we subtract own firm level exports and sales in this measure to avoid endogeneity issues.

$$MA_{jirt} = \ln\left(\left(\sum_{j \in i \cup r} X_{jirt} - X_{jirt}\right) \Big/ \left(\sum_{j \in i \cup r} y_{jirt} - y_{jirt}\right)\right) \tag{6}$$

Hence, our final empirical specification can be written as:

$$tfp_{jirt} = \alpha + \beta_1 IIS_{jirt} + \beta_2 (IIS \times For)_{jirt} + \beta_3 MA_{jirt} + \beta_4 Exsh_{jirt} + u_{jir} + \varepsilon_t, \tag{7}$$

where *tfp* is log total factor productivity. The RHS variables have been described above, all of them are specified in logs. We include firm fixed effects to control for unobserved firm heterogeneity and selection effects. For instance, if firms select themselves into agglomerated regions there could be an identification problem. By including firm level fixed effects, we control for such self-selection, provided that economically concentrated regions only change gradually over time. We will also report a number of robustness results that deal with this issue. Furthermore, we allow the standard errors to be clustered around regions. In addition, we also include a full set of industry - year specific fixed effects, which control for industry- and time-specific shocks.

According to the previous discussion, we expect all of the RHS variables to have a positive impact on firm level TFP ($(\beta_1, \beta_2, \beta_3, \beta_4) > 0$). However, we expect the agglomeration effects to be stronger in regions with more intensive presence of MNCs ($\beta_2 > \beta_1$), and stronger in regions with better access to exports markets ($\beta_3 > \beta_1$).

2.2. Data

We use micro data of companies active in manufacturing and services sectors in Slovenia between 2000 and 2008. The data are derived from annual income statements with financial and operational information, including the 3-digit NUTS region in which these firms are located. The data are retrieved from official published income statements and are from the Agency for Public Legal Records and Related Services (AJPES). The full population of firms is used. We cover between 35,300 and 36,000 firms per year, which implies that we have 2,999 firms per region on average.

Table 1 provides a number of summary statistics. The average firm employs 10 workers, with each worker contributing approximately 31,000 euro to value added on average.

Table 1: Summary Statistics for 2008

	Mean (s.d.)
Employment	9.8 (97.0)
Value added (millions euro)	0.49 (4.78)
Labor productivity (000's euro)	31.21 (105.22)
ln(TFP)	4.87 (0.99)
Domestic knowledge spillovers	8.18 (1.94)
Foreign knowledge spillovers	5.22 (3.06)
Regional export share	0.10 (0.03)
Firm Export share	0.15 (0.16)
No. of firms	35,988
No. of regions	12
No. of firms / region	2,999

Note: Mean values of variables, standard deviations in parentheses

Note that the figures on average regional export share and average firm export share are low due to the fact that we use the whole universe of Slovenian firms including services firms. A large fraction of micro firms (with one employee only) and the vast majority of the service firms do not export. Hence, average export shares at the firm level (15 per cent) and at the regional level (10 per cent) are accordingly low.

3. Results

This Section presents results obtained from estimating the empirical model (7). We first present the main results, and proceed with results obtained by estimating model (7) by firm size classes, to check how firm heterogeneity (in terms of firm size) may matter for understanding agglomeration economies

3.1. Main results

Table 2 gives our base line results. In column (1) we report the results from estimating (7). The first row shows the domestic regional knowledge spillovers. We can note that domestic regional knowledge spillovers have a positive impact on firm level total factor productivity. A doubling of knowledge spillovers would increase TFP by 3.8%[5]. Furthermore, these domestic spillovers are amplified by the presence of foreign regional knowledge spillovers as reported in the second row of Table 2. Hence, a doubling of regional foreign presence would imply an increase in TFP in Slovenian firms by an additional 1 percentage point or 4.8% in total. This is consistent with the view that foreign firms generate stronger positive externalities for domestic firms and the internationalization of the production process can be interpreted as beneficial for local firms.

[5] Since knowledge spillovers are expressed in logarithms, referring to equation (3), a doubling of these spillovers would imply an increase in total factor productivity of $(2^{\beta_1} - 1) \times 100\%$.

Table 2: Agglomeration effects in Slovenia, base results

	(1) TFP	(2) TFP 1-lag	(3) TFP 2-lags	(4) VA/emp
IIS	0.055***	0.045***	0.030***	0.057***
	[8.20]	[6.81]	[4.54]	[8.73]
IIS_For	0.013***	0.016***	0.012***	0.012***
	[5.02]	[6.12]	[4.50]	[4.76]
MA	0.142**	0.216***	0.058	0.077
	[2.06]	[3.35]	[0.87]	[1.12]
Exsh	0.123***	0.022	0.041**	0.067***
	[7.25]	[1.15]	[2.17]	[3.90]
K/emp				0.132***
				[60.33]
Constant	-0.002***	0.011***	0.013***	0.047***
	[-11.55]	[65.98]	[49.17]	[342.07]
Firm level fixed effects	Yes	Yes	Yes	Yes
Year-industry effects	Yes	Yes	Yes	Yes
Observations	209,441	178,908	149,746	209,441
R-squared	0.002	0.001	0.001	0.054
Number of firms	35,988	33,551	31,076	35,988

Robust t-statistics in brackets; all specifications include year-industry effects, through the first step estimation of TFP
**** p<0.01, ** p<0.05, * p<0.1*

The positive effects of globalization for firm performance is also clear from the regional exposure to international markets measured by what we call market access, defined in equation (6) (MA). We find a strong and statistically significant positive effect of international market access on total factor productivity. In particular, a doubling of market access would imply an increase in TFP of 10%. Moreover, in addition to the regional export spillovers, firms that export also have a better performance. We find that on average a 10 percentage points increase in firm level export shares are associated with an increase in firm level total factor productivity of 1.2%[6].

A potential concern that arises is self-selection of firms. The most productive firms locate in the regions where agglomeration effects are strongest, which in turn can strengthen already existing agglomeration economies. Such endogeneity of our agglomeration measures, however, is less likely as we include firm fixed effects in all specifications and hence we control for such self-selection, provided it takes time for regions to build up agglomeration economies. Nevertheless, we also ran the same specification, but with lagged values of our agglomeration measures. The idea is that if self-selection is driving our results, the lagged values of our agglomeration measures should not have an impact on current productivity and hence any positive effect can then be attributed to the actual impact of agglomeration, rather than self-selection. We report these results in the second and third column. The second column includes the RHS variables lagged by one period, while third column includes second lags of the explanatory variables. The point estimates related to knowledge spillovers remain virtually the same. While the effect of market access goes up in the second column. Using two lags, however, this effect becomes insignificant, although it remains positive. This suggests some unspecified dynamics related to market access and potential self-selection effects that are dynamic in nature. All in all, the results remain relatively robust, which suggests that self-selection cannot explain the positive effects of agglomeration on measured total factor productivity.

While it seems natural to analyze the impact on total factor productivity, we do rely on the correct estimation of TFP. To check whether our results are robust to alternative measures of productivity, we replace in the fourth column TFP with labor productivity measured by (deflated) value added per worker. Hence, we include as an additional regressor the capital labor ratio to capture the effect that capital intensive firms typically will have a higher value added per worker. Again our results remain fairly robust. The coefficients on domestic and foreign agglomeration effects are almost identical to the ones obtained using the TFP measure of productivity.

The results in Table 2 provide average effects for both manufacturing and services firms, controlling for firm fixed effects as well as sector-year effects. In Table 3 we show separate results for manufacturing and services firms. The results

[6] Note that the firm level export share is not in logarithms, unlike the other variables.

are fairly intuitive. One can see that agglomeration effects stemming from domestic regional knowledge spillovers are substantially stronger for service firms. The same applies for agglomeration effects stemming from foreign presence in regions, where these effects are even insignificant for manufacturing firms. One reason for this could be that the embedded knowledge is arguably less tangible in service sectors than in manufacturing firms. Manufacturing firms are also more export oriented and thus more exposed to international knowledge spillovers. This shows up in the large coefficients for market access for manufacturing firms, while for service firms this effect is only statistically significant at the 10 percent level and the point estimate is less than half of the one in manufacturing. In contrast, the effects of learning in foreign markets, proxied by the firm level export share, is similar for manufacturing and service firms.

These results seem to suggest that manufacturing firms are predominantly learning from knowledge spillovers in the foreign markets, while service firms are less exposed to foreign competition and essentially have more to gain from regional agglomeration effects. Foreign presence is shown to strengthen these regional learning effects for service firms.

One concern is that the results in tables 2 and 3 do not take into account firm heterogeneity. Both tables provide results for the average firm while controlling for narrow and broad sectors. However, typically, within narrowly defined regions and within sectors there exists a lot of firm heterogeneity. The Slovenian economy in particular is characterized by a large group of micro firms that co-exist with medium and large sized enterprises. We therefore analyze how our agglomeration measures may have a different impact depending on firm size. Arguably, micro firms may benefit more from local knowledge spillovers than large firms given they have less resources to invest in own R&D or on-the-job training. We report the results in the next sub-section.

Table 3: Agglomeration effects in Slovenia, accounting for difference between manufacturing and services firms

	(1) Manufacturing	(2) Services
IIS	0.026**	0.083***
	[2.51]	[8.59]
IIS_For	0.001	0.019***
	[0.29]	[5.28]
MA	0.329*	0.113
	[1.93]	[1.52]
Exsh	0.115***	0.116***
	[4.43]	[5.29]
Constant	-0.005***	-0.001***
	[-10.68]	[-4.02]
Firm level fixed effects	Yes	Yes
Year-industry effects	Yes	Yes
Observations	32,418	174,363
R-squared	0.002	0.002
Number of firms	5,936	30,577

Robust t-statistics in brackets; all specifications include year-industry effects, through the first step estimation of TFP

**** p<0.01, ** p<0.05, * p<0.1*

3.2 Accounting for firm size

Table 4 repeats the results of Table 2, but in addition we report results for five different size classes. They refer to micro firms when the firm employs between 1-9 workers; small firms when the firm has between 10-49 workers; our third size class refers to firms with 50-249 workers, and the final two size classes refer to firms with 250 to 499, and the largest with more than 500 employees.[7]

It is interesting to note that knowledge spillovers are strong and positive for micro and small firms, but they vanish for the larger ones. This pattern also emerges for our measure of market access or regional export exposure, with stronger results for micro firms and small firms, but for the larger ones, the effects become small and insignificant.

[7] Note that there is no switching of firms between different size classes as we classify firms to different size classes based on firms' median number of firms in the analyzed period.

There could be a number of reasons why especially micro and small firms benefit from agglomeration economies. Typically small firms have less resources to invest in R&D than large firms and by locating in regions with important agglomeration economies in terms of knowledge spillovers they can learn from the larger firms in the region, without having to incur the R&D sunk costs. Also in terms of export exposure small firms can benefit from the regional expertise of international firms and by using or being part of the same specialized regional suppliers networks. This is in line with Chetty and Blankenburg Holm (2000), who find for New Zealand's exporting firms that networks can help firms expose themselves to new opportunities, obtain knowledge, learn from experiences, and benefit from the synergistic effect of pooled resources. Small firms are more flexible than large ones and hence they can adjust their production process faster when there are different shocks in terms of agglomeration rents to benefit from. Finally, small firms have more potential for growth and therefore are more likely to be able to engage in a process of 'catching up' compared to large firms.

Table 4: Agglomeration effects in Slovenia, by size classes

Variables	(1) Pooled	(2) SC1	(3) SC2	(4) SC3	(5) SC4	(6) SC5
IIS	0.055***	0.061***	0.054***	0.001	-0.003	0.053
	[8.20]	[7.38]	[3.87]	[0.03]	[-0.03]	[0.97]
IIS_For	0.013***	0.017***	-0.000	0.008	0.037	0.042
	[5.02]	[5.16]	[-0.03]	[0.89]	[1.46]	[1.31]
MA	0.142**	0.102	0.333**	0.207	0.571	-1.167
	[2.06]	[1.28]	[2.32]	[0.79]	[1.18]	[-0.87]
Exsh	0.123***	0.142***	0.078***	0.030	-0.048	0.239
	[7.25]	[6.84]	[2.64]	[0.38]	[-0.32]	[0.84]
Constant	-0.002***	-0.131***	0.530***	0.804***	1.231***	1.283***
	[-11.55]	[-1,411.21]	[502.38]	[142.26]	[49.36]	[30.30]
Firm level fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	209,441	172,207	29,441	6,590	755	448
R-squared	0.002	0.002	0.002	0.001	0.005	0.013
Number of mark	35,988	30,526	4,288	998	113	63

Robust t-statistics in brackets
**** p<0.01, ** p<0.05, * p<0.1*

4. Conclusions

The paper studies the impact of agglomeration economies on firm level performance measured by total factor productivity in Slovenia. The main contribution of the paper lies in introducing agglomeration economies that are linked to globalization. Furthermore, we measure the impact of agglomeration on total factor productivity, taking into account potential endogeneity of the input choices and selection effects. We distinguish between domestic and foreign knowledge spillovers and analyze the impact of regional export market exposure, which we call international market access.

We find positive effects knowledge spillovers, which increase with foreign firm presence in regions. We find that a doubling of knowledge spillovers increase TFP by 3.8 percent and this effect increases with a doubling of foreign firms in regions, to 4.8%. We also show that international market access has a positive effect on firm level total factor productivity. These effects are more important for firms active in service sectors and micro firms.

Our research shows that properly accounting for agglomeration economies requires to take into account the internationalization of firms.

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