

11.

**Internationalisation
and firm productivity:
firm and regional
level effects**

Authors

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This study analyses the relationship between several dimensions of internationalisation – foreign firms, exports as a share of turnover, imports as share of the total use of intermediaries, and the presence of foreign (knowledge) workers – and total factor productivity (TFP) at the firm and at the regional level. We find that foreign-owned firms and trading are related to higher levels of TFP, while there is no relationship between the presence of foreign workers and TFP. Even though there is substantial heterogeneity in regional productivity, we found no evidence for externalities¹⁾ from internationalisation.

11.1 Introduction

Many national and local governments aim to increase the internationalisation of their economy by attracting investments of foreign firms and welcoming talented foreign workers, and by stimulating domestic firms to become actively involved in international trade. Governments attempt to attract foreign firms by lowering taxes and relaxing regulations – which some fear may result in a ‘race to the bottom’. The measures taken in the global ‘race for talent’ are described in Chapter 10. The Dutch government follows suit as is shown by recent policy incentives and the installation of a Minister for Foreign Trade and Development Cooperation.

The rationale is that internationalisation stimulates economic growth and development. Firms with an international orientation are assumed to be more productive. Because of their worldwide access to capital, knowledge and labour, they can perform the tasks required to manufacture goods and services at locations with a comparative cost advantage, and therefore more efficiently (Groot, 2013). The presence of internationally oriented firms in a region may also increase the productivity of other local firms through positive spill-overs (Sourafel et al., 2008). Local firms can learn from internationally oriented firms how to improve their productivity through interactions or competition effects. The aim of this chapter is to estimate the direct and indirect effects of internationalisation on the productivity of firms.

¹⁾ Externalities are positive or negative side effects that affect other parties who are otherwise uninvolved. For example, a neighbour who maintains an attractive house may increase the value of surrounding properties.

Despite the widespread belief in the positive effects of internationalisation on firm productivity, the empirical evidence for this is mixed. Several studies have shown that foreign firms and firms involved in international trade are more productive (e.g., Girma et al., 2008, Parotta et al., 2011). However, other studies have shown that this effect disappears after controlling for firm-specific characteristics, suggesting that the distinctive characteristics of internationally oriented firms makes them more productive rather than internationalisation (Rojas-Romagosa, 2010). Empirical evidence for the existence of regional spill-overs from internationalisation is also far from conclusive: positive and negative effects have been found (Görg and Greenaway, 2003).

Empirical insight in the effect of internationalisation on firm productivity in the Netherlands is still very limited due to a lack of data at the firm level. Only a few very recent studies address the issue (Möhlmann, 2013; Smit et al., 2013). In this chapter, we examine how total factor productivity of firms in the Netherlands is linked to four dimensions of internationalisation: foreign ownership, exports, imports and foreign workers. For this we use detailed data on firm productivity derived from Dutch tax declarations. Furthermore, we examine the effects of these four dimensions at the firm and the regional level, allowing us to test whether there is evidence for spill-over effects.

11.2 Theoretical background

Foreign-owned and exporting firms are known to be more productive than non-exporters and native Dutch firms. This is perhaps because they can learn from their interactions with foreign markets. However, the higher productivity level of foreign-owned and exporting firms is also often attributed to selection effects (Bernard et al., 2007; Wagner, 2011). Only the most productive firms are able to successfully invest abroad or export. Firms trying to enter a foreign market have less information about the specifics of that market than domestic firms. They are also confronted with fixed costs for establishing distribution networks and learning about specific regulatory arrangements (Görg and Greenaway, 2003). Successfully entering a foreign market requires firm-specific assets such as a superior production technique, know-how or management strategy, compensating for these costs and the liability of being foreign (Dunning, 1998). Selection effects imply that there is no causal relationship between exporting or foreign ownership and productivity, but rather that foreign or exporting firms were already more productive *before* they entered the foreign market.

Importing is also often associated with higher levels of productivity, as firms can benefit from relative comparative cost advantages. International sourcing is likely to increase the productivity of firms if outsourcing enables them to lower their production costs below the additional external transaction costs involved in obtaining intermediates from abroad (Möhlmann, 2013). For instance, when foreign suppliers can produce the imported intermediaries cheaper than the firm itself because of lower wages or economies of scale (Abraham and Taylor, 1996).

The effect of hiring foreign employees on firm productivity is less straightforward (Groot, 2013; Möhlmann, 2013). Internationally oriented firms can gain from hiring employees with relevant country-specific knowledge (Rauch and Casella, 2003). Their understanding of the market can help the firm invest in or export to that country. Diversity of the workforce may also increase the likelihood of innovation because foreign employees are likely to bring new knowledge and production techniques to the firm (Saxenian, 2007). However, problems with communication and trust among employees may lower a firm's productivity.

Productive firms with an international orientation may not be able to keep their firm-specific assets from other firms in the region. Three mechanisms may trigger spill-overs: competition effects, labour mobility, and buyer-supplier links (Görg and Greenaway, 2003). A productive internationally active firm means more competition for others in the field. This may trigger the competitors to imitate its production process or management strategies, or to become more efficient by improving their own technology, production process or management strategy. Competitors can also get access to firm-specific assets by hiring former employees with detailed knowledge about the specificities of the production process or management strategy that gave the internationally oriented firm the competitive edge (Görg and Greenaway, 2003).

Buyer-supplier links with internationally oriented firms lead to regular, repeated interactions from which both benefit by sharing insights in firm-specific assets (Girma et al., 2008). The internationally active firm may stimulate local suppliers to improve their production processes and increase the quality of the supplies or provide higher quality supplies to local buyers.

But the presence of internationally active firms may also lead to negative spill-overs (Girma et al., 2008). Increased competition could result in negative effects when the foreign firm 'steals clients' from the domestic firms. Likewise buyer-supplier links may turn sour if internationally active firms have more bargaining power that results in unfavourable contracts.

Spatial proximity between firms is not necessary for spill-overs but it does increase their likelihood, because proximity allows for continuous monitoring and comparing (Bathelt et al., 2004). Firms active in the same region operate under similar conditions, and can effectively compare their performances. Also, most people in the Netherlands change jobs without moving to another town. Consequently, labour mobility is more likely to lead to spill-overs between firms located in the same region. Despite the increasing globalisation of buyer-supplier networks, certain relations require frequent interactions to ensure that the supplies match the buyer's requirements (Neffke and Nedelkoska, 2013). Spatial proximity between buyer and supplier facilitates such interactions, and greater intensity of interactions makes positive spill-overs more likely.

There is no consensus about why firms may benefit from the presence of foreign employees in a region (Groot, 2013; Möhlmann, 2013). A diverse labour force may increase productivity because interactions of people with a variety of backgrounds increases the potential for innovation, creativity and problem solving (Ottoviano and Peri 2005, 2006). But diversity can have a negative effect on productivity because a society with a higher diversity of cultures may face higher communication costs and costs associated with a lack of trust between different groups (Putnam, 2007).

11.3 Data and methodology

To estimate the effects of different dimensions of internationalisation on the productivity of firms, we employed a two-stage approach. In the first stage, we estimated the annual total factor productivity (TFP) of firms. Subsequently, we used TFP by firm and year as the dependent variable in our second stage regressions, where the independents are firm and regional level variables including exports, imports, foreign ownership of firms, and the presence of different types of foreign workers.

Stage I – Estimating total factor productivity

The starting point of our empirical analyses is to estimate separate production functions for 9 different industries, taking into account that there is great

heterogeneity in production processes between sectors.²⁾ To estimate productivity, we adopt the methodology developed by Levinsohn and Petrin (2003) and Petrin et al. (2004). Their methodology is designed to avoid a number of pitfalls when estimating production functions and should provide us with consistent estimates of the different production function parameters.

In our productivity estimates, we assume the following (Cobb-Douglas) structure of a firm level production function:

$$v_t = \beta_0 + \beta_l l_t + \beta_k k_t + \beta_m m_t + \omega_t + \eta_t, \quad (1)$$

where v_t is the natural logarithm of value added of the firm in year t , l_t the use of labour, k_t the use of capital and m_t the use of intermediary inputs. There are two error terms in equation (1): ω_t is a transmitted productivity component which is correlated to the use of inputs (see Petrin et al., 2004), while η_t captures our level for TFP of each firm in each year. TFP is thus defined relative to the productivity of other firms within the same industry. table 11.3.1 provides a detailed description of the variables that are included in our first stage regressions.

11.3.1 Variables used to estimate total factor productivity

Variable	Description	Source	Definition
v_t	(log) value added	Company tax return (WIA)	total turnover -/- costs of raw and auxiliary inputs -/- non-monetary personnel costs -/- other operating costs ¹⁾
m_t	(log) intermediary inputs	Company tax return (WIA)	total turnover -/-value added
l_t	(log) labour	Monthly wage bills	sum of all pre-tax wages paid by firm
k_t	(log) capital	Company tax return (WIA)	fixed-capital stock * 8%-discount rate +/- total depreciation -/- depreciation on goodwill, concessions, permits and intellectual property

¹⁾ Examples of other operating costs are energy, transport and housing costs, costs of machinery, inventory, installations, sales, communication and service costs.

²⁾ Separate production functions are estimated for capital intensive industry (SBI 1993 codes 15, 16, 21, 26 and 26), labour intensive industry (17–20, 28, 36 and 37), knowledge intensive industry (22–24, 27 and 29–35), construction (45), trade (50–52), hotels and restaurants (55), transport (60–64), financial services (65–67), and commercial services (70–74). Agriculture, mining and quarrying, utilities, the public sector, and employment agencies have been excluded for various reasons (see Groot and Weterings, 2013).

The data used in this chapter were provided by Statistics Netherlands (CBS), and are available for the years 2007 to 2010. They include value added, turnover, capital stock and depreciation. Source of these data are tax return statements (WIA) supplied by the fiscal authority. To obtain our capital measure, we multiplied the total stock of material assets with an 8%-discount rate that is constant across time, industries and firms and add depreciation of the capital stock (excluding depreciation on immaterial assets).³⁾ The use of total labour is derived from monthly wage bills, by aggregating all monetary and non-monetary compensations paid by the firm. In addition to the variables described above, we used the industry of the firm as described in the General Business Register (ABR).

We applied a number of selection criteria to our data. We removed all firms with a total annual wage bill of less than 20,000 euros. Also we removed all firms where the total share of labour in value added exceeded 100 percent; where total imports were negative; where the share of imports in the total use of intermediaries exceeded 100 percent; and firms with negative exports or a share of exports in total turnover exceeding 100 percent. Finally, we removed firms for which we could observe all variables in only one year, as the estimation strategy of Petrin et al. (2004) relies on time variation. A total of 82,344 firms were included in our first-stage estimates. These firms are somewhat larger than the average Dutch firm and account for almost one fifth of total Dutch value added. Descriptive statistics are presented in table 11.3.2.

11.3.2 Descriptive statistics productivity estimates

Variable	Unit	Average	St. dev.
Value added	x 1000 euros	644.9	440
Total wages paid		310.7	1,659
Value of intermediaries		2,249.6	67,600
Value of capital		102.6	1,493
#Firms	x 1	82,344	
#Observations (firms × years)		293,287	

³⁾ The use of capital as measured by a fiscal definition may differ significantly from the actual use of capital, because firms will attempt to report the maximum allowed depreciation to minimize profits before taxes which is likely to result in an underestimation of the actual use of capital.

Stage II – Relating total factor productivity to characteristics of firms and regions

In the second stage of our analyses, we related TFP to a large set of independents on the level of firms and 40 NUTS-3 regions (known in the Netherlands as COROP regions). While the second stage regressions are the topic of the next section, this section will describe the data and present a number of stylized facts. The use of capital and value added of different firm establishments is unknown, therefore we need to make the assumption that the total factor productivity – which can be interpreted as the total amount of money a firm makes at a given use of inputs – is the same across all firm establishments. As a consequence, the level of TFP of firms with establishments in multiple regions is attributed to all regions. To analyse the impact of this assumption, we also estimated regression models that only include firms with all establishments in the same region.

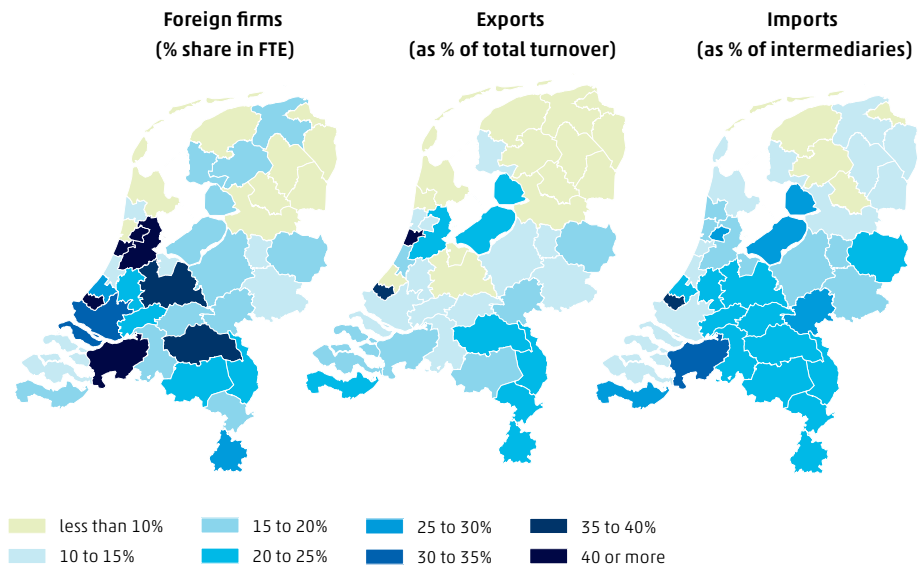
We included four different types of firm level measures for internationalisation. First, a dummy variable that indicates whether the Ultimate Controlling Institutional Unit (UCI) of the firm is Dutch or foreign, using a CBS dataset on foreign ownership. Small Dutch owned firms are often not included in this dataset. When the country in which the UCI resides is unknown, we assume that we are dealing with Dutch firms. Data about imports and exports of goods follow from matching trade information with the General Business Register (see chapter 13 for more information). If no import or export value was reported, we assume it was zero. To determine the regional import and export shares, we allocate the value of imports and exports of firms with establishments in multiple NUTS-3 regions to the different regions based on the share of wages paid by the firm to employees working in each region (see Groot and Weterings, 2013, for an in-depth discussion of our methodology). As we will include logs of shares in our regressions in the next section while the log of a zero share is undefined, we included a dummy for these variables that indicates shares that are at least positive. If the actual shares equal zero (and thus the dummy for that share is zero), we set the log share to zero.

To obtain more information on the employees working for a firm in a specific region, we merged our matched employee–firm–NUTS-3 dataset to census data, which includes country of birth, as well as year and month of birth. Together with the total number of hours worked from the monthly wage bills, we calculated total employment (FTE) by firm and NUTS-3 region, the share of foreign born employees,

the shares of foreign and other knowledge workers⁴⁾, and the average age of the employees. Using the same data as those used to construct firm-region level data, we determined employment, as well as the shares of foreign born employees, foreign knowledge workers and other knowledge workers in total regional employment.

Figure 11.3.3 presents maps on three dimensions of internationalisation: the share of foreign firms in regional employment, regional exports and imports. Foreign firms are relatively overrepresented in the Randstad, in particular in Amsterdam and near Schiphol airport, the port of Rotterdam, and in the south of the country. Goods exports have less regional variation, but tend to be somewhat lower in the north-east and higher in the south-east. The same goes for imports. These regions have a larger share of manufacturing which is more involved in international trade than services. The spatial dispersion of foreign labour is the topic of Chapter 10.

11.3.3 Internationalisation of Dutch firms



Source: Statistics Netherlands/PBL.

⁴⁾ Knowledge workers are defined in the basis of their wages compared to employees in similar age groups. Foreign knowledge workers were born outside the Netherlands and immigrated after the age of 18. See Chapter 10 for a more detailed discussion of our definition of knowledge workers.

11.4 Empirical results

Direct effect of internationalisation

To determine the direct effects of internationalisation (e.g. the firm level of internationalisation) on the productivity of firms we estimated two different specifications: one *with* and one *without* firms that have establishments in multiple regions. The results are presented in the columns (I) and (III) of table 11.4.2. To estimate the relevance of regional conditions for differences in firm productivity, we have included fixed effects for each NUTS-3 region. Specifications (II) and (IV) – discussed later in this section – are similar to (I) and (III), but include regional level variables to capture spill-over effects rather than region fixed effects.

In line with what is commonly found, larger firms are more productive than their smaller competitors. Doubling the firm size results in an 11 percent rise in TFP levels, independent of the selected econometric specification. Foreign-owned firms in our sample have a substantially higher TFP than Dutch owned firms. The model including all firms in our sample shows that foreign-owned firms are 49 percent more productive than domestic firms and 29 percent more than firms with all establishments in the same region.

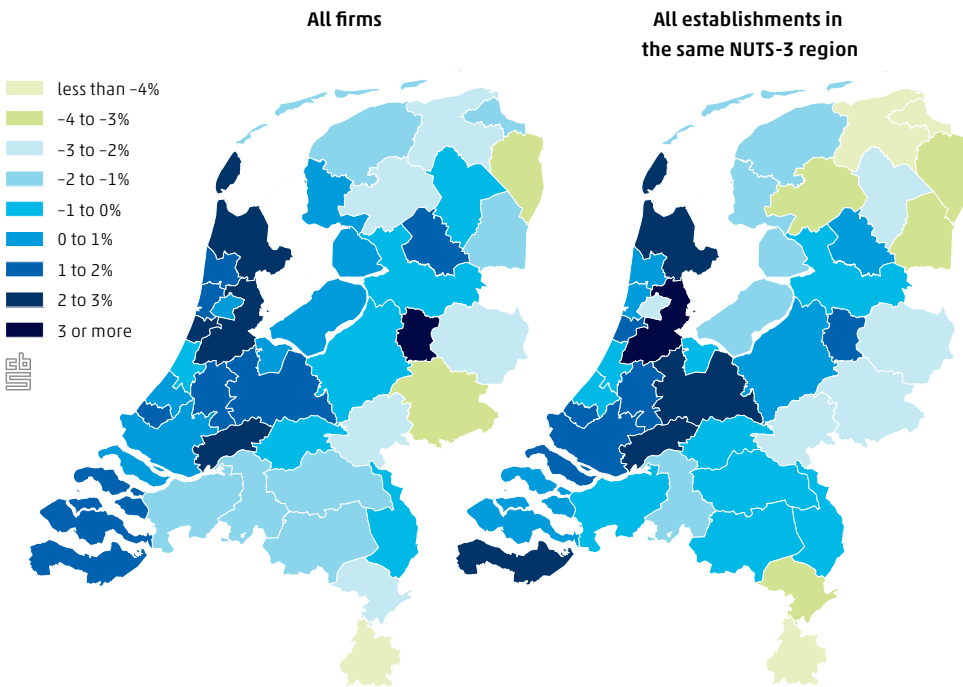
Foreign-owned firms are **49%**
more productive than domestic firms



Also, we find that exporting firms have a substantially higher level of TFP – about 18 percent higher than non-exporting firms. In addition to this, we find that doubling the share of exports results in a 6 percent increase of TFP. Firms who use imported intermediaries rather than domestically produced inputs are more productive than firms that do not import intermediary goods. This is consistent with, for example, the work of Möhlmann (2013) who shows that outsourcing results in a higher level of productivity. Firms importing intermediary goods seem to benefit from the comparative cost advantages in different countries.

The presence of foreign workers is generally negatively related to TFP. The share of foreign *knowledge* workers (defined as highly paid foreign workers, see Chapter 10) has a no strong effect on the productivity of firms, and it is also somewhat inconsistent across specifications. In contrast, the share of Dutch knowledge workers is positively related to productivity in all specifications. Together, the included variables explain much of the variation in TFP, as the high R^2 indicates.

11.4.1 Regional total factor productivity after correcting for firm heterogeneity



Source: Statistics Netherlands/PBL

The region fixed effects that were included in the specifications in table 11.4.2 can be interpreted as the spatial component of TFP, after controlling for heterogeneity in firm characteristics including sectoral structure. Figure 11.4.1 presents regional TFP, whereby the estimates were converted to percentage deviations to the productivity of the average Dutch firm. The general picture that emerges from Figure 11.4.1 is that TFP is somewhat higher in the western and central parts of the country. This finding is comparable to the usual findings in the literature estimating productivity on wage data (see, for example, Groot and De Groot, 2013).

The regional dispersion in productivity of all firms looks very similar to that of productivity of firms with all establishments in the same region.

Indirect effects of internalisation

Firm productivity is not only directly affected by internationalisation at the firm level. It may be related to how internationalised the region is due to how international the firms in the region are. Therefore, we also estimated productivity regressions that include explanatory variables that vary by region and year. Columns (II) and (IV) of table 11.4.2 show the results. It is important to note that the regional level independent variables are the same across all specifications.

The firm level parameters are very similar when we include region level variables rather than region fixed effects, therefore we do not discuss them again. At the regional level, we find that firms in regions with a higher employment density do not have higher levels of TFP.

We hardly found any relation between internationalisation of other firms in a region and TFP. All parameters estimated for the presence of exporting firms, foreign-owned firms, and the share of foreign workers and foreign knowledge workers are close to zero and never statistically significant. The presence of importers in the region is even slightly negative. The presence of foreign firms in a region is consistently associated with a somewhat lower TFP level. The presence of foreign knowledge workers – in contrast – has a positive and statistically significant relation with firm productivity. Overall, regional characteristics explain a relatively small part of firm productivity. The evidence presented in this section is thus inconsistent with theories that predict positive externalities from internationalisation on a regional level.

11.4.2 Regression results

Dependent: TFP by firm and year	All firms		All establishments in same region	
	(I)	(II)	(III)	(IV)
#Observations	294,813	294,813	270,606	270,606
Firm specific variables				
Log employment (in FTE)	0.109*** (38.8)	0.109*** (38.8)	0.110*** (58.2)	0.110*** (58.4)
Foreign firm	0.488*** (10.9)	0.488*** (10.9)	0.289*** (23.7)	0.289*** (23.7)
Exporter	0.181*** (12.0)	0.179*** (12.0)	0.209*** (19.7)	0.207*** (19.6)
Log share of export in turnover	0.058*** (8.4)	0.058*** (8.4)	0.068*** (13.1)	0.067*** (13.0)
Importer	0.166*** (11.0)	0.166*** (11.0)	0.158*** (21.0)	0.158*** (20.9)
Log share of import in intermediaries	0.056*** (8.3)	0.056*** (8.3)	0.061*** (16.6)	0.061*** (16.6)
Log average age	-0.087*** (7.1)	-0.089*** (7.3)	-0.080*** (15.3)	-0.082*** (15.8)
Minimum of 1 foreign employee	-0.003 (0.5)	-0.003 (0.4)	-0.007 (1.1)	-0.006 (1.2)
Log share foreign employees	-0.018*** (7.4)	-0.018*** (7.3)	-0.017*** (7.6)	-0.017*** (7.5)
Minimum of 1 foreign knowledge worker	-0.010 (0.5)	-0.009** (0.5)	0.036* (2.5)	0.037** (2.6)
Log share foreign knowledge workers	-0.024*** (3.7)	-0.024* (3.7)	-0.011* (2.3)	-0.011* (2.3)
Minimum of 1 Dutch knowledge worker	0.124*** (20.4)	0.125*** (20.7)	0.130*** (30.1)	0.131 (30.3)
Log share Dutch knowledge workers	0.035*** (11.1)	0.036*** (11.2)	0.039*** (20.3)	0.040*** (20.5)
<i>Region specific variables</i>				
Log employment NUTS-3		-0.009*** (3.3)		0.000 (0.1)
Log export share NUTS-3		0.001 (0.2)		0.004 (1.2)
Log import share NUTS-3		-0.020*** (4.6)		-0.020*** (4.6)
Log share of foreign firms NUTS-3		-0.002 (0.8)		-0.006 (1.8)
Log share of foreign employees NUTS-3		0.019 (1.9)		0.008 (0.8)

11.4.2 Regression results (end)

Dependent: TFP by firm and year	All firms		All establishments in same region	
	(I)	(II)	(III)	(IV)
Log share of foreign knowledge workers NUTS-3		-0.004 (0.5)		0.001 (0.1)
Log share of other knowledge workers NUTS-3		0.070*** (4.7)		0.072*** (4.8)
NUTS-3 fixed effects	40	No	40	No
Sector fixed effects	9	9	9	9
Year fixed effects	4	4	4	4
Adjusted R-squared	0.711	0.711	0.722	0.722

Notes: t-values are in parentheses. Significance levels of 0.05, 0.01 and 0.001 are denoted by * ** and *** respectively.

11.5 Conclusions

Our analyses show that differences in firm productivity are related to different dimensions of internationalisation, but also that internationalisation matters mainly at the firm level. We hardly found evidence for spill-over effects from internationalisation.

Foreign-owned and trading firms in the Netherlands are more productive than domestic firms, even after controlling for firm heterogeneity. Because firms with a high level of productivity tend to pay higher wages and more corporate taxes, attracting foreign firms may bring substantial benefits to regions. The positive relationship between trading and productivity, however, does not necessarily imply that governments should stimulate trading. It is very well possible that market forces have resulted in an optimal amount of trading. However, the measured effect could reflect selection effects if exporting firms are exporting *because* they are more productive rather than the other way around. The fourth dimension of internationalisation, the presence of foreign employees in firms, seems less relevant for total factor productivity, even at the firm level. In all specifications

we estimated, their presence is either completely unrelated to productivity or the effect is very small.

After controlling for the unequal distribution of internationally oriented firms across regions, we still find evidence of regional differences in total factor productivity. Nevertheless, regional heterogeneity in total factor productivity is relatively small compared to the heterogeneity in labour productivity (Groot and De Groot, 2013). Furthermore, contrary to labour productivity, TFP is found to be almost completely unrelated to differences in economic density. A likely explanation for this difference is that the higher level of productivity in agglomerated areas is completely offset by higher wages and higher land rents. This finding is consistent with the new economic geography (NEG) literature, which predicts that in market equilibrium all regions should be equally attractive to firms at the margin.

We found no evidence for spill-over effects from internationalisation. While the presence of foreign firms, exporting firms, and foreign (knowledge) workers in a region are almost completely unrelated to TFP, we found a negative – albeit small – effect of the presence of importing firms. The present study has treated the extent of possible spill-over effects in different regions as homogeneous. Future research could test whether there are interaction effects with characteristics of firms and regions: do foreign firms in some regions benefit more from a higher share of foreign firms than firms in other regions? Perhaps firms close to Schiphol airport benefit more from high levels of internationalisation than firms in other regions. Also, high spill-over effects may be larger in more agglomerated areas because the closer proximity of firms to other firms fosters sharing knowledge.