KTH Architecture and
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Essays on Regional Growth, Comparative Advantages and Foreign Direct Investments

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ABSTRACT

This thesis consists of four essays, covering four different topics. The first essay investigates the relationship between inter-firm labor mobility and regional productivity growth. Previous studies have shown that density is positively correlated with growth. I claim that it is not density in itself, but rather the attributes associated with it that drives economic growth. One such attribute is the increased possibility for labor mobility and knowledge diffusion that follows when firms and individuals locate in close proximity to each other. This hypothesis is tested using density as an instrument for labor mobility. The result shows that labor mobility increases regional growth rates.

The second essay examines the relationship between agglomeration economies and relative wage costs in influencing location of multinational corporations. An inflow of firms to certain regions and industries is likely to increase demand for labor. If mobility of labor is low increased costs can be expected to deter additional inflows of firms, albeit agglomeration economies may compensate for higher wages. The empirical analysis finds that FDI has become increasingly sensitive to differences in wage costs across industrialized countries, but also that agglomeration economies related to knowledge externalities positively influences higher costs.

The third essay looks at the impact of FDI on home country investments. Previous research has been inconclusive as regards the effects on domestic investments. In this article, we show that this inconclusiveness can be explained at a disaggregated level as a function of the way industries are organized. We argue that a complementary relationship can be expected to prevail in vertically integrated industries, whereas a substitutionary relationship can be expected in horizontally organized production. The empirical analysis confirms a

significant difference between the two categories of industry as regards the impact of outward FDI on domestic investment.

The fourth, and final, essay of this thesis analyses how increased R&D expenditures and market size influence the distribution of comparative advantage. Previous studies report ambiguous results and also refer to periods when markets were much more segmented and production factors less mobile. The empirical analysis comprises 19 OECD-countries and spans the period 1981 to 1999. It is shown how an increase in R&D-expenditures by one percentage point implies a three-percentage point increase in high-technology exports, whereas market size fails to attain significance. In addition, institutional factors influence the dynamics of comparative advantage.

Keywords: Agglomeration, agglomeration economies, dynamic comparative advantage, FDI, gross domestic investment, industry-specific effects, institutions, labor mobility, market size, R&D, regional growth, relative costs

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Per Thulin

Summary of the Thesis

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The thesis comprises four essays covering four different topics in economics. This chapter provides a short summary of the essays.

Essay 1: Labor Mobility, Knowledge diffusion and Regional Growth

The first essay in this thesis studies the impact of labor mobility on regional productivity growth. Labor mobility can affect productivity in at least two ways. First, labor mobility facilitates knowledge diffusion by exposing the worker to a wider set of other workers, thereby increasing the potential for human interactions and knowledge flows. Knowledge flows from the new worker to the incumbent workforce, but also from the incumbent workforce to the new worker, leading to an overall increase in human capital in the region. Second, the quality of the match between a worker and a job is likely to improve as the worker move between different employers and tries different jobs. A better match between workers' skills and aptitudes and what is required by the job lead to a more efficient allocation of the workforce and higher overall productivity. Labor mobility can therefore be expected to have a positive impact on the level and growth rate of regional productivity regardless of which one of the two abovementioned mechanisms we refer to.

Human capital and knowledge is generally regarded as the prime means behind sustained economic growth – the engine of growth (Lucas, 1988). Since knowledge diffusion is facilitated by, and in many cases requires, face-to-face interactions, this gives a central role to proximity in explaining growth. Previous studies support this view and show that density, measured along various dimensions, is positively related to productivity (Ciccone and Hall, 1996; Ciccone, 2002; Braunerhjelm and Borgman, 2004). However, the mechanisms through which this relationship works is usually left unexplained in the empirical literature or is only briefly commented upon.

The hypothesis pursued in this paper is that knowledge diffusion and labor market efficiency are higher in regions with higher labor mobility, and hence, that labor mobility constitutes one mechanism behind the relationship between density and productivity growth.

The econometric analysis is based on a matched employer-employee dataset covering all employed individuals, aged 16–64 years, in the private sector of the Swedish economy between 1997 and 2005. The impact of labor mobility on regional growth is estimated in two steps, where the first step is aimed at obtaining measures of labor mobility, controlling for heterogeneity along several dimensions. This step utilizes the micro structure of the dataset and implements probit analyses at the individual level, regressing intraregional labor mobility on individual and firm characteristics and a set of regional dummy variables. The estimated coefficients of the regional dummies are subsequently used as a measure of intraregional labor mobility.

The second step uses cross-section regression analysis to assess the impact of labor mobility on regional wage growth. The unit of observation is Swedish labor market regions (FA-regions), defined as areas in which people can live and work without having too long commuting times. Regional wage growth is regressed on the intraregional labor mobility variable obtained in step one and a set of control variables, using density and density squared

as instruments for labor mobility. Potential spatial autocorrelation is dealt with by including accessibility measures among the exogenous variables.

The result from the analysis shows that labor mobility is statistically significant and positively related to productivity growth. An additional result is that regions embedded in larger knowledge abundant areas tend to benefit from interregional spillover effects yielding further productivity growth.

Essay 2: Agglomeration, Relative Wage Costs and Foreign Direct Investment

The deregulation created by the European integration process – within as well as between nations – has turned the issue of firm location into a highly topical point on the political agenda in Europe. Integration makes firms more exposed to inter-country differences with respect to production costs, market size, knowledge spillovers, etc., thereby stiffening the competitive pressure under which firms operate. Similarly, differences in macroeconomic regimes and the institutional setting across countries also become more transparent. The spectacular growth in global foreign direct investment (FDI), and the European Union's (EU's) increasing involvement in this process since the 1980s and 1990s, leaves little doubt that regional integration does influence the location of firms.

This brings up a number of questions concerning the current restructuring of the European industry and its spatial implications. According to mainstream new economic geography models, the basic determinants of firms' locations can be allotted trade/transport and production costs together with the degree of scale and agglomeration economies (Krugman 1991; Fujita, Krugman and Venables 1999).[1] These factors clearly allude to strategic FDI-decisions taken by profit-maximizing multinational corporations (Buckley and

[1] See also Brainard (1993), Krugman and Venables (1995), Markusen (1995), Markusen and Venables (1995), Dunning (2002) and Buckley and Ghauri (2004). For a survey, see Braunerhjelm et al. (2000).

Casson 1976), as well as the OLI framework frequently imposed in the analysis of international business (Dunning 1977). This paper aims at making a contribution in that direction by examining the relationship between locations of multinational corporations, relative production costs and agglomeration economies.

Using country- and industry level data numerous studies have addressed how FDI influence home country employment and production, sensitiveness to wage differences, the impact of existing agglomerations on FDI, knowledge sourcing, etc.[2] However, to our knowledge, no empirical analysis has examined whether agglomeration economies may compensate for higher wage costs in the presence of the alleged lack of labor mobility in certain regions of the world. That would also influence the spatial distribution of production. In particular, can we expect Europe's more immobile labor market – where a shift in location of production is not accompanied by labor flows – to generate a more "fragmented" distribution of production as compared to other regions, particularly the U.S.?[3]

To examine these issues we pool a unique data set on the location of foreign production by Swedish multinational corporations (MNCs), spanning the period 1974 to 1998, with host-country data (38 countries) for the same period classified on cost-, agglomeration- and policy variables. We formulate and test three hypotheses:

H1 In countries (regions) characterized by low labor mobility, locations of MNCs will be positively influenced by the degree of agglomeration of production but negatively affected by higher relative wage costs which tends to erode profits and deter further agglomeration.

[2] For a broad survey, see Caves (2007).

[3] Blanchard and Katz (1992) show that the labor migration adjustment process works in the U.S. However, in Europe only about 1 percent of the EU workers are employed in a member state different from their home country. Even within the respective country, labor mobility is often limited. Obstfeld and Peri (1998) show that labor mobility is approximately twice as large in the U.S. compared to a number of European countries for the period 1980-1995. See also Braunerhjelm et al. (2000).

H2 In countries (regions) characterized by high labor mobility, locations of MNCs will be unambiguously positively influenced by the degree of agglomeration of production and there will be no or weak signs of negative effects related to higher relative wages due to inflows of labor which tend to positively affect profits and reinforce agglomeration.

H3 Countries (regions) characterized by strongly agglomerated industries may generate external economies that compensate for differences in relative wages, implying that higher production costs have no or insignificant impact on agglomeration.

One clear result from the analysis is that agglomeration factors do influence the location of production. At the same time, differences in relative wage costs are reported to have a negative effect on the location and production of MNCs in the EU. Considering the relatively modest mobility of the European labor force, this suggests that concentration to a limited number of regions within Europe is less likely, since an inflow of MNCs would tend to increase wages which would then deter further inflows of production. Alternatively, in countries outside the more homogenous Europe, differences in relative wage costs may also reflect differences in productivity.

In addition, economic policy variables were found to influence the outcome of the location of firms. First, an expansionary fiscal policy (high taxes) resulting in large public expenditures relative to GDP seems to be negatively associated with firms' locational decisions. Since this is not entirely due to the size of public expenditures, but more likely their composition, we control for education. The average spending on education is found to strongly increase the probability of inflows of FDI and also has a positive impact on the level of production. Finally, the effect of openness on location is more ambiguous even though there are indications that the effect is positive, except for more distant markets. We also

controlled for market size and the relative abundance of capital, both of which were shown to exert a strong positive influence on MNC entry.

Essay 3: The Relationship Between Domestic and Outward Foreign Direct Investment

This essay investigates the effect of outward foreign direct investment (FDI) on domestic investments. There have been both political and general concern regarding the effects of transferring resources abroad could have on the domestic economy. Some have argued that resources are scarce and that investing capital abroad implies a shortage of capital for domestic investments, leading to reduced economic activity and unemployment. If this is an accurate description of the effects involved, politicians must take this into account when formulating policies. On the other hand, if capital markets are efficient in allocating capital, then other political measures are called for. Thus, it is of vital importance to know how the relationship between outward FDI and domestic investments looks like in order to formulate an adequate policy. Earlier empirical studies of the relationship have been inconclusive. By using industry level data for the U.S., Herring and Willett (1973) and Noorzoy (1980) concluded that outward FDI and domestic investments were positively related, whereas other studies have come to the opposite conclusion (Belderbos, 1992; Stevens and Lipsey, 1992; Feldstein, 1995).

In this essay, we argue that the divergent results generated by earlier studies could be due to not taking industry specific effects into account when estimating the relationship between outward FDI and domestic investments. Adopting a simple two-industry model we show that industry-specific factors do influence the relationship between FDI and domestic gross fixed capital formation. More precisely, a substitutionary relationship between foreign and home-country investment can be expected for R&D-intensive, horizontally organized

industries (referred to as the Schumpeter industry), whereas a complementary investment relationship prevails for vertically integrated industries, originating in traditional comparative advantage factors (referred to as Heckscher–Ohlin industry). We use R&D-intensity, defined as expenditures on R&D divided by value added, as a proxy for the degree of horizontal integration and employ cluster analysis on this variable to separate between Schumpeter- and Heckscher-Ohlin industries in Sweden. The results indicate that only two industries are classified as Schumpeterian – the chemical industry and the industry for fabricated metal products, machinery and equipment. The remaining seven industries are consequently classified as Heckscher–Ohlin industries.

In the empirical part of the essay, we estimate the effect of outward FDI on domestic gross fixed investments, distinguishing between FDI to the European Union (EU) and to the rest of the world. The FDI variable is also interacted with R&D-intensity to allow for industry specific effects on domestic investments. In addition to these four key variables, we control for export lagged one year, R&D-intensity, total taxes divided by GDP, percentage change in the relative unit labor costs, three different specifications of GDP growth and time dummies for 1986 and 1995 to control for the enlargement of the EU in those years. Domestic investments, FDI and export are specified as first-differences. The dataset used to estimate the relationship between domestic investments and the explanatory variables covers the Swedish manufacturing sector, distributed on nine industries, for the period 1982–2001. To somewhat reduce the effect of the highly volatile investment pattern shown by firms that grow mainly through the acquisition of other firms, we have estimated the model on a basis of 3-year moving averages.

The impact of the explanatory variables on domestic investments is estimated using regressions with fixed industry-specific effects and controlling for the autocorrelation invoked by the use of moving averages. The results show a significant, positive impact of FDI to the

EU on domestic investments. The significant, negative coefficient for the interaction variable between FDI to the EU and R&D-intensity also shows that the impact differ between industries, depending on their R&D-intensity. The positive impact of FDI to the EU turns into a substitution one when expenditures on R&D exceed 20 percent of value added. This is the case for our Schumpeter industries in 2001. As regards the estimated result for FDI to the rest of the world, both the level and the level interacted with R&D-intensity are insignificant. Turning to the control variables, export is highly significant and shows an expected positive relationship with domestic investments, taxes is negative and slightly significant in two out of four regressions, R&D-intensity and relative unit labor costs are negative, albeit insignificantly estimated and finally, all three specifications of the growth variable have an expected positive sign and are significant.

The result from the empirical analysis highlights the importance of taking industry-specific effects into account when trying to explain how FDI affect the home-country economy. This also shed some light on why previous studies of the relationship have been inconclusive.

Essay 4: Can Countries Create Comparative Advantages?

This essay empirically investigates the dynamics of comparative advantages with special focus on countries' ability to generate comparative advantages in knowledge-intensive production by investing in R&D. According to traditional trade theory, increased R&D investments should have this effect, either by affecting the relative factor endowments (Heckscher–Ohlin), or by enhancing the production technology (Ricardo), thereby making it possible for a country to specialize in more knowledge-intensive production. Both these

theories therefore predict that increased R&D investments, over time, should alter the composition of a country's production and export in favor of more high-technology products.

Whereas trade theories stress the importance of accumulating production factors for altering a country's comparative advantages, new economic geography models emphasize economies of scale and market size. Since production of knowledge is characterized by economies of scale, we should expect to find knowledge-intensive production concentrated to larger markets, thus giving larger countries a comparative advantage in the production of high-technology products. The importance of market size as a determinant of comparative advantages may have increased during the last decades due to increased economic integration and trade liberalization, facilitating factor mobility and trade. An implication of this is that, since the production and exploitation of knowledge not necessarily need to take place in the same country, increased investments in R&D do not have to be reflected in a country's export composition.

In the empirical part, we try to discern the effects of these two alternative sources on countries' comparative advantages. The dependent variable, assumed to mirror comparative advantages, is defined as the share of high-technology products in total export. Effects on the export composition stemming from knowledge accumulation is supposed to be captured by R&D expenditures relative to GDP, and effects from the new economic geography theory from countries' GDP relative to total GDP in the OECD region. Beside these two key variables, we also take into consideration countries' institutional setting by including public expenditures in relation to GDP as an explanatory variable. This is usually not done in earlier empirical studies of comparative advantages, and may be responsible for their diverging results. In addition to these variables, we also control for public expenditures on education relative to GDP, capital stock per worker, outward flow of foreign direct investments divided by GDP, technology balance of payments and production of medium technology goods

relative to GDP. A linear trend variable is included to capture the observed trend wise increase in our dependent variable during the last two decades. Finally, we interact R&D expenditures with a dummy for Ireland, since the effect of R&D expenditures on the share of high-tech export seems to be much stronger for Ireland than for the rest of the included OECD countries.

The compiled dataset comprises 19 OECD countries, covering the period 1981–1999. Data are collected for every second year, giving us a balanced panel of 190 observations to perform the estimations on. We employ panel estimations with fixed country-specific effects to estimate the impact of the explanatory variables on our proxy for comparative advantages. The results from the regression show a robust and highly significant positive impact of R&D expenditures on the dependent variable. An increase in the R&D to GDP ratio by one percentage point increases the high-tech share in export by approximately three percentage points. Thus, there seem to be strong support for the trade-based view of factor accumulation as a primary force affecting comparative advantages across countries. The estimated impact of market size, on the other hand, has the expected positive sign throughout the regressions, but fails to achieve any reasonable level of significance. This implies that our analysis does not support the hypothesis posed by new economic geography models, that market size is a crucial determinant of comparative advantages. Our proxy for the institutional setting has a negative estimated effect on the dependent variable, however only significant in two out of four regressions. The overall conclusion from the study is that countries can affect their comparative advantages by accumulating knowledge through investing in R&D.

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