

***Knowledge Transfer and the Location of
New Information and Communication Technology
Establishments in the Dutch Province of Zuid-Holland****

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Abstract

This paper looks at the determinants of births of new establishments in the information and communications technology (ICT) sector among 416 4-digit zip code areas in the Dutch province of Zuid-Holland (South-Holland). In particular, we examine the role of agglomeration economies and other locational attributes in determining where new firms will locate. Agglomeration economies facilitate knowledge transfer and are thus expected to be important determinants of entrepreneurial activity. We find that more industrially diverse zip code areas that are already relatively specialized in ICT attract more start-up establishments than other zip code areas. This result supports previous evidence that high-technology enterprises tend to collocate in areas where economic activity is spatially dense.

1. Introduction

The role of agglomeration economies in economic growth has long been a central theme in urban and regional economics (Sveikauskas 1975, Moomaw 1981, Henderson 1986). Additionally, this topic has taken on greater importance in years since seminal contributions by Romer (1986) and Lucas (1988) modeled growth in an endogenous framework. In these types of models, knowledge spillovers between economic agents, an important source of agglomeration economies, play a crucial role in the growth process leading to external economies of scale in production. A large and growing empirical literature has been built around testing this idea using data from cities (Glaeser *et al.* 1992, Henderson *et al.* 1995, and Ciccone and Hall 1996). The reasoning here is that if knowledge spillovers are important to growth, they should be more easily identified in

cities where many people are concentrated into a relatively small geographic space so that knowledge can be transmitted between them more easily. Most studies along these lines, however, have focused on overall employment growth so they do not consider the role of knowledge spillovers in fostering the formation of new firms, or entrepreneurship.

This paper looks at how agglomeration economies, actually indicators of knowledge spillovers, affect births of new establishments using a unique data set from *Zuid-Holland* (South-Holland), one of 12 provinces in the Netherlands. The main focus of the analysis is on the information and communications technology (ICT) sector. Development of high-technology industries has long been the subject of general interest among social scientists and there have been related investigations of the computer industry (i.e., Beardsell and Henderson 1999). The data utilized in the present study provide counts of newly established businesses and their employment levels by industry for 416 (postal) zip code areas in the province over a ten-year period extending from 1988-1997. Thus, the approach taken here is similar to that in Rosenthal and Strange (2000), who analyzed determinants of establishment births in United States zip codes using Dun & Bradstreet Marketplace data. While the U.S. data have the advantage that more is known about each establishment in the data set, the Dutch data provide information about establishment births over a longer time period. A longer time period over which to measure births is expected to provide a clearer picture of which types of areas and which regional characteristics are most attractive to entrepreneurs.

The remainder of this paper is divided into three sections. Section 2 provides some background for the study and describes the data. Section 3 presents results and

compares estimates developed to those obtained in related previous studies. Section 4 concludes.

2. *Background and Data*

Cities are fertile grounds for testing knowledge-based theories of endogenous growth. Dense urban agglomerations provide opportunities for learning because they are frequently centers of knowledge creation. Electronic communications infrastructure generally is well developed and face-to-face meetings between key people desiring to share knowledge are certainly easier to arrange than they would be in rural areas. In fact, if electronic and face-to-face communications are complements rather than substitutes, as Glaeser has hypothesized, many firms may see a decided cost savings from locating in urban areas rather than rural areas. Prior studies looking at employment growth rates in cities have tested three (in some respects competing) hypotheses concerning the way in which knowledge spillovers affect growth. The first hypothesis, originally developed by Marshall (1890) and later formalized by Arrow (1962) and Romer (1986) (MAR), emphasizes spillovers between firms in the same industry that arise, for example, through inter-firm movements of skilled labor. These spillovers are thought to be most important when little prevailing local competition is present so that rents associated with sector-specific knowledge can be internalized. The second hypothesis, as developed by Porter (1990), agrees that knowledge spillovers within a localized industry are most important, but argues that their effects on growth are enhanced when fierce local competition forces firms to innovate in order to survive. The third (Jacobs 1969) emphasizes spillovers between (rather than within) industries, playing up the notion of cross-fertilization of ideas, and contends that they promote growth most effectively in a competitive

environment. Of course, a fourth theory could be developed by combining aspects of MAR, Porter, and Jacobs that would emphasize the role of industrial diversity in a non-competitive environment.

This paper tests how well these theories predict one aspect of urban employment growth; i.e., that part of growth arising from entrepreneurship or the birth of new establishments. Focusing on establishment births sets this paper apart from the related literature on employment growth and facilitates analysis in at least two ways. First, initial economic conditions prevailing in an area at the beginning of the sample period can arguably be treated as exogenous determinants of births. In other words, new establishments can be viewed as taking initial conditions as given and then deciding where to locate. Second, new establishments do not have a prior history of location, input, and output choices that needs to be accounted for. Thus, this analysis avoids the frequently intractable problem of collecting historical establishment-level data on capital stocks. In any case, births are treated as count variables and empirical models of this variable can be estimated in Poisson and/or negative binomial frameworks.

As indicated previously, data are taken from the Dutch province of South-Holland. South-Holland is approximately 2350 km² (about the size of the Dallas-Ft. Worth metropolitan area in the U.S.) and has a high population density (about 1190 persons/km²). It covers a large part of the core economic area of the Netherlands, the Randstad, and includes the second and third largest cities in the Netherlands (Rotterdam and The Hague) as well as numerous medium sized cities such as Leiden, Delft and Schiedam. These cities are located in close proximity to each other and the province can

be usefully viewed as a single urbanized area with a small amount of open space (the “green heart”) near the center.

Data used in this study, available from the BZH Firm Register, are of interest for at least four reasons. First, the data are comprehensive in that they include virtually all births of new establishments in South-Holland in each year of the sample period. Establishments are enumerated based on information furnished by the Chamber of Commerce, insurance companies, and industrial sector associations and an annual questionnaire is sent to each. The average annual response rate to the questionnaire is 96%. The data set contains just over 1 million observations, giving annual information on approximately 100,000 establishments over the period 1988-1997. Additionally, given that each establishment in the data set is given a unique identification number, “old” establishments that existed at the beginning of the sample period can be distinguished from “new” establishments that either started-up in or relocated during the sample period. The analysis below separates start-ups from establishments that relocated and then treats the number of start-ups (by industry) as the unit of analysis.

Second, the data have been extensively checked for accuracy. For example, in a social employment project for the disabled and mentally handicapped, all ‘doubtful’ businesses in the data set are visited to be certain that they really exist. If doubt remains after the visit, the case is checked out in more detail by a professional researcher using all information sources available. Special attention is given to businesses with one employee, since many of these cases are simply ‘mailbox’ enterprises established only for tax-related reasons. Such enterprises are eliminated from the data set. Additionally, the employment data from this source are adjusted using an RAS procedure so that they

match corresponding data distributed by the Central Bureau of Statistics at the municipality level (Van Oort 2001).

Third, the information available is very detailed. Questionnaire results identify each establishment's 6-digit zip code (a small area containing about 100 different mailing addresses), and 5-digit activity code; a level of detail that is actually too great for meaningful analysis. Because many of the 6-digit zip code areas have only residences and most 5-digit industries have few new establishments in South-Holland, data were analyzed at the 4-digit zip code, 2-digit industry level. Despite aggregation, the spatial scale of the data still is quite small, particularly in comparison to that used in U.S. studies. South-Holland contains 416 4-digit zip code areas that average about 5.65 km² in size, although they are smaller in urban areas where the density of addresses is high and larger in areas that have more open space. Additionally, previous studies of employment growth in cities have analyzed 2-digit industry data (Glaeser *et al.* 1992, Henderson *et al.* 1995).

Fourth, the small size of South-Holland provides a natural control for location-specific heterogeneity. In fact, several variables enumerated in related studies (Henderson, Kuncoro, and Turner 1995, Henderson 1997, Kim 1999, Ellison and Glaeser 1999) are potentially important location-specific factors that may affect either employment growth or establishment birth rates either are roughly constant between locations in South-Holland, or else can be at least partially controlled. Cultural differences between locations in South-Holland are negligible. Variations in taxes, environmental amenities (such as climate), and environmental regulations between locations are quite small. Differences in prices of non-land inputs exhibit little variation across the province. Prices charged for energy inputs vary by sector, but within a sector,

they are the same throughout the province. Wages also vary by sector, but not much within sectors. The province is small enough that workers can live in one zip code area and commute to work in almost any other (as well as to areas in other provinces) using either public or private transportation modes, and in fact they do. Thus, wage rates within a sector would be uniform and there is little need to control for labour force characteristics such as level of education, percent of workers with particular skills, or percent of workers who are union members. There are, of course, historical factors that have led to the current spatial organization of economic activity. These factors can be controlled to some extent by including explanatory variables that measure the spatial layout of the province. Yet, land prices and land availability may vary greatly between zip code areas as some still are more or less rural and others are fully built-up. This and other remaining sources of unobserved heterogeneity are dealt with econometrically (see below).

The dependent variable used in the analysis measures the number of births of new businesses in four industry groups (ICT hardware (*H*), ICT services (*S*), producer services (*PS*), and manufacturing (*MN*)) over the period 1988-97 in each of the 416 South-Holland zip code areas. The first two sectors are of immediate interest in light of the main emphasis of this paper. ICT hardware includes production of fiber-cables and equipment, production of telecommunications, audio, and video equipment, and production of measurement, regulatory, and control equipment. ICT services include telecommunications services, and computer software and information technology agencies and consultancies. Also, these two sectors are components of producer services; other subsectors within producer services include business services, wholesale trade, and research and development. While they are not the main focus of the analysis, estimates

for manufacturing are presented for comparison purposes. The manufacturing sector includes chemicals, electronics, metal products and machinery.

Table 1 provides summary information regarding births of new establishments in South-Holland. As shown, there were over 57 thousand establishment births in all industries (about 137.6 per zip code) in South-Holland over the period 1987-98. About 32% of these births occurred in producer services, and about 6.5% percent of births occurred in manufacturing. Births in ICT hardware and computer services represented a small fraction of births in the broader producer services sector and together account for 2.3% of total establishment births in South-Holland. In South-Holland as a whole, only two zip code areas had no establishment births over the ten year period studied. ICT hardware, computer services, producer services, and manufacturing had no births in 355, 68, 11, and 33 zip code areas, respectively.

This study utilizes a more detailed set of explanatory variables than those used in related studies and are aimed at measuring aspects of agglomeration economies emphasized by the previously discussed MAR, Porter, and Jacobs theories. *SpecInd*, a measure of industrial concentration, is a location quotient showing the percentage of employment accounted for by an industry ($Ind=H, S, PS, MN$) in a zip code relative to the percentage of employment accounted for by that industry in South-Holland. This variable measures whether an industry is over- or under-represented in a zip code compared with the average representation in South-Holland. Industrial diversity in a zip code area is measured by computing the *Gini* coefficient for employment in all industries there. Because this coefficient measures the area between the 45 degree line and a Lorenz curve, larger values *Gini* means that employment is more unequally distributed across the

economic sectors of a zip code area. Also, notice that unlike the variable *SpecInd*, *Gini* is the same for all industries in a zip code area. The variable *CompInd*, defined as the number of establishments per worker in an industry ($Ind=H, S, PS, MN$) in a zip code area, has alternative possible interpretations. Glaeser *et al.* (1992) interpret this variable as a measure of local competition on the assumption that competition is more intense among a larger number of smaller establishments than among a smaller number of larger establishments. This interpretation, however, has been called into question by Combes (2000), who contends that it may measure internal diseconomies of scale, and by Rosenthal and Strange (2000), who view it as a broader measure of local industrial organization.

Because of the small geographic size of the South-Holland zip codes, the above measurements of industrial specialization, industrial diversity, and competition may not tell the whole story. In consequence, we also include measures of these three factors in other zip code areas. *WSpecInd*, *WGini*, and *WCompInd* are weighted sums of *SpecInd*, *Gini*, and *CompInd* outside the zip code area where the weights are given by the reciprocal of distance (in km) between centers of zip code areas. Thus, effects of industrial specialization, industrial diversity, and competition are divided into “own-zip code area” and “out-of-zip code area” effects. Additionally, in measuring competition it may be particularly important to include a measure of the out-of-zip code effect. Firms may face substantial competitive pressure from outside the local area and this argument is strengthened when the “local area” is as small as a South-Holland zip code.

Also, notice that *SpecInd*, and *Gini* control for relative industrial specialization and diversity in a zip code area relative to other zip code areas. In consequence, it is useful to

include variables measuring absolute levels of employment in a zip code area both within an industry (*EmpInd*) as well as outside that industry (*EmpOther*) in order to control for effects on births that arise because of the scale of economic activity. Distance-weighted sums of these variables (*WEmpInd*, *WEmpOther*), computed as discussed above, also were included in the analysis. Remaining variables control for effects of population, wages, and the spatial layout of the South-Holland province. In particular, *Population* measures own-zip code area population and *Wpopulation* is a distance-weighted sum of population in all other South-Holland zip code areas. *WageInd* (*Ind=H, S, PS, MN*) measure wage levels in the industry under consideration. Because the wage variable is specific to industries only at the regional (COROP) level (there are five such regions in South-Holland), we cannot distinguish between own-zip code and out-of-zip code effects.

Additionally, several variables are used to capture historical factors affecting the spatial organization of economic activity in South-Holland. *DisRotterdam* measures distance of the center of a zip code from Rotterdam harbour. *DisAmsterdam* measures distance of the center of a zip code from Amsterdam and *DisUtrecht*, (which measures proximity to the region's hinterland) is the distance from a zip code center to Utrecht. *DisHighway* measures the distance in kilometers from the center of a zip code area to the nearest main highway. *Urban* is a dummy measuring whether the zip code area is classified as urbanized. *Work* is a dummy variable measuring whether a zip code area is primarily a work area and *Mix* measures whether a zip code area is a mixed work and residential area. (A dummy variable indicating whether a zip code area is primarily residential is omitted from the analysis.) Distance-weighted sums of *Urban*, *Work*, and *Mix*, labeled *WUrban*, *WWork*, and *WMix* also were included in the analysis to control for

effects of these same factors in surrounding zip codes. Further details regarding construction of all variables described above as well as more complete information about data sources are presented in Appendix A.

Results presented in the next section can be used to make at least a suggestive test the three hypotheses outlined earlier. For example, we have several measures indicating the extent of activity in an industry in a zip code area as well as in neighboring zip code areas. *SpecInd* and *WspecInd* indicate its relative concentration locally as compared to other zip code areas, whereas *EmpInd* and *WEmpInd* measure its absolute scale. So, for example, the coefficient of *SpecInd* measures the effect of an increase in relative concentration of employment on establishment births in an industry in a zip code area, holding constant both the absolute scale of economic activity in a zip code area as well as the relative scale of economic activity elsewhere. The coefficient of *EmpInd*, on the other hand, measures the effect on births of an increase in the scale of activity in an industry in a zip code area, holding relative concentration (and other factors) constant. Positive effects of specialization and negative effects of competition would support the MAR view. Of course, as previously discussed, *CompInd* and *WCompInd* may be poor measures of local competition, but even if so, positive coefficients on the other two variables still provide some (albeit weaker) support for MAR. On the other hand, if the absolute and relative measures of industry specialization positively affect births, but the coefficients of the competition measures are positive, the Porter hypothesis would be supported. The Jacobs hypothesis would be supported if increases in local industrial diversity, measured by the Gini coefficients and the level of employment outside the industry, and local competition positively affect establishment births. Notice also that test

of these hypotheses are conditioned on the inclusion of the other variables described above.

3. *Results*

Table 2 presents evidence on the determinants of establishment births in South-Holland. Estimates of equations presented initially were obtained from a Poisson regression model; however, this framework proved to be too restrictive because the implicit assumption that the mean of the dependent variable equals its variance is violated in each case. LM tests based on the Poisson regressions (see Greene 2000, pp. 885-86) strongly suggested overdispersion and that more general count data methods, such as a negative binomial model, may be more appropriate. The negative binomial model is a simple generalization of the Poisson model that introduces (in this analysis) a multiplicative random, zip code specific, unobserved effect into the conditional mean function for establishment births (Cameron and Trivedi (1998 pp. 96-102). Thus, the negative binomial approach allows zip code areas to differ in a manner not fully accounted for by the observed covariates, has a natural interpretation as a random effects estimator, and offers a statistical control for unobserved heterogeneity among zip code areas. Recall that in Section 2 we argued that this problem is partially controlled by focusing on a small geographic area. Use of the negative binomial estimator, then, offers another level of control for remaining unobserved heterogeneity that can arise from differences in land prices, land availability and other factors (see Section 2).

In each of the four regressions, Table 2 presents negative binomial coefficients and Huber/White standard errors, computed as a correction for heteroskedasticity. The number of observations in each regression is 416, the number of South-Holland zip

codes. Marginal effects of a change in an explanatory variable on establishment births can be computed by multiplying the appropriate coefficient shown in the table by the predicted value of births from the regression (see Greene 2000, p. 551). As a consequence, negative binomial coefficients and marginal effects differ only by a multiplicative constant; hence, the latter are not presented. Also, likelihood ratio statistics (the smallest of which is 47.40 for ICT Hardware) suggest that a joint test that coefficients of explanatory variables are zero would be rejected in each regression at the 1% level using a Chi-Square test with 12 degrees of freedom.

A common feature of the regressions for ICT Hardware and ICT Services is that coefficients of *SpecInd* and *WspecInd* are positive and significantly different from zero at conventional levels, while coefficients of *EmpInd* and *WEmpInd* do not differ significantly from zero. Thus, increasing relative own-zip code and neighboring-zip code area specialization in these two sectors promotes greater numbers of establishment births, whereas, the absolute level of employment does not appear to matter. These results are consistent with findings regarding the role of specialization obtained by Beardsell and Henderson (1999), who studied employment growth in the U.S. computer industry. They are also consistent with results obtained for other industries reported by Henderson *et al.* (1995), but conflict with findings for city-industries reported by Glaeser *et al.* (1992).

Similar to the Glaeser *et al.* (1992) study, however, we find that industrial diversity positively contributes to establishment births. Coefficients of *Gini* are negative with t-statistics that exceed 2.0 in absolute value. Thus, a more equal distribution of employment within a zip code area contributes positively to establishment births in ICT Hardware and ICT Services. These results are reinforced by the outcome for coefficients

of *EmpOther* and *Population*, which are positive and significantly different from zero in the regressions for both of the ICT sectors. In other words, not only does relative industrial diversity contribute to greater rates of establishment births, the effect of absolute scale of employment and population outside the ICT sectors also appears to work in the same direction. Effects of both relative industrial diversity and the absolute scale of activity outside the ICT sectors, but outside the own-zip code area, on the other hand, are unimportant.

Results also suggest that the number of establishments per worker in ICT, tentatively interpreted as a measure of competition, may play a positive role in fostering births; but the evidence is weak. Coefficients of *CompInd* are positive for both ICT hardware and ICT Services, but they are not significantly different from zero at conventional levels. Also, performance of *WCompInd* is mixed with a positive and significant coefficient in the ICT Services regression, but an insignificant coefficient in the ICT Services regression. Thus, the results appear to downplay the importance of prior discussion in the literature of the appropriate interpretation of the establishments per worker variable. Regarding other variables included in the two regressions, designation of a zip code area as primarily a work area and proximity to other zip codes with a similar designation is not surprisingly positively associated with more establishment births. Other variables, including the designation of a zip code as an urban area as well as those measuring wages and distance from major Dutch cities, did not have significant coefficients at conventional levels.

Results for the Producer Services and Manufacturing sectors largely reinforce the outcomes just described for the two ICT sectors. Notable differences are that the

coefficient of *WspecInd* is not significant in the Producer Services regression and coefficients of *WGini* are negative and significantly different from zero in the regressions for each of these two sectors. However, inspection of Table 2 indicates that much of the discussion of results for the ICT sectors carries over to the regressions for Producer Services and Manufacturing. In any case, results for all four sectors suggest that relative industrial specialization and relative industrial diversity both foster more establishment births. Also, the absolute scale of employment in other industries both in a zip code area as well as in neighboring zip code areas positively affects firm births, too.

Interestingly, these results do not provide unambiguous support for any of the three endogenous growth theories discussed in Section 2. Results for industrial specialization support the MAR and Porter hypotheses, but results for industrial diversity and competition do not. Results for industrial diversity support the Jacobs hypothesis, but the outcomes for industrial specialization and competition do not. Yet, results presented still are of interest from the broader perspective of those concerned with the location tendencies of start-up establishments in the ICT sector. Again, these firms tend to cluster in zip code areas that already are employment centers, rich in industrial diversity.

4. Conclusions

This paper has empirically investigated determinants of growth in the information and communications technology (ICT) sector in the Dutch province of South-Holland. The empirical investigation makes use of a unique and highly detailed data set on births of new establishments in these sectors in each of 416 4-digit zip code areas in this province. The small size of South Holland offers control for certain types of unobserved

heterogeneity, such as aspects of labor market conditions, that have plagued earlier studies. Additionally, the negative binomial estimator used in the analysis provides further control for unobserved heterogeneity that may arise because of differences in land prices and land availability that may vary substantially among zip code areas in South Holland.

Results from this analysis suggest that new establishments in the ICT sector tend to be concentrated in zip code areas that are already relatively specialized in this sector and that are relatively rich in the presence of other industries. This outcome does not fully support or contradict three theories, of knowledge spillovers, attributed to Marshall-Arrow-Romer, Porter, and Jacobs that frequently have been tested using data from urbanized areas. Yet, it does provide some insights into the types of areas where ICT establishments choose to locate. This result, however, should be treated cautiously because to date, most studies of location determinants have focused on employment growth; relatively few have looked at the component of employment growth arising from establishment births. Additional studies of establishment births will be necessary before it can be known whether results presented here will carry over to other settings. It will be most helpful if some of the needed studies are conducted in an international context.

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Table 1: Establishment Births in South-Holland

Sector	Total Births	Mean Births per Zip Code	Standard Deviation of Births	Zip Codes with Zero Births
ICT Hardware	63	0.15	0.37	355
ICT Services	1,261	3.03	3.27	68
Producer Services	18,578	44.68	44.65	11
Manufacturing	3720	8.94	8.41	33
TOTAL (All Sectors)	57,249	137.61	62.54	2

TABLE 2: Determinants of Establishment Birth

Explanatory Variable	ICT Hardware	ICT Services	Producer Services	Manufacturing
<i>Constant</i>	-6.546 (-0.94)	2.122 (1.21)	5.471 (3.24)	4.891 (2.26)
<i>SpecInd</i>	0.178 (2.78)	0.180 (3.95)	0.353 (2.30)	0.284 (3.75)
<i>WSpecInd</i>	0.364 (2.10)	0.203 (3.00)	-0.0042 (-0.23)	0.362 (2.93)
<i>CompInd</i>	0.018 (1.39)	0.007 (1.22)	0.007 (0.22)	-0.006 (-0.65)
<i>WCompInd</i>	0.021 (0.75)	0.031 (2.76)	-0.004 (-0.34)	0.035 (2.00)
<i>Gini</i>	-3.467 (-2.60)	-1.572 (-3.12)	-1.999 (-4.31)	-2.911 (-6.58)
<i>WGini</i>	-0.379 (-0.201)	-0.814 (-1.88)	-1.226 (-3.41)	-1.116 (-2.01)
<i>WageInd</i>	-0.020 (-0.47)	-0.012 (-1.32)	-0.048 (-3.54)	-0.005 (-0.34)
<i>Population</i>	3.46E-05 (0.82)	8.73E-05 (5.70)	9.29E-05 (6.99)	7.61E-05 (5.83)
<i>WPopulation</i>	1.25E-04 (1.64)	2.15E-05 (1.03)	5.19E-05 (2.85)	1.44E-05 (0.55)
<i>DisRotterdam</i>	0.041 (0.54)	-0.023 (-1.06)	-0.017 (-0.98)	-0.053 (-2.33)
<i>DisAmsterdam</i>	0.012 (0.20)	-0.029 (-1.73)	-0.001 (-0.10)	-0.027 (-1.50)
<i>DisUtrecht</i>	0.020 (0.63)	0.002 (0.17)	-0.011 (-1.69)	-0.005 (-0.56)
<i>Urban</i>	-0.262 (-0.84)	-0.073 (-0.63)	-0.020 (-0.20)	-0.233 (-1.97)
<i>Wurban</i>	-0.645 (-1.09)	0.026 (0.14)	0.127 (0.77)	0.099 (0.45)
<i>Work</i>	0.311 (0.64)	0.454 (2.48)	0.362 (2.38)	0.404 (2.09)
<i>Wwork</i>	0.946 (0.82)	0.867 (2.51)	1.279 (4.60)	0.385 (1.02)
<i>Mix</i>	0.291 (0.79)	0.069 (0.69)	0.178 (2.01)	0.238 (2.25)
<i>Wmix</i>	-0.540 (-0.65)	-0.234 (-1.06)	0.508 (3.35)	-0.051 (-0.24)

<i>KmDist</i>	0.046 (1.27)	0.004 (0.37)	0.011 (1.27)	0.020 (1.72)
<i>EmpOther</i>	0.0002 (3.02)	0.00012 (5.00)	0.00015 (4.23)	0.0001 (3.29)
<i>WEmpOther</i>	-4.67E-05 (-0.39)	-4.19E-05 (-1.100)	-9.02E-05 (-3.822)	-6.85E-07 (-0.02)
<i>EmpInd</i>	-0.007 (-1.62)	-0.0007 (-1.26)	-0.0002 (-1.69)	-9.70E-05 (-0.61)
<i>WEmpInd</i>	-0.20 (-1.54)	-0.0004 (-0.72)	-0.013 (-1.15)	-0.0004 (-1.43)
<i>Summary Statistics</i>				
<i>N</i>	416	416	416	416
<i>LR Statistics</i>	47.40	169.50	233.97	194.63

APPENDIX A: DESCRIPTION OF THE DATA

The data used in this paper are derived from various sources. The most important sources are the longitudinal datasets of the Firm Register South-Holland (BZH) and the National Information System on Employment (LISA, the nationwide firm register in which the BZH is embedded). Registration is at the level of individual firms, including detailed information on location (6-digit zip-code) and activity (5-digit SBI93-code, completely consistent with NACE and ISIC industrial classifications). However, actual firm level data are only available for South-Holland; the Netherlands data set only gives information on sectoral employment (i.e., aggregate employment of all firms in a specific sector) in each 6-digit zip code area. Various other sources have been consulted to construct and verify the remaining variables, like data from the Chamber of Commerce in 1990 and CBS statistics on (aggregate) employment development. The Netherlands wage data have been obtained from CBS Labour Statistics whereas the regional South-Holland wage rates are obtained from the CBS's Annual Regional Economic Dataset (various years). The variable measuring the distances between zip code areas and from cities such as Rotterdam was constructed using Atlas*GIS, ArcInfo and ArcView geographical information systems. The authors can supply more details about these data on request.
