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REGIONAL DIFFERENCES IN THE PACE OF STRUCTURAL CHANGE

The Effects of Improved Cross-Border Transport Infrastructure

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Structural change occurs as economies reallocate factors of production across industries. This paper seeks to investigate the causal effect of international economic integration, achieved through improvements of cross-border transport infrastructure, on regional differences in the pace of structural change. Previous literature focuses on structural change at the national level, and primarily on its direction rather than pace. Through a difference-in-difference identification strategy applied to regional data, we assess if the opening of the Øresund Bridge in 2000 affected the pace of structural change differently for contiguous and non-contiguous regions. Our research indicates that the effect on the pace follows a non-uniform spatial pattern, and that the direction of the effect varies with regional differences.

Keywords: Economic integration, international economics, structural change

JEL: F15, L16, O18, R23

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Contents

Introduction

The structure of economies changes over time. One hundred years ago, close to half of the Swedish labour force was employed in the agricultural sector. This number had fallen to less than 10% by the 1960s (Krantz & Schön, 2012). More recently, considerable attention has been given in the economic debate to the potential effects of trends such as automation and globalization on job creation and destruction in different economic sectors (Frey & Osborne, 2013; Görg, 2011). While changes like these can induce costs, for example in the form of unemployment, they are also an integral part of the process whereby an economy develops its productive capacity (Groshen & Potter, 2003; McMillan & Rodrik, 2011).

In this context, the concept of structural change commonly refers to shifts in the interindustry allocation of factors of production (Groshen & Potter, 2003; Ngai & Pissarides, 2007; SOU, 2008). Structural change can be described as an ongoing process in which labour and capital are reallocated across industries in response to, amongst other, technological development and economic policies (Lindmark & Vikström, 2002; Ngai & Pissarides, 2007). When studying structural change, it is of interest to look at both its direction and pace. The direction of structural change refers to the pattern of reallocation of production factors across industries, while pace refers to the speed by which this reallocation process occurs.

Both theoretical and empirical studies have investigated the determinants of structural change. There is a large body of literature indicating that international economic integration–achieved, for example, through increased trade openness–affects the structural change experienced by countries (Hijzen & Swaim, 2007; McMillan & Rodrik, 2011; Trefler, 2004). To date, most of this research is focused on the national level, treating countries as homogenous entities. However, as noted by Imbs et al. (2014), amongst others, there is little reason to believe that the impact of international economic integration on structural change is uniform within countries.

For instance, reduced transport costs between countries are believed to affect both the specialization and geographic agglomeration of production. According to most models belonging to the theoretical strand known as New Economic Geography–which is distinguished by incorporating individual maximization in general-equilibrium settings–the levels of specialization and agglomeration both respond in the same direction to shifts in transport costs (Aiginger & Rossi-Hansberg, 2006; Krugman, 1998). Some models predict that lower transport costs lead to increased agglomeration (Krugman, 1991), while many others foresee an inverted U-shape of reduced specialization and agglomeration for low and high transport costs (Aiginger & Rossi-Hansberg, 2006; Puga, 2002). Regardless the true relationship, lower cross-border transport costs are likely to have non-uniform effects on regional structural change within integrating countries due to the dynamics of specialization and agglomeration.

The purpose of this study is to shed greater light on the potential different effects that international economic integration achieved through reduced cross-border transport costs can have on the pace of structural change in sub-national regions. While reduced cross-border transport costs potentially also have an impact on the direction of regional structural change, we limit the scope of this paper to only considering its pace. As discussed later in this section, the pace of structural change has economically important effects, for example on the unemployment level (Lilien, 1982; Wacziarg & Wallack, 2004). It is therefore important to understand the pace by which the structure of economies change. Despite this, the determinants of the pace of structural change have received little attention in the previous literature. This especially applies to studies considering structural change in sub-national regions.

Reduced transport costs can be achieved in several ways. The theoretical literature usually makes no distinction between the different channels. However, from the empirical standpoint that this paper takes, it is important to differentiate between the channels, as they may have different effects on the pace of structural change in practice. We therefore only consider improvements in transport infrastructure, which is a well-documented and economic important channel through which reductions in transport costs are achieved (Edmonds & Fujimura, 2006; Limão & Venables, 2001). Based on the purpose of the paper and the previously motivated restrictions, the research question being asked is:

> *Does international economic integration, achieved through improvements of cross-border transport infrastructure, have different effects across regions on the pace of structural change?*

To answer the research question, we study the effect of the opening of the Øresund Bridge on the pace of structural change in Danish and Swedish regions. The opening of the rail and highway bridge over the strait separating Copenhagen and Malmö in 2000 constitutes a case of international economic integration, primarily by facilitating the flow of people and goods between Denmark and Sweden (Ajmone Marsan, et al., 2013; OECD, 2003).

The motive for choosing the construction of the Øresund Bridge as the object of our case study is threefold. First, it reduced time-distance and bottleneck barriers for transports between Denmark and Sweden, and can therefore be considered a case of international economic integration achieved through reduced transport costs (Wichmann Matthiessen, 2004). In this sense, the case conforms with the purpose and research question of the paper. Second, the opening of the bridge represents a relatively sharp treatment effect in time. Before the opening, people and goods were confined to maritime or aerial means of transportation between Denmark and Sweden. After 1 July 2000, when the bridge opened, cross-border movements were facilitated. This sharp treatment effect in time makes the case suitable for empirical analysis. Third, Denmark and Sweden are in many respects two similar and integrated countries. The countries share a common cultural and linguistic background and both belong to the European Single Market. Additionally, both have a long history of sharing a common labour market, formalized in 1954 by bilateral agreement. By studying economic integration between two similar countries, the extent to which national differences can act as confounding factors in the empirical analysis is reduced.

Region-industry level measures of the yearly pace of structural change are constructed using regional data of the interindustry allocation of labour and value-added in Denmark and Sweden. Through a difference-in-difference identification strategy, we attempt to determine if international economic integration, achieved through improved cross-border transport infrastructure, can explain differences in the pace of structural change across regions. Due to different data structures and definitions in the two countries, the regressions are run separately for Denmark and Sweden.

In addition to enhancing international economic integration, the opening of the Øresund Bridge also deepens economic ties at the level of regions and urban centres. One can equally well argue that the bridge represents a case of cross-border urban integration of Copenhagen and Malmö, rather than solely integration at the international level. Since infrastructure improvements are predicted to create specialization and agglomeration patterns in its vicinity–regardless of the level or levels at which the integration process occurs–this distinction has no direct influence on our hypotheses or econometric design. While we theoretically frame and discuss this paper from the perspective of international economic integration–which is in line with the purpose and research question–it is important to recognize that the empirical results can be driven by dynamics of cross-border urban integration. Even if this is true, the opening of the Øresund Bridge still represents a case of international economic integration achieved through improved cross-border transport infrastructure, and thus conforms with the research question. However, if the results are determined by the fact that Copenhagen and Malmö are located at either side of the cross-border bridge, it affects the contextualization of the results and has important consequences for the external validity of the study. We will therefore return to this issue in the concluding section of this paper.

There are clear rewards of a better understanding of the interrelationship between international economic integration, achieved through improved cross-border transport infrastructure, and regional differences in the pace of structural change. A high pace of structural change can induce certain costs, primarily in the form of temporarily underutilized production factors during the reallocation process (SOU, 2008). For instance, due to labour market frictions, higher unemployment levels are usually observed when the reallocation of labour across industries occurs at a faster pace (Lilien, 1982; Wacziarg & Wallack, 2004). These costs should be included in cost-benefit analyses for evaluating proposed infrastructure projects, and their distribution across regions taken into account. Furthermore, it may be advisable to combine infrastructure investments with policy initiatives aimed at mitigating potential regional differences, for example through more flexible labour markets (McMillan & Rodrik, 2011). With several cross-border transport infrastructure projects intended to increase the economic integration across countries being proposed–for example the Elsinore-Helsingborg tunnel–their potential effects on regional differences in the pace of structural change are important to uncover.

The paper is structured according to the following sections. First, we present the concepts of structural change and transport costs, and provide a historical background on the Øresund Bridge. Thereafter we formulate two hypotheses that allow us to empirically test our research question. The method and data are described in the following section. Then, we present the empirical results for Denmark and Sweden. We conclude by highlighting the main findings and their implications, including a discussion of the study's limitations and benefits.

Literature review

Concept of structural change

Structural change is defined as the reallocation of factors of production, commonly categorized into capital and labour, both within and across industries of an economy, driven by profit-maximizing allocation of resources (Groshen & Potter, 2003; Lindmark & Vikström, 2002; Ngai & Pissarides, 2007; SOU, 2008). The concept may eloquently be stated as solving the questions '[..] *what* is going to be produced, *how* should it be produced and for *whom* is it produced?' (Lindmark & Vikström, 2002, p. 90) through an iterative and gradual process of reallocation of production factors. As such, structural change is an integral part of the process by which economic welfare is created (McMillan & Rodrik, 2011).

The most thoroughly studied example of structural change is industrialization. From being predominantly rural until the 19th century, Western countries developed into industrial economies in a couple of decades. More recently, the relative rise of service industries at the expense of manufacturing has received considerable attention. Many explanations for the observed structural changes have been proposed, ranging from technological innovations to political reforms and changes in consumer preferences (Baumol, 1967; Kuznets, 1966; Ngai & Pissarides, 2007; SOU, 2008; Syrquin, 1988). As these processes take place over long periods of time and with clear patterns, many studies of structural change are concerned with its direction (Syrquin, 1988). However, the pace at which structural change occurs is also an important determinant of economic prosperity (McMillan & Rodrik, 2011).

There are different methods for empirically examining structural change. Primarily, data of the allocation of production factors are used to study its direction and pace. Measurements of inputs, however, are often limited to labour due to the lack of reliable data for capital (SOU, 2008). An alternative approach is to instead let changes in value-added indicate structural change, as output is the natural outcome of the factors used in the production process (Lindmark & Vikström, 2002). The drawback of studying value-added is the presence of total factor productivity in the measure. Value-added is therefore not directly related to reallocations of production factors (SOU, 2008).

Structural change takes place at different levels of economic aggregation (Lindmark & Vikström, 2002). The literature often makes a distinction between intraindustry and interindustry factor reallocation (Goos, et al., 2014; Trefler, 2004). Intraindustry structural change is concerned with movements of labour and capital within industries. At one extreme, the single worker's position may be replaced by another, similar position at the same workplace. At the other end of the spectrum, the worker or the entire workplace may relocate to a new plant or another firm, but still remain within the same industry. While intraindustry reallocation has been shown to be economically important (Choksi, et al., 1990; Trefler, 2004; Wacziarg & Wallack, 2004), the favoured focus by economists is often on changes across industries due to the prevalence of data (Andersson, et al., 2000). Interindustry labour reallocation occurs when workers either move from one industry to another, or when they display different entry and exit rates from the labour force across industries (Wacziarg & Wallack, 2004). Industry-level inflows and outflows of production factors are usually not identified separately. Instead, net changes across industries are more commonly used to measure interindustry structural change. This follows naturally, as a worker changing job from one industry to another is not necessarily an indication of structural change, but can rather be part of life itself. In contrast, net changes across industries indicate aggregate reallocations of production factors, and thereby capture the concept of structural change.

Pace of structural change

As established before, changing economic structures is one of the main processes through which economic development occurs. This concerns not only the direction of structural change, but also its pace. Countries with a higher pace of interindustry factor reallocation exhibit a faster rate of economic growth. This is attributed to that labour and capital can find uses that are more productive in new industries in a prompt manner (Dietrich, 2012; McMillan & Rodrik, 2011; Poirson, 2001; SOU, 2008). However, the relationship between the pace of structural change and economic growth is not unidirectional. Dietrich (2012) finds that economic growth accelerates structural change over a longer time horizon, but that the short-run effect runs in the opposite direction.

While economic growth is facilitated by a higher pace of structural change, the reallocation process also puts greater demands on an economy's ability to adjust. More rapid factor movements across industries has been documented to entail adjustment costs from underutilized capital and labour, for example in the form of temporary higher unemployment (Lilien, 1982; SOU, 2008; Trefler, 2004; Wacziarg & Wallack, 2004).

The structural change of economies does not progress at a uniform pace. In the academic literature, a number of factors affecting the pace of structural change have been identified. One prominent determinant is economic crises. Sweden experienced significant increases in the pace of structural change both during the crisis of the early 1990s and the global recession of 2008–2009 (SOU, 2015). As noted by Ehmer (2009), this observation can be explained by that industries usually are affected differently by cyclical business patterns. In recessions, firms tend to reduce their spending and investment more than households do. If the manufacturing industries in a country are focused on capital goods, as is the case in Sweden, they will therefore experience a sharper drop in demand than service industries, which primarily are relying on domestic private consumption. Differences like these across industries can thus explain why shifts in their relative size occur more rapidly during economic downturns.

In contrast to the drastic shifts in times of recession, the long-term pace of structural change has been found to relate to shifts in competitiveness between industries. Studying Swedish employment data in manufacturing industries from 1964 to 1996, Anderson et al. (2000) find that interindustry job turnover is higher when changes in profit margins across industries are more dispersed. They conclude that shifts in relative international competitiveness across industries can help explain both the level and trend of the interindustry pace of labour movements. The study's results also indicate that the pace of labour reallocation across plants within industries–which is found to be higher in sectors with many small plants and import competition–exceeds the shifts occurring across industries.

Another important force behind interindustry factor reallocation arises from technological progress. In a study of individual-level worker mobility across industries in the US between 1982 and 1990, technological innovations are found to decrease mobility across high-tech industries. In contrast, workers in low-tech industries exhibit increased mobility in response to technological progress. These results are consistent with the view that innovations lessen the distance in terms of technology between low-tech industries–which facilitates interindustry worker mobility–while it becomes greater for industries at the upper end of the technology spectrum (Magnani, 2009).

Technological innovations also affect the tasks performed by workers in the production process. By complementing the activities of skilled workers, skilled-biased technological change can lead to increases in the relative demand for educated labour. The concept has proven successful in explaining shifts in labour demand in many countries (Acemoglu & Autor, 2011; Autor & Katz, 1999). However, it does not conform well with the recent labour market pattern of job polarization, whereby the share of labour in low- and high-skilled occupations grows at the expense of jobs in the middle. Instead, technological progress that increasingly allow for the automation of routine tasks–known as routine-biased technological change–can underlie the phenomenon. As routine tasks primarily are associated with middle-skilled occupations, the observed job polarization can be explained by this bias of technological change (Acemoglu & Autor, 2011; Goos, et al., 2014). Interindustry reallocation of production factors is likely to follow from technological changes that are biased, as the extent of their effects will vary across industries (Goos, et al., 2014). These technology-induced phenomena should not only impact the direction of structural change, but also its pace. From this perspective, the pace of structural change is linked to the rate at which new technological innovations occur, and this rate is time-variant (Acemoglu & Autor, 2011). Furthermore, firms' responses to skilled- and routine-biased technological changes vary over time, for instance in connection to economic recessions (Hershbein & Kahn, 2016; Jaimovich & Siu, 2012).

Market forces–as those arising from economic crises, competition, and technological change–are acting within a framework of economic policies and institutions. Economic historians have argued that unfavourable and rigid regulatory frameworks can effectively hinder the interindustry reallocation of factors of production to their most productive uses. Eventually, the cumulative transformation pressure in the economy will become great enough to precipitate a 'structural crisis', whereafter the pace of structural change remains elevated for an extended period to allow production factors to reallocate. In this Schumpeterian view, economic policies should be formulated with the aim to strengthen the adaptive capacity of economies (Lindmark & Vikström, 2002).

One contentious area in the economic policy debate concerns the effect of trade liberalization on the pace of structural change. Economic models yield diverging results concerning this issue. In classical trade models, the gains from trade openness arise from the reallocation of production factors to industries in which the liberalizing country has comparative advantages (Wacziarg & Wallack, 2004). Comparative advantages can stem from technological differences across countries, as in the Ricardian model, or cross-country variation in relative factor endowments, as in the Heckscher-Ohlin model. Trade liberalization is thus predicted, ceteris paribus, to yield an increase in the pace of structural change.

The classical trade models predict that countries will export from industries in which they have comparative advantages. However, as first noted by Grubel and Lloyd (1975), interindustry trade is not consistent with data over actual trade patterns between countries. Instead, a large part of international trade occurs between rather similar trading partners that are active within the same industries. This observation led to the creation of new classes of international trade models. Krugman (1980), Helpman (1981), and Ethier (1982) spearheaded the development of models in which increasing returns to scale and consumer preferences for being offered a variety of products and services motivate firms to focus their production on certain varieties. This specialization of firms leads to intraindustry trade between countries, which is in line with observed trade patterns. However, this class of models does not yield any conclusive predictions concerning the effect of trade policy openness on the pace of structural change. Resources may be reallocated within–rather than between–industries in response to trade liberalization (Wacziarg & Wallack, 2004). Melitz's (2003) addition of heterogeneous firms to the class of models with product differentiation and economies of scale yields that no labour movements occur across industries when countries liberalize their trade policies. A similar prediction is made by Rivera-Batiz and Romer (1991), who show that the benefits from trade liberalization can arise from increasing returns to scale in research and development activities rather than by labour shifting to more productive industries.

In an important contribution, Helpman and Krugman (1985) develop an integrated model that combines product differentiation and economies of scale with the industry-based comparative advantages of the classical models. The integrated model predicts that labour will be reallocated across industries when countries open up to trade (Bernard, et al., 2007). Furthermore, due to the increasing returns to scale incorporated in many trade models, economic integration can lead to spatial agglomeration of production, which has the potential to affect the pace of interindustry factor reallocation. In models where trade policy openness facilitates diffusion of technology, interindustry movements of production factors take place if industries are affected differently by technological transmission (Wacziarg & Wallack, 2004).

As the presentation shows, models of international trade are inconclusive regarding the effect of trade liberalization on the pace of structural change. The existing empirical evidence is also mixed, often according to the level of development of the studied countries. Trefler (2004) finds that the Canada-US Free Trade Agreement led to significant, industry-specific effects on employment in Canada. Consistent with these results, employment levels in trade-impacted US manufacturing industries are affected negatively by increased import competition (Revenga, 1992).

In developing countries, the link between trade liberalization and the pace of interindustry factor reallocation appears to be weaker. Choksi et al. (1990) study 36 separate episodes of trade liberalization from 1950 to 1984 in a set of developing countries. They find little evidence supporting the notion that increased trade openness results in interindustry movements of labour. Instead, they conclude that most of the reallocation occurs within industries. Wacziarg and Wallack (2004) reach similar results in a cross-country panel data study of developing economies. In the study, they are unable to identify any reallocation of production factors across broadly defined industries. Only across sub-industries of the manufacturing sector are factor movements possible to detect. They argue that intraindustry effects of trade liberalization probably are greater than those on the pace of structural change across industries.

In addition to the trade policies pursued by countries, their labour market regulations can also affect the pace of structural change. In a cross-country study, including both developed and developing countries, McMillan and Rodrik (2011) note that policies creating rigid labour market conditions–for example in the form of high firing costs–can make it preferable for firms to expand their activities through capital deepening rather than by increasing the workforce. This can explain why countries with less flexible labour markets exhibit lower levels of interindustry reallocation of labour. Adding to this understanding, Boeri and Macis (2010) find empirical support for theoretical predictions that more extensive unemployment benefits increase the reallocation of labour across industries. Also regulations affecting firms directly can be important. Through both theoretical and empirical work, restrictions on firm entry have been shown to reduce the interindustry reallocation of production factors (Ciccone & Papaioannou, 2008).

Management practices of firms are believed to be linked to the pace of structural change. The introduction of lean staffing, a higher share of performance-based executive pay, and the increased hiring of temporary personnel are all examples of management practices that are speculated to impact the pace of interindustry labour reallocation. The pace is also thought to be affected by operational innovations such as outsourcing and just-in-time delivery (Groshen & Potter, 2003).

Infrastructure and transport costs

Effective transport systems are vital parts in achieving economic development and productivity growth (Krugman, 1996; Venables, 2007). Improved conditions for transportation allow for increased exchange of goods, services, and labour by bypassing physical obstructions, such as distances and naturally occurring obstacles in the landscape. However, all transports, regardless if moving cargo or people, incur various costs, including fixed, variable, and opportunity costs (Ortuzar & Willumsen, 2001). In terms of people travelling over longer distances to and from work, these costs are commonly referred to as commuting costs.

Fixed transport costs are incurred primarily by car owners as opposed to commuters by bus, train, ferry, and other communal means of travel. These costs are related to purchasing and owning a vehicle, and include taxes, insurances, and other costs that are incurred regardless of usage. In contrast, variable transport costs are increasing with the number, time, and length of trips. These costs are for example represented by fuel costs for motorists and ticket prices for commuters by train. Variable costs can also be of a more indirect nature. Studies show that the health status of commuters deteriorates as stress levels increase with the time of car and train commuting (Evans, et al., 2002), a phenomenon attributed to the invariability and randomness inherent in longer transport times (Chatterjee & Lyons, 2008). Transport times also affect the opportunity costs of transportation. Less time spent commuting implies more leisure time or more hours being able to work. A British study from 2016 estimates a value of SEK 83 per hour as the willingness to trade money for time (UK Department for Transport, 2016).[1]

As such, improvements in transport infrastructure that reduce the time and distance of transportation have the potential to lower variable as well as opportunity costs for all affected means of transport. In turn, reductions in transport costs affect the behaviour of rational, utility-maximizing agents, for example their location decisions and choices of means of transport. Andersson (2011) and Johansson et al. (2002) find that commuting time, rather than distance, is the main explanatory variable in commuting decisions.

The Øresund Bridge and regional description

The Øresund region is the common name of the geographical area encompassing the Danish regions of Zealand and Hovedstaden, and the Swedish county of Skåne (Örestat, 2016). The cross-border region is approximately 20 800 km^2 and centred around a narrow strip of water called the Øresund strait. It has 4 million inhabitants, of which some two-thirds live on the Danish side of the strait. The region, strategically located on the outlet of the Baltic Sea into the Atlantic Ocean, has long been an economically important centre of trade and commerce. Until the mid-17th century the entire region

[1] GBP 7.71. Converted to SEK using the daily exchange rate 13 October 2016.

was under the control of Denmark, but the eastern side of the Øresund strait has since belonged to Sweden.

Today, more than 350 years after the split, the Danish and Swedish parts of the Øresund region still share several similarities across the border. Both nations are full members of the European Union and have chosen to stay outside the euro area.[2] Since 1954, Denmark and Sweden, through the Nordic Council, have adopted a common labour market, exempting all Nordic citizens from requiring either residence or work permits (OECD, 2003). This agreement, revised continuously until 1982, pre-dates the European Union's common labour market by 40 years. In addition to harmonized labour market regulation, both Denmark and Sweden share a long history of consensus-driven co-operation between employer's organizations and trade unions, dating back to 1899 with the Danish agreement Septemberforliget and its Swedish equivalent Saltsjöbadsavtalet from 1938. The labour market integration has led to similar specialization patterns on both sides of the strait, with the Øresund region having joint clusters in the life-science, environmental, and internet and communication technologies. The formation of these clusters has been further facilitated by other shared characteristics. Both sides of the strait have high living standards, skilled labour forces, and host several institutions for higher education and science. Moreover, the cross-border area has similar languages, as well as common cultural and religious traditions (Ajmone Marsan, et al., 2013).

Since the advent of railroads, and consequently land-travel being faster than seafaring, the idea of constructing a bridge across the Øresund strait to enhance economic integration has been envisioned by both Danish and Swedish politicians (Marstrand, 1936). Plans for cross-border bridges and tunnels were presented in 1872, 1888, 1914, 1936, and 1954, but due to several reasons (technical issues, world wars, lack of funding, and diplomatic disputes amongst other), it was not until 1991 that the governments of Denmark and Sweden formalized the decision to build a bridge (Ajmone Marsan, et al., 2013). Political strife and indecisiveness over the bridge's location, with the alternative route between Elsinore and Helsingborg being the main contender, delayed the political planning and financing until November 1995, when a consortium of constructors signed an agreement with the jointly state-owned Øresundsbro Konsortiet. The construction of the bridge began in 1996 with the bulk of work taking place in 1997 and 1998, and finished in December 1999 with a royal ceremony at

[2] Denmark and Sweden shared a common currency 1874–1924 through the Scandinavian currency union. The union was based on a common gold standard for Denmark, Sweden, and from 1876 also Norway.

the mid-point of the bridge. After series of tests and installation work, the bridge opened for traffic on the evening of 1 July 2000.

The final construction constitutes a 7.8 km bridge, an artificial island, and a 4.1 km tunnel complete with a four-lane highway and a double-track railway. The combination of a bridge and tunnel allows free passage for smaller boats and vessels under the bridge, and passage of taller ships over the tunnel. Construction costs amounted to SEK 37.8 billion in 2000, including complementary road infrastructure (Øresundsinstituttet, 2015). The complete link is owned in equal shares by the states of Denmark and Sweden, and the investment and maintenance costs are financed by crossing fees. Separate to the bridge, in order to increase railroad capacity on the Swedish side, the railroad tunnel Citytunneln was built under the city of Malmö between 2005 and 2010. Prior to the Øresund Bridge, the Great Belt Fixed Link was constructed between 1991 and 1998 joining Zealand with Fyn and the Danish mainland. As the Little Belt Fixed Link was finished already in 1935, the Øresund Bridge fully connects the Nordic countries with one another and continental Europe through both motorway and railroad. Future projects include the Fehmarn Belt Fixed Link, which will connect Zealand, through Lolland, directly with Germany, and is scheduled to begin construction in 2017.

The duration of a journey across the strait between Denmark and Sweden was sharply reduced by the opening of the Øresund Bridge. Before the bridge, when passage was undertaken by means of ferry, travelling from central Malmö to central Copenhagen took roughly two hours with severely limited scheduling and connection possibilities. With the bridge, the time was reduced to some 50 minutes by car and 40 minutes by train. In addition to the lower opportunity costs generated by the time gains, the direct fees for crossing the strait were also reduced. In response to the lower transport costs, daily commuting increased from 3 000 workers in 1999 to 20 000 workers in 2008, of which 96% were Swedish residents working in Denmark. Moreover, roughly half of these commuters were expatriate Danish nationals taking advantage of the lower housing prices in Sweden for residency, while still working in Denmark (Ajmone Marsan, et al., 2013). As depicted in Figure 1, the number of border-crossings by vehicles increased by 78% between 1999 and 2001.

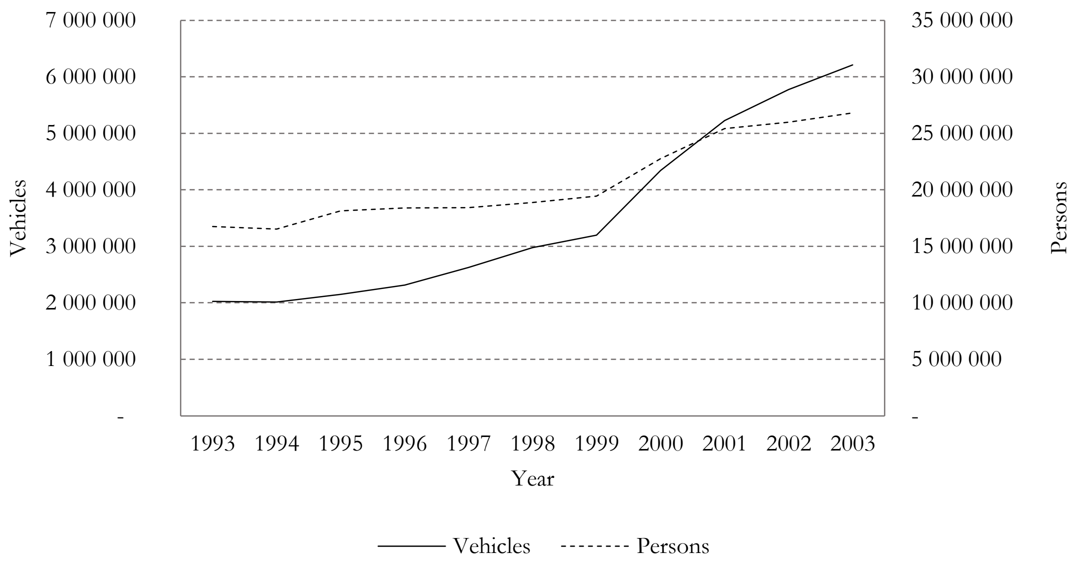

Figure 1: Number of yearly Øresund border-crossings by vehicles and persons (Wichmann Matthiessen, 2004)

Much like commuting increased and changed, so have migration patterns, with an increased flow of Danish citizens to Sweden. In 1998, the net yearly migration flow from Swedish to Danish Øresund was 200 persons, whereas in 2002 this had gradually changed to a net flow in the opposite direction of 1 400 persons. Changed industry dynamics have also been observed after the opening of the bridge. Exports increased primarily in wholesale and retail markets, while manufacturing industries experienced no significant effects. Employment and salaries in knowledge-intensive industries in Swedish Øresund showed faster growth rates than in other parts of Sweden in the post-opening years (Andersson, 2011).

Despite the many tangible effects of the Øresund Bridge, OECD (2003) and Wichmann Matthiessen (2004) conclude that the process of economic integration proceeded at a pace slower than anticipated in the years following its opening. Inflated crossing fees are cited as a major cause. There are also important differences between the Danish and Swedish sides of the Øresund region that hinder further integration. As mentioned, the labour markets are to a large extent harmonized, but regulatory and practical issues remain. For example, administrative procedures and active labour market policies differ between the countries. Denmark exhibits a more flexible labour market as a result of less public intervention and employment protection. It is also more common with collective bargaining at the level of the enterprise in Denmark, which further enhances flexibility (OECD, 2003). More practical problems for improved labour market integration are found in working cultures and managerial practices. Swedish workplaces are often characterized by a consensual culture, while a more hierarchical decision-making process is common in Denmark (Ajmone Marsan, et al., 2013; Wihlborg, 2012). Furthermore, educational qualifications that are not mutually recognized pose another obstacle to cross-border labour mobility (OECD, 2003).

Differences in taxes and social security systems also affect economic integration in the Øresund region. In the years after the opening of the bridge, cross-border asymmetries in taxation created incentives for people to live in Sweden and work in Denmark, and complexities in tax administration reduced the willingness of firms to expand their business activities to the other side of the strait. Such distortions can be further enhanced by differences in the provision of welfare services. Uncertainties arising from the lack of harmonization of social security systems also obstruct cross-border commuting. The location decisions of firms and labour are likely distorted by these differences in tax and social security regulations between Denmark and Sweden (OECD, 2003).

The Danish and Swedish housing markets exhibit important dissimilarities. At the time of the opening of the Øresund Bridge, both countries used rent controls and other non-market mechanisms for rental housing, but they were more extensive in Denmark. Labour mobility was likely reduced by these public interventions and their asymmetries. Furthermore, lower property prices and tax burdens on homeowners made it more attractive to live on the Swedish side of the strait (OECD, 2003).

There are imbalances in economic size between the Danish and Swedish parts of the Øresund region. Gross-domestic product on the Danish side is larger both in nominal terms and in relation to the national economy. Lately, this gap has been closing due to the stronger economic growth experienced in Swedish Øresund since 2000. Despite this, the unemployment rate has consistently been higher in Sweden (Ajmone Marsan, et al., 2013; OECD, 2003).

Hypotheses

As outlined in the introduction, this paper seeks to investigate if international economic integration, achieved through improvements of cross-border transport infrastructure, has different effects across regions on the pace of structural change. In order to empirically test the research question, we need to specify how the effect differs across regions. We do this by formulating two hypotheses based on theoretical predictions and empirical findings related to the effects of improved transport infrastructure. An appropriate method is later chosen to empirically test the hypotheses. Through this process, we seek to answer the research question of the paper.

The theoretical underpinnings of the first hypothesis are provided by work in the field of New Economic Geography. It relates reduced transport costs–for example in the form of improved transport infrastructure–to both economic specialization and geographic agglomeration (Aiginger & Rossi-Hansberg, 2006; Krugman, 1998). One class of models belonging to the school of New Economic Geography is spatial computable general equilibrium models (SCGE models). They predict that line infrastructure, for instance roads and railways, produces spatial economic patterns resembling a butterfly, with smaller economic impacts closer to its edges. In contrast, the economic effects from point infrastructure, for instance harbours and airports, take a concentric spatial shape. When the space is isomorphic–that is, there are no differences in economic densities or transport costs across space–these shapes will be even. This case is pictured in Figure 2. In a non-isomorphic space, for example due to a major agglomeration or national border, the shapes get distorted, but the basic patterns remain the same. Furthermore, the spatial impact from improvements in transport infrastructure depends on the overall level of transport infrastructure development. In areas with abundant provision of transport infrastructure, improvements have minimal spatial effects. However, even in these areas there will be strong local economic impacts when the improvements–either to line or point infrastructure–solve capacity constraints. The local impacts occur at the expense of surrounding regions (Knaap & Oosterhaven, 2003). Thus, according to this theoretical strand, regions located in spatial proximity to improved transport infrastructure are predicted to experience greater economic effects than regions located further away.

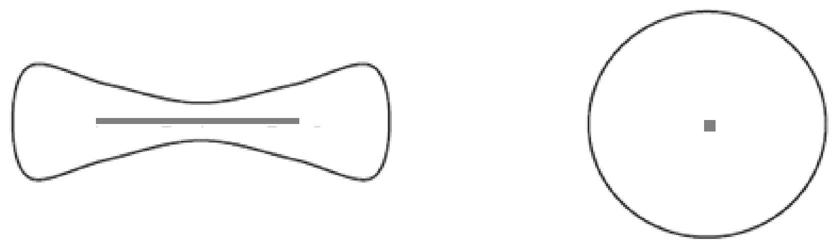

Figure 2: Predicted spatial economic effects of line infrastructure (left) and point infrastructure (right) in an isomorphic plane

The theoretical predictions concerning the spatial effects of improvements in transport infrastructure are largely supported by empirical work. Although the network effects associated with improved transport infrastructure tend to yield positive spillover effects across regions, the aggregate economic impacts are largest in its direct vicinity (Arzoz, et al., 2002; Cantos, et al., 2005; Cohen & Morrison Paul, 2004). Even negative regional spillover effects on output levels and economic growth from improvements in transport infrastructure have been found (de Jong, et al., 2013; López-Bazo & Moreno, 2007). Turning to some micro-level evidence, Holl (2004a) finds that the birth of new firms increases more in areas that are geographically close to new road infrastructure. In Spain, new manufacturing plants are primarily located close to new motorways, while the rate of new establishments is impacted negatively in municipalities further away (Holl, 2004b).

Both the theoretical and empirical works indicate that the magnitude of the economic impacts of improved transport infrastructure declines across space. We use this finding to construct testable hypotheses that detail how the pace of structural change may be effected differently across regions by international economic integration achieved through improvements of cross-border transport infrastructure. In light of the theoretical and empirical results we hypothesize that the pace of structural change differs across regions according to geographical proximity to improved cross-border transport infrastructure. We formulate Hypothesis 1 accordingly:

$H1_0$: Improved cross-border transport infrastructure has uniform effects on the pace of structural change of contiguous and non-contiguous regions.

$H1_1$: Improved cross-border transport infrastructure has non-uniform effects on the pace of structural change of contiguous and non-contiguous regions.

As a possible interpretation, the null hypothesis states that improvements in cross-border transport infrastructure cannot explain regional differences in the pace of structural change. This is contrasted by the alternative hypothesis, according to which improvements in cross-border transport infrastructure can serve as an explanatory factor for differences.

As expressed by Hypothesis 1, the potential different effects of improved cross-border transport infrastructure are sharply demarcated by the geographical area of contiguous regions. In reality, the effect is more likely to decline on a continuous spatial scale, both within and across regions. However, without using regional areas to define the spatial coverage of the treatment effect it would be hard to empirically test the hypothesis. The approach conforms with most empirical studies of the link between transport infrastructure and aggregate economic outcomes (Edmonds & Fujimura, 2006; López-Bazo & Moreno, 2007).

Hypothesis 1 does not detail the dynamics over time of a potential non-uniform effect across regions of improved cross-border transport infrastructure. However, empirical results based on the assumption of no dynamic treatment effect can be misleading if dynamic effects actually are present. Furthermore, the dynamics may be important to understand in themselves. In light of this, we formulate Hypothesis 2:

$H2_0$: The difference in the effects of improved cross-border transport infrastructure on the pace of structural change of contiguous and non-contiguous regions is constant over time.

$H2_1$: The difference in the effects of improved cross-border transport infrastructure on the pace of structural change of contiguous and non-contiguous regions is not constant over time.

Thus, according to the null hypothesis, the treatment effect is not dynamic, while the alternative assumes some arbitrary dynamic process.

We test hypotheses 1 and 2 by empirically assessing the impact of the opening of the Øresund Bridge on Danish and Swedish regions. The method is detailed in the following section.

Method

This paper seeks to determine if international economic integration achieved through improved cross-border transport infrastructure can explain differences in the pace of structural change across regions. We have formulated the main hypothesis that the pace of structural change of regions contiguous to improved cross-border transport infrastructure is affected differently compared to regions located further away. Through a case study, we investigate if this spatial pattern is possible to detect in connection with the opening of the Øresund Bridge in 2000. We apply a difference-in-difference identification strategy to region-industry specific measures of the yearly pace of structural change in Denmark and Sweden. The measures are constructed using data of employment and value-added, and cover the period 1993–2008. Due to different data structures and definitions in the two countries, the regressions are run separately for Denmark and Sweden. This section further presents the construction of measures, econometric design, and data.

Measures of pace of structural change

The literature proposes several measures of the pace of structural change. We include two commonly used measures in our study, both constructed using data of employment and value-added from the regional accounts of Denmark and Sweden. By considering two measures of the pace of structural change, we can alleviate concerns that observed relationships are specific for a certain measure. Furthermore, in choosing commonly used measures, comparisons with other studies are facilitated.

The first measure of pace of structural change being considered is the Norm of Absolute Values (NAV). Let x_{irt} be industry i's share of total employment or value-added in region r at time t. Then NAV_{rt}, the pace of structural change in region r at time t, is given by (Dietrich, 2012):[3]

$$NAV_{rt} = \frac{1}{2}\sum_{i=1}^{n}\left|x_{irt} - x_{ir(t-1)}\right| \qquad (1)$$

The absolute value of the yearly change in each industry's share of total regional employment or value-added is first calculated. These values are then summed across all industries n. Finally, since all changes in industry shares are counted twice, the sum is divided by two. By this construction, NAV measures

[3] As we are interested in region-specific measures of the pace of structural change, we have introduced the subscript *r* in the formulas.

the pace of regional structural change. The industry-level contribution to the regional NAV is given by:

$$NAV_{irt} = \left|x_{irt} - x_{ir(t-1)}\right| \tag{2}$$

The NAV is monotonically increasing in each industry's change in share of employment or value-added. Thus, by considering the industry-level changes, it is possible to determine the pace of regional structural change. The industry-level measure in (2) serves as our dependent variable when considering NAV in the empirical analysis.

The interpretation of the regional NAV in (1) is intuitive. It ranges from zero to unity, with a lower value indicating a slower pace of regional structural change as less labour or value-added is shifted across industries. The NAV, or versions of it, are frequently used in the literature, for example by Goos et al. (2014), Lindmark and Vikström (2002), Långtidsutredningen 2015 (SOU, 2015), Nishi (2015), and Wacziarg and Wallack (2004).

The second measure of pace of regional structural change is the Modified Lilien Index (MLI). The Lilien index was originally developed by Lilien (1982) and later modified to include industry weights at both the start and end of the time period (Dietrich, 2012). Using the same notation as for the NAV, the regional MLI is constructed as

$$MLI_{rt} = \sqrt{\sum_{i=1}^{n} x_{irt} * x_{ir(t-1)} * \left(ln\frac{x_{irt}}{x_{ir(t-1)}}\right)^2} \tag{3}$$

where $x_{irt} > 0$ and $x_{ir(t-1)} > 0$. The contribution of industry i to the pace of regional structural change as measured by the MLI is thus given by:

$$MLI_{irt} = x_{irt} * x_{ir(t-1)} * \left(ln\frac{x_{irt}}{x_{ir(t-1)}}\right)^2 \tag{4}$$

The pace of regional structural change measured as MLI is monotonically increasing in each industry's relative size and growth rate. The industry-level contribution expressed in (4) serves as our dependent variable when considering the MLI in the empirical analysis.

The interpretation of the MLI is similar to that of the NAV. Its lower bound of zero is reached when all industries exhibit no changes in their relative share of employment or value-added. A higher value of the MLI indicates a faster pace of regional structural change. The measure is used frequently in the literature (Dietrich, 2012; Nishi, 2015; SOU, 2008).

As mentioned before, several measures of the pace of structural change are proposed in the literature. Another common measure is Moore's test (Moore, 1978). However, this measure is similar in its construction to the NAV and MLI, and is also found to produce similar results in empirical applications (Dietrich, 2012). We therefore choose to only consider the NAV and MLI in this paper.

A limitation of both the NAV and MLI is that they are unable to differentiate between changes in industries' employment shares arising from actual labour movements across industries, and those attributable to uneven industry-level entry and exit rates from the labour force. Empirical approaches that separate these two sources of change have been developed (Wacziarg & Wallack, 2004), but as it falls outside the scope of this paper to study these two components of structural change separately we are not affected by this limitation.

Econometric design

The Øresund Bridge represents a case of improved cross-border transport infrastructure between Denmark and Sweden. On the Danish side, the bridge connects to the region Hovedstaden, and on the Swedish side to the region Sydsverige. According to our main hypothesis–that regions located in direct geographic connection to improved cross-border transport infrastructure experience a different effect on the pace of structural change than regions located further away–these are our two treatment regions. Furthermore, we can divide our dataset, covering the period 1993–2008, into post- and pre-treatment time periods in relation to the opening of the bridge on 1 July 2000.

The separation of data into groups and time periods affected by the treatment makes it possible to apply a difference-in-difference identification strategy. Conceptually, difference-in-difference models compare the difference in outcomes before and after treatment of groups receiving the treatment to those groups not receiving it. Under the identifying assumption that the two groups would have exhibited parallel time-trends in the outcome variable in absence of treatment, the difference-in-difference identification strategy detects the causal effect of treatment (Pischke, 2005). The advantage of this strategy is that several of the internal validity threats often plaguing empirical studies of heterogeneous units can be avoided (Bertrand, et al., 2004). Mayer (1995) notes that the inclusion of an untreated control group allows the difference-in-difference design to reduce concerns of omitted variable bias and mismeasurement. Problems associated with trends in outcomes are also mitigated–or completely eliminated if the identifying assumption is believed to be true–by the approach.

In the most basic difference-in-difference model, only two groups and two time periods are considered. To test Hypothesis 1, we use an extended difference-in-difference model presented in Bertrand et al. (2004), Mayer (1995), and Pischke (2005), which allows for the inclusion of multiple groups and time periods.[4] Let y_{irt} be the contribution of industry i to the pace of structural change in region r at time t.[5] Then the difference-in-difference regression equation, estimated by ordinary least squares, is given by:

$$y_{irt} = \gamma_r + \lambda_t + \beta T_{rt} + \delta X_{irt} + \varepsilon_{irt} \tag{5}$$

The variables γ_r and λ_t are region and time fixed effects, respectively. The treatment dummy T_{rt} takes the value of unity for regions Hovedstaden and Sydsverige after the opening of the Øresund Bridge, otherwise its value is null. Control variables at the industry level or at the regional level that vary over time are included in the vector X_{irt}. The error term is represented by ε_{irt}.

The coefficient of interest in regression equation (5) is β. A positive value of β implies that the pace of regional structural change is higher in contiguous than non-contiguous regions due to the opening of the Øresund Bridge. An opposite effect is implied by a negative value of β. Thus, under the premise of the identifying assumption being true, estimating the regression equation in (5) allows us to detect if the opening of the Øresund Bridge can explain differences in the pace of structural change across regions.

Hypothesis 1, presented in the previous section, can be expressed in terms of the notation used in regression equation (5):

$H1_0$: $\beta = 0$

$H1_1$: $\beta \neq 0$

We formulate the alternative hypothesis to not state the direction of a potential non-uniform effect. Econometrically, this implies that we conduct a two-sided test of significance for the treatment effect.

[4] We have adjusted the notation to better correspond with the specifics of our study.
[5] We use two measures of the pace of regional structural change, NAV and MLI. The construction of these measures is presented earlier in this section.

This is done with the intention to obtain more conservative results, since it is more difficult to reject the null hypothesis using a two-sided test than a one-sided test for a given significance level.

It is important to note that β does not capture the effect on the regional level of pace of structural change from opening the bridge, but the difference in the effect across treatment and control regions. This follows from the fact that there is no sharp treatment effect across space: also regions that are not contiguous to the bridge are likely to receive some of the treatment through the inherent network effects of transport infrastructure. As the control regions to some extent are subject to treatment, β captures the difference in the treatment effect for contiguous regions. This is an important characteristic to understand, since it enables the econometric design to test the hypotheses.

Ideally, we would like to start the treatment period on 1 July 2000, when the bridge opened. However, since all of our data follow the calendar year, we are unable to do so. Instead, we construct two treatment variables. The first defines the treatment period to last from 2000 until the end of our sample period in 2008, and the second assigns the years 2001–2008 to the treatment period. All specifications are estimated twice, one time for each treatment variable. This is done with the ambition to provide more robust results. It should also be noted that by our construction of the treatment variables, we assume that the treatment has no dynamic effects during 2000–2008 and 2001–2008. In other words, the opening of the Øresund Bridge is assumed to have a stable, permanent effect on differences in the pace of regional structural change. This assumption is later relaxed in regression equation (6) by including year-specific treatment effects.

The explanatory variables included in vector X_{irt} serve different purposes. First, by including time-varying variables at the regional level, confounding factors are controlled for (Besley & Burgess, 2004; Pischke, 2005). More explicitly, the estimates can be biased if the construction and location of the Øresund Bridge are correlated with regional time-varying characteristics that are not included in the specification but affect the pace of regional structural change. In the literature review, previously identified determinants of the pace of structural change were presented. We base our choice of control variables at the regional level on these findings. Dietrich's (2012) conclusion that economic growth affects the pace of structural change motivates us to include the log of regional value-added in current prices as a control variable. Furthermore, this control variable can act as a proxy for other determinants that–in addition to influencing the interindustry factor reallocation–also are likely to be related to overall economic growth. For example, the effects of regional-level changes in regulatory frameworks and labour market policies on the pace of structural change (Ciccone & Papaioannou, 2008; Lindmark & Vikström, 2002; McMillan & Rodrik, 2011) are potentially controlled for indirectly by regional value-added serving as a proxy variable for these determinants.

For Sweden, we include two additional time-varying control variables at the regional level. These cannot be included for Denmark since the required data are unavailable. The first is the number of employees in technology and knowledge-intensive industries. This inclusion is motivated by Magnani's (2009) finding that technological innovations increase labour movements across low-tech industries, while high-tech industries experience an opposite effect. Thus, even if all regions are subject to the same technological development, its impact on the pace of structural change could be different across regions depending on the size of their high-tech industries. By including the number of employees in technology and knowledge-intensive industries we attempt to control for this effect. We use the number of employees in levels and not as shares of total employees as it would risk to constitute a case of over-controlling given our dependent variables. As a consequence of this decision, we capture differences across regions and time in the absolute, rather than relative, size of technology and knowledge-intensive industries. Ideally, we would like to use the relative size of these industries as it best corresponds to the theoretical underpinnings for including the control variable, but as explained, this is inappropriate from an econometric perspective. While variation in the absolute and relative sizes across regions risk deviating considerably from each other, the variation in the time dimension is probably more consistent between the two measures. Since our econometric design uses regional variation over time to identify a potential causal effect, this is the relevant dimension to assess. We therefore believe that the inclusion of the number of employees in technology and knowledge-intensive industries can be informative. The addition of a second time-varying control variable for Swedish regions stems from our hypotheses, which are formulated based on work indicating that improvements in transport infrastructure affect the spatial pattern of economic outcomes. Thus, infrastructure projects realized in parallel to the construction and opening of the Øresund Bridge could confound our results. To control for this, we include a variable of the length of regional road, rail, and waterways networks as a proxy for improvements in the overall level of transport infrastructure.

In addition to the regional time-varying variables based on findings in the previous literature, we also include region-specific parametric time trends in X_{irt} for both Denmark and Sweden. This is a common way to assess the robustness of difference-in-difference models to endogeneity in the treatment (Autor, 2003; Besley & Burgess, 2004). By this inclusion, the treatment effect of opening the Øresund Bridge on regional differences in the pace of structural change comes from the deviation it creates from the pre-existing region-level parametric trend. Thus, the effect on the dependent variable becomes considerably harder to detect if it accumulates gradually over time. In practice, the treatment effect must be relatively sharp in order to be identified when regional time trends are included (Pischke, 2005).

The final regional time-varying variable included in X_{irt} is a dummy taking the value of unity for the treatment regions during the Øresund Bridge's construction period from 1996 to 1999. Since the construction itself may affect the pace of structural change in the treatment regions differently compared to the control regions due to their geographical proximity to the bridge, the identifying assumption of parallel trends risks being violated if this is not controlled for. The construction dummy is added to address this concern.

The second set of variables included in the vector X_{irt} contains industry-level characteristics. In contrast to time-varying variables at the regional level, within-region variation across industries does not affect the estimated coefficients. Expressed differently, these variables do not control for confounding factors. Instead, their inclusion serves a purpose by reducing the residual variance, and thereby the efficiency of the estimates is increased (Meyer, 1995; Pischke, 2005). We therefore include a full set of industry dummies as explanatory variables.

There are two main concerns related to the validity of the difference-in-difference identification strategy. The first is the risk of endogeneity in the treatment itself (Bertrand, et al., 2004). In our case, the Øresund Bridge might have been constructed due to some characteristics of the treatment regions of Hovedstaden and Sydsverige that the other regions do not exhibit. The estimates of β risk being biased if these characteristics also affect the pace of regional structural change. However, by including region and time fixed effects, as well as time-varying control variables at the regional level, these problems are mitigated. The second concern is that the treatment and control regions are affected differently by other events occurring besides the construction of the bridge (Meyer, 1995). For example, amendments to national laws may impact the pace of structural change differently across regions. Again, this would bias the estimates of β. Both these concerns constitute cases where the identifying assumption of the difference-in-difference strategy is violated.

To test Hypothesis 2 of a dynamic treatment effect, we specify a second difference-in-difference regression equation. It comes with the additional benefit that we can conduct a test to investigate whether the identifying assumption of identical counterfactual trends in treatment and control regions is plausible. The regression equation in (5) is extended by including year-specific leads and lags for the treatment effect (Autor, 2003; Pischke, 2005). The new regression equation becomes:

$$y_{irt} = \gamma_r + \lambda_t + \sum_{j=-m}^{q} \beta_j T_{rt}(t = k + j) + \delta X_{irt} + \varepsilon_{irt} \tag{6}$$

The first real treatment year k is either 2000 or 2001.[6] The coefficients of the q year-specific treatment lags provide information about the dynamics of the treatment effect. As the treatment variable of the regression equation in (5) is defined for either 2000–2008 or 2001–2008, it imposes that the treatment effect is constant during these time periods. By instead using year-specific treatment variables, as in (6), this restriction is relaxed. We are thus able to evaluate Hypothesis 2 by conducting a Wald test of the year-specific treatment lags being equal. Expressed in terms of the notation used in regression equation (6), Hypothesis 2 can be restated as:

$H2_0$: $\forall a, b \in \mathbb{Z}_{\geq 0}$ and $a \neq b : \beta_a = \beta_b$

$H2_1$: $\exists a, b \in \mathbb{Z}_{\geq 0}$ and $a \neq b : \beta_a \neq \beta_b$

In addition, visual inspection of the magnitude and significance of the treatment lags can provide insights into the dynamic pattern of the effect. For example, if β_j is decreasing in j it indicates that the treatment effect fades over time.

By using the coefficients of the m treatment leads we can formulate a hypothesis for testing the plausibility of the identifying assumption. If the identifying assumption is true, we would expect the treatment and control regions to exhibit parallel trends pre-treatment. We formulate the following hypothesis:

H_0: $\forall j \in \mathbb{Z}^{-}: \beta_j = 0$

H_1: $\exists j \in \mathbb{Z}^{-}: \beta_j \neq 0$

If the null hypothesis is rejected, it indicates that the treatment and control regions do not exhibit parallel trends pre-treatment. In extension, this reduces the plausibility of the identifying assumption

[6] See previous discussion for why two treatment years are considered.

being true. The test, however, is only indicative in its nature; it is impossible to establish with certainty whether the identifying assumption is violated.

In case the test indicates that the identifying assumption of parallel counterfactual trends is invalid, it does not necessarily imply that another identification strategy is more suitable for estimating the treatment effect. As noted before, difference-in-difference models address many potential problems related to empirical studies of heterogeneous units. If the identifying assumption is violated, it implies that problems associated with trends in the outcome variable cannot be completely eliminated. Still, compared to standard cross-section or fixed effects regression frameworks, concerns of omitted variable bias and mismeasurement are likely reduced by the use of a difference-in-difference identification strategy (Bertrand, et al., 2004; Meyer, 1995). Given our research question and case under study, we believe that the difference-in-difference framework is the most reliable identification strategy available even if the test indicates that the identifying assumption is violated.

Difference-in-difference regressions using panel data are often subject to problems arising from serial correlation and clustered observations, in our case at the regional level. If not adjusted, the standard errors risk being underestimated, and consequently the reported significance levels would be too high. We therefore use STATA to cluster observations at the regional level, and not for region-year combinations, when estimating the regression equations in (5) and (6). By doing so, we obtain consistent standard errors even in the presence of serial correlation and clustered observations (Bertrand, et al., 2004; Trefler, 2004).

The regression equations in (5) and (6) are estimated separately for Denmark and Sweden. This is primarily done due to different data structures and definitions in the two countries. Moreover, the separate treatment of Denmark and Sweden facilitates the presentation of our estimation results. If the two countries' regions were included in a single estimation, we would need to include country fixed effects and country-specific time trends, as national heterogeneities in, for example, economic policies must be taken into account in both the intercept and the trend. Also, due to the different characteristics of the treatment regions in Denmark and Sweden, we would need to allow for country-specific treatment effects.

Data

Data for constructing the measures of pace of structural change are gathered from the regional accounts published by Statistics Denmark and Statistics Sweden. The regional accounts provide data for market production at different levels of regional aggregation. It is possible to differentiate between industries for some of the regional production data. The statistical agencies in both countries compile the regional accounts in accordance with the European system of national and regional accounts (ESA).[7] The data used in the study cover the period from 1993 to 2008, which is the longest available time span of regional accounts for Sweden that encompasses the opening of the Øresund Bridge.

As the two main categories of production factors, it is of interest to consider both labour and capital input when studying structural change (SOU, 2008). However, due to the data availability for both Denmark and Sweden, we are forced to limit the scope of the study to not consider capital input. This limitation is not uncommon from the perspective of existing literature, as most studies of interindustry reallocations of production factors are confined to labour.

For constructing the measures of regional pace of structural change, we use industry-level data of employment and value-added in Danish and Swedish regions. When considering employment, it is often preferable to use the number of hours worked instead of the number of persons employed, as it provides a more complete picture of labour input in production. The existing literature primarily uses hours worked when studying structural change (Goos, et al., 2014; SOU, 2008), but also the number of persons employed is used as a metric (Nishi, 2015). In Denmark, we have access to both these figures in each region and industry. Statistics Sweden only publishes data for the number of persons employed at the region-industry level. However, as we run separate regressions for Denmark and Sweden, we are able to use the data of both hours worked and number of persons employed for our econometric specifications for Denmark. We do so with the intention to provide more complete and nuanced results, and to facilitate comparisons with other studies.

The regional classifications used by Statistics Denmark and Statistics Sweden are both defined according to Eurostat's classification Nomenclature of territorial units for statistics (NUTS). The NUTS classification divides the European Union's economic territory into a hierarchical system consisting of three levels. At all levels, the regional divisions of the NUTS classification are guided by three principles: population size, national administrative divisions, and general geographic units (Eurostat, n.d.). For the purpose of this study, the lowest level of regional aggregation available in both Denmark and Sweden is NUTS-2. By using the same level of aggregation in the NUTS

[7] The Danish data used in the study are compiled according to ESA2010, while the Swedish data are compiled according to ESA95.

classification, the regional divisions follow the same method and principles in both countries. This facilitates the comparison of results from Denmark and Sweden.

Maps of the NUTS-2 regions in Denmark and Sweden are presented in Figure 3 and Figure 4. At the level of NUTS-2, Denmark and Sweden have five and eight regions, respectively.[8] Based on the formulation of our hypothesis, the treatment region in Denmark is Hovedstaden (DK01), and the corresponding region in Sweden is Sydsverige (SE22). From the maps it is evident that the geographic span of the two regions differs considerably, as do their population sizes. These differences should be kept in mind when comparing the empirical results for Denmark and Sweden.

For the Swedish data, the classification of industries follows the Swedish Standard Industrial Classification 2002 (SNI2002), which is constructed according to the Statistical classification of economic activities in the European Community Revision 1.1 (NACE Rev. 1.1) (MIS, 2003). In contrast, the Danish industrial classification Dansk Branchekode 2007 (DB07) is based on NACE Rev. 2 (Statistics Denmark, n.d.). Although the two revisions of NACE are similar in their criteria for construction and in their structures, differences between them exist. The Swedish and Danish industrial classifications used in the study are thus not directly comparable. At the most detailed level of industrial aggregation available for this study, both countries' classifications contain 13 industries.[9]

The development from 1994 to 2008 of the two measures of pace of structural change, NAV and MLI, based on data of employment and value-added are plotted in Figure 5 and Figure 6. The graphs compare the regional paces of structural change in Hovedstaden and Sydsverige with the pace of structural change experienced in their respective country.

Data are obtained from the regional accounts of Statistics Denmark and Statistics Sweden for constructing the control variable of log of value-added. The control variables of employment in technology and knowledge-intensive industries and of the length of road, rail, and navigable inland waterways networks are based on data from Eurostat.[10] The data are only available for Sweden, and

[8] Both Statistics Denmark and Statistics Sweden include an additional region to NUTS-2 in their regional accounts. This additional region contains economic activities, for example those associated with embassies or offshore extraction of oil and natural gas, that cannot be attributed to a specific region (Statistics Denmark, 2014; Statistics Sweden, 2010). In the Danish data this additional region is called '999 Uden for region' and in Sweden '90 Extra region'. Economically, these regions are small in size compared to the NUTS-2 regions. For the purpose of this study, these additional regions have been excluded.

[9] For the Swedish data, we do not include the industry 'Ej branschfördelade poster'.

[10] The employment in technology and knowledge-intensive industries is measured in thousands of persons, and the length of road, rail, and navigable inland waterways networks is measured in kilometres.

follow the regional division of NUTS-2. The two control variables cover the years 1995–2006 for all regions except 'Småland med öarna' and 'Västsverige', for which Eurostat only publishes data for the period 1996–2006. Due to these restrictions, the number of observations for Sweden is reduced by 338 when the two variables are included in the regressions.

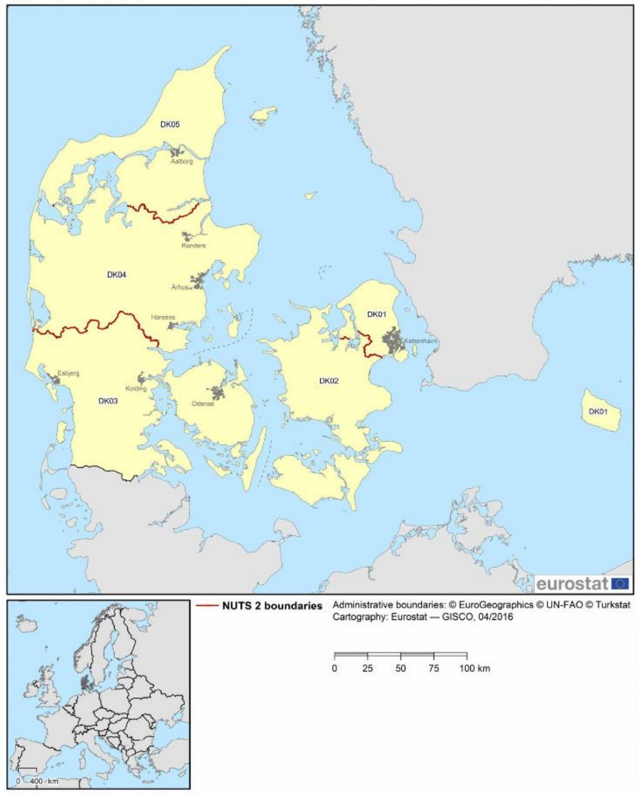

Figure 3: Map of NUTS-2 regions in Denmark

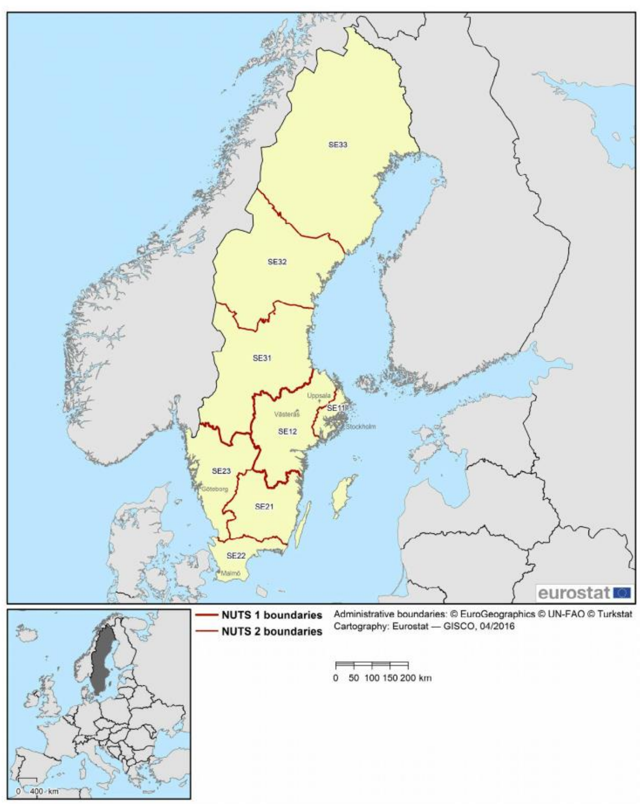

Figure 4: Map of NUTS-1 and NUTS-2 regions in Sweden

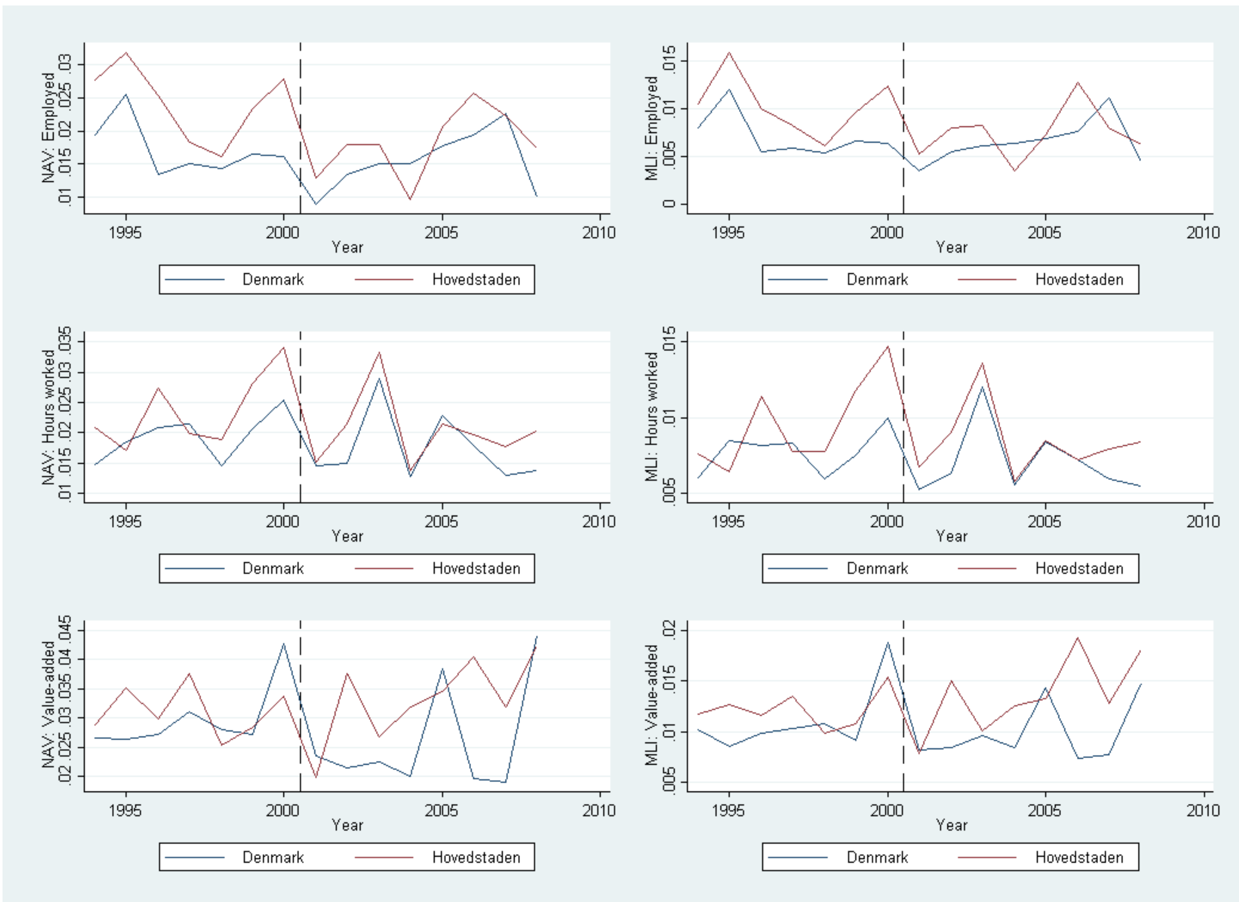

Figure 5: Pace of structural change 1994–2008 in Denmark and Hovedstaden

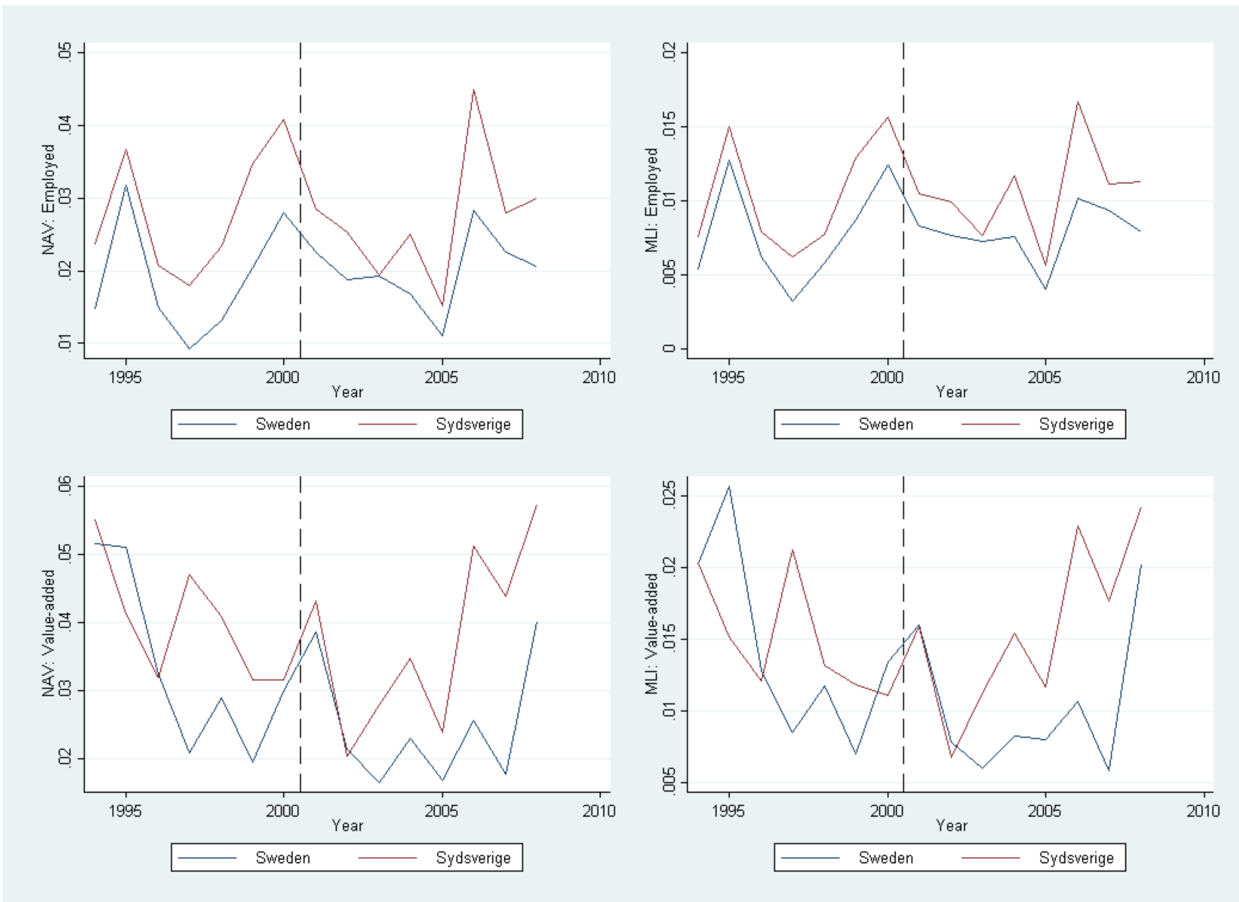

Figure 6: Pace of structural change 1994–2008 in Sweden and Sydsverige

Results

We have formulated the main hypothesis that improved cross-border transport infrastructure has different effects on the pace of structural change in contiguous and non-contiguous regions. To empirically test the hypothesis, we use a difference-in-difference identification strategy to study the effects on Danish and Swedish regions of the opening of the Øresund Bridge. In this section, the empirical results are presented separately for Denmark and Sweden.

Denmark

Table 1 presents the regression results using the MLI constructed with the number of persons employed as measure of the pace of regional structural change in Denmark. As motivated before, we run all specifications two times: with the treatment effect starting in 2000 (columns 1–5) and starting in 2001 (columns 6–10). Irrespective of when the treatment period starts, the estimated treatment coefficients are negative and significant for all but one specification. Using the alternative measure NAV based on the number of persons employed confirms these results (see Table 7 in the appendix).[11] The estimated treatment effects provide support for rejecting Hypothesis 1's null alternative of improved cross-border transport infrastructure having the same effect across regions on the pace of structural change. Interpreted in our specific case, the negative and significant coefficients indicate that the treatment region of Hovedstaden, located in direct geographical connection to the Øresund Bridge, experiences a deaccelerated pace of structural change after 2000/2001 compared to other Danish regions due to the opening of the bridge. The economic size of the effects appears to be relatively large, amounting to around one fourth of the standard deviations of both MLI and NAV based on the number of persons employed in the treatment region.

Regressions using the NAV based on hours worked as dependent variable, presented in Table 2, yield estimates in line with earlier results.[12] Again, most treatment coefficients are negative and significant, leading us to reject Hypothesis 1's null alternative of a uniform effect of improved cross-border transport infrastructure on the pace of regional structural change. The magnitude of most of the estimated treatment effects are one tenth to one fifth of the standard deviation of NAV for hours worked in the treatment region. In contrast to when using measures based on employment data,

[11] The only major difference in the estimated treatment effects between MLI and NAV based on the number of persons employed concerns specification 5, in which the treatment effect is positive and significant using NAV.
[12] Table 8 in the appendix presents the same specifications but with the MLI as dependent variable instead of NAV. The main differences arise in specifications 1 and 2, in which the treatment effects are not found to be statistically significant.

regressions with the MLI and NAV for value-added as dependent variables produce no statistically significant treatment effects (see Table 9 and Table 10 in the appendix). As mentioned before, the interindustry reallocation of value-added only serves as a proxy of the pace of structural change in production factors, as fluctuations in TFP can obscure the true factor reallocations.

As presented, most specifications using MLI or NAV for employment as dependent variable yield negative and statistically significant treatment effects. However, this is not true when regional linear time trends are added in specification 5 with treatment from 2000. The signs of the estimated treatment effects become positive, and are still statistically significant in most cases.[13] As mentioned when describing the empirical approach, the inclusion of region-specific time trends is a common robustness check for treatment endogeneity in difference-in-difference regressions (Autor, 2003; Bertrand, et al., 2004; Besley & Burgess, 2004). Since the sign of the treatment effect turns positive when this inclusion is made, it indicates that the opening of the Øresund Bridge correlates with other regional trends in the pace of structural change. However, this explanation is made less likely by the fact that the treatment effect from 2001 remains negative and statistically significant although regional time trends are added in specification 10. There is a potential risk of increased bias of estimates when including time trends if the sample period before the treatment begins is short and the treatment itself is believed to affect the trend of the dependent variable (Pischke, 2005).

With the intention to increase the comparability of the estimated treatment effects between Denmark and Sweden, we enlarge the Danish treatment region by defining it for the whole of Zealand. In terms of the NUTS-2 classification depicted in Figure 3, the enlarged treatment region includes Zealand (DK02) in addition to the original treatment region of Hovedstaden (DK01). By making the treatment region larger, it becomes more comparable in geographic size and industry composition to the Swedish treatment region of Sydsverige. However, the enlargement further increases the difference in economic size. The estimated treatment effects remain stable when the treatment region is enlarged, with the statistically significant coefficients being predominantly negative (see Table 23 to Table 28 in the appendix). The main difference arises when MLI and NAV are based on value-added. For the original treatment region of Hovedstaden all estimated treatment effects are statistically insignificant for these measures of the pace of structural change. However, after the enlargement, most treatment

[13] The treatment effect in specification 5 is positive and statistically significant in Table 2, Table 7, and Table 8. In Table 1 the treatment effect in specification 5 is positive, but not statistically significant.

coefficients turn significant and negative. This lends further credibility to the previous indications of a negative treatment effect in Denmark.

Through the estimated year-specific treatment leads and lags in Figure 7, Hypothesis 2 of a dynamic treatment effect is assessed for the original treatment region of Hovedstaden. The estimated specification includes control variables for regional value-added, construction period, and industry fixed effects.[14] Table 3 presents the results from a Wald test of the lags for 2000–2003 and 2001–2004 all being equal.[15] At the 1% significance level, we reject the null alternative of Hypothesis 2 in favour of a dynamic treatment effect in all but two cases. However, by visual inspection of the graphs in Figure 7, few consistent dynamic patterns are discernible. For MLI and NAV based on data of hours worked, there seems to be a spike in the treatment effect for year 2000 when the bridge opened. When the measures are based on the number of persons employed, both indicate negative treatment effects during the years after the opening of the bridge. Besides these observations, the dynamic of the treatment effect shows no clear pattern across the various measures. This also holds true for other estimated specifications (see Table 13 to Table 18 in the appendix).

In order to interpret the above results as causal effects of opening the Øresund Bridge, the treatment and control regions need to exhibit parallel counterfactual trends in the pace of structural change. This is the identifying assumption of our difference-in-difference regressions, and since the counterfactual trends are unobservable, we cannot establish whether it is true or not. However, if the identifying assumption is true, we would expect the regions to exhibit the same trends before the treatment came into effect with the opening of the bridge. The year-specific treatment effects prior to the actual treatment in 2000 allow us to test this. In Figure 7, the confidence intervals of the point estimates indicate that for all measures of the pace of regional structural change, at least one year-specific treatment effect is different from zero at the 5% significance level prior to the actual opening of the bridge. This result is confirmed by most estimated specifications (see Table 13 to Table 18 in the appendix). The null hypothesis formulated in connection to the regression equation in (6) is thus rejected, indicating that the regions exhibit different trends in the pace of structural change before receiving any treatment. This result casts doubts on the validity of the identifying assumption, and

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[14] The full regression results of the specification used to obtain the estimated treatment effects in Figure 7 are presented in Table 13 to Table 18, specification 2, in the appendix. The specification corresponds to specifications 4 and 9 in Table 1, Table 2, Table 7, Table 8, Table 9, and Table 10 with the only difference being that the single treatment variable has been replaced by multiple year-specific treatment effects, in accordance with the regression equation in (6).

[15] The years 2000–2003 and 2001–2004 are the longest time periods possible to test given the restrictions imposed by the clustered data.

thus also on any causal interpretation of our results for Denmark. However, as it is impossible to establish the validity of the identifying assumption with certainty, the test should only be interpreted as an indication.

To summarize the results for Denmark, the opening of the Øresund Bridge is estimated to have non-uniform effects on the pace of structural change across regions. More precisely, the results indicate that the pace of structural change in the treatment region contiguous to the bridge is lower in relation to the other regions due to the opening. Furthermore, the estimated treatment effect appears to be relatively constant over time. However, the robustness checks indicate that the identifying assumption of parallel counterfactual trends across regions is violated. In being so, the causal validity of the Danish results should be questioned. Caution is therefore required if interpreting the estimated treatment effects as being representative of the true, causal effects of opening the Øresund Bridge. Still, given that the data allow us to use a difference-in-difference approach, switching to another identification strategy risks lowering the reliability of the estimated treatment effects even if the identifying assumption is violated.

Table 1: Denmark – Modified Lilien index (MLI) based on number of persons employed

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	MLI employed	MLI employed	MLI employed	MLI employed	MLI employed	MLI employed	MLI employed	MLI employed	MLI employed	MLI employed
Treatment 2000	-5.08e-06***	-3.79e-06**	-6.20e-06***	-6.20e-06***	5.85e-06					
	(3.96e-07)	(8.60e-07)	(9.33e-07)	(9.39e-07)	(2.84e-06)					
Treatment 2001						-7.09e-06***	-6.60e-06***	-9.17e-06***	-9.17e-06***	-5.18e-06**
						(5.75e-07)	(3.55e-07)	(5.54e-07)	(5.57e-07)	(1.74e-06)
Log of regional value-added		-2.03e-05	-1.74e-05	-1.74e-05	3.66e-06		-8.63e-06	-9.89e-06	-9.89e-06	1.77e-06
		(1.67e-05)	(1.56e-05)	(1.57e-05)	(2.26e-05)		(9.88e-06)	(1.04e-05)	(1.04e-05)	(2.13e-05)
Construction			-3.35e-06***	-3.35e-06***	5.68e-07			-4.61e-06***	-4.61e-06***	-3.90e-06***
			(3.31e-07)	(3.33e-07)	(8.12e-07)			(4.24e-07)	(4.26e-07)	(4.42e-07)
Constant	7.01e-06***	0.000238	0.000204	0.000200	0.000317	7.26e-06***	0.000106	0.000119	0.000115	0.000243
	(8.86e-07)	(0.000189)	(0.000177)	(0.000178)	(0.00113)	(9.31e-07)	(0.000112)	(0.000117)	(0.000118)	(0.00108)
Observations	975	975	975	975	975	975	975	975	975	975
Adjusted R-squared	0.034	0.034	0.033	0.204	0.207	0.037	0.036	0.037	0.208	0.207
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Denmark – Norm of absolute values (NAV) based on hours worked

VARIABLES	(1) NAV hours worked	(2) NAV hours worked	(3) NAV hours worked	(4) NAV hours worked	(5) NAV hours worked	(6) NAV hours worked	(7) NAV hours worked	(8) NAV hours worked	(9) NAV hours worked	(10) NAV hours worked
Treatment 2000	-0.000216**	-0.000314*	6.34e-05	6.34e-05	0.000970***					
	(6.66e-05)	(0.000120)	(0.000174)	(0.000175)	(0.000134)					
Treatment 2001						-0.000452***	-0.000608***	-0.000510***	-0.000510***	-0.000697***
						(6.76e-05)	(9.19e-05)	(0.000110)	(0.000111)	(6.02e-05)
Log of regional value-added		0.00153	0.00108	0.00108	0.000673		0.00279	0.00283	0.00283	0.000530
		(0.00144)	(0.00157)	(0.00158)	(0.00139)		(0.00135)	(0.00136)	(0.00137)	(0.00147)
Construction			0.000522***	0.000522***	0.000806***			0.000176	0.000176	0.000120
			(0.000100)	(0.000101)	(3.79e-05)			(9.54e-05)	(9.60e-05)	(9.48e-05)
Constant	0.00198***	-0.0157	-0.0105	-0.0108	0.105	0.00201***	-0.0300	-0.0305	-0.0308	0.101
	(0.000124)	(0.0163)	(0.0178)	(0.0178)	(0.0754)	(0.000118)	(0.0153)	(0.0154)	(0.0154)	(0.0895)
Observations	975	975	975	975	975	975	975	975	975	975
Adjusted R-squared	0.007	0.006	0.006	0.359	0.359	0.008	0.008	0.007	0.360	0.358
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Figure 7: Denmark – Point estimates with 95% confidence intervals for year-specific treatment effects β

Table 3: Denmark – Wald test of year-specific treatment lags being equal

Null hypothesis	(1) MLI employed	(2) MLI hours worked	(3) MLI value- added	(4) NAV employed	(5) NAV hours worked	(6) NAV value- added
Treatment 2000–2003 all equal	77.70	575.79	22.35	43.19	783.64	202.09
	(0.0005)	(0.0000)	(0.0058)	(0.0017)	(0.0000)	(0.0001)
Treatment 2001–2004 all equal	39.06	200.37	1.30	19.13	487.62	5.59
	(0.0020)	(0.0001)	(0.3905)	(0.0078)	(0.0000)	(0.0648)

F-statistics and corresponding p-values of Wald test
*** p<0.01, ** p<0.05, * p<0.1

Sweden

The empirical results for the regions on the Swedish side of the Øresund Bridge are somewhat more ambiguous than for Denmark. Table 4 presents regressions using the MLI for the number of persons employed as measure of the pace of regional structural change. First, it should be noted that specifications 1–5 and 7–11 are the same specifications as those used for Denmark. Specifications 6 and 12 also include time-varying control variables for regional employment in high-tech industries and the length of regional transport infrastructure. Since data for these control variables only are available for Sweden, we are unable to include them in the regressions for Denmark. Furthermore, these variables do not cover the full sample period of 1993–2008, which explains the lower number of observations in specifications 6 and 12. For most regions, the studied time span is reduced to 1995–2006.[16]

Concerning the results in Table 4, we observe that the estimated treatment effects starting in 2000 are positive and statistically significant when fixed effects for regions and years are included together with the control variable for regional value-added. For treatment starting in 2001, only the specification limited to controlling for region and year fixed effects yields a significant estimate. The magnitudes of the significant coefficients are slightly above one tenth of the standard deviation of the dependent variable in the treatment region. The treatment effects–starting in both 2000 and 2001–become insignificant when more explanatory variables are added. The one exception is specification 6, which includes the full set of control variables. Again, the estimated treatment effect is significant, but this time with a negative sign. Compared to specification 5, in which the coefficient is negative but insignificant, two changes can explain the shift in specification 6: additional control variables are added and, as a consequence, the studied time period is restricted to 1995–2006 for most regions. To better understand if it is a combination or only one of these changes that underlie the negative and significant treatment estimate, we re-estimate specification 5 based on the fewer observations included in specification 6. The results indicate that the smaller set of observations, and not the two additional control variables, explains most of the change in both magnitude and significance of the estimated treatment effect from specification 5 to 6.

As an indicator of the robustness of the results in Table 4, which are based on the MLI for the number of persons employed as dependent variable, all specifications are also estimated using the alternative

[16] Refer to earlier sections for a more detailed presentation of the two control variables 'Regional employment high-tech jobs' and 'Regional transport infrastructure'.

measure NAV (see Table 11 in the appendix). Compared to the MLI, the estimated treatment effects change quite markedly when using the NAV as dependent variable. Most of the estimated treatment effects turn negative, and several of these are statistically significant. These findings do not conform well with the results in Table 4, which, if anything, indicate a positive treatment effect of opening the Øresund Bridge.

The estimated coefficients differ less between the MLI and NAV when they are constructed using regional value-added instead of employment (see Table 5, and Table 12 in the appendix). For many specifications, the opening of the Øresund Bridge is estimated to have a positive and statistically significant treatment effect. The significant results suggest that the opening of the bridge had non-uniform effects on the pace of regional structural change in contiguous and non-contiguous Swedish regions, and that the null alternative of Hypothesis 1 therefore should be rejected. Furthermore, the positive signs of the treatment effects indicate that the treatment region of Sydsverige experiences an increased pace of structural change compared to other Swedish regions due to the new connection to Denmark. The increase amounts to around one fifth to one half of the treatment region's standard deviation in the measured pace. However, specification 12 casts some doubt on the direction in the relationship, since it yields a significant treatment effect of negative sign. As stressed before, some caution is required when using value-added for measuring the pace of structural change, as it only serves as a proxy for interindustry factor reallocations.

In Figure 8 the estimated coefficients of the year-specific treatment effects are presented for all measures of the pace of structural change available in Sweden. As for Denmark, the effects are estimated using a specification including control variables for regional value-added, construction period, and industry fixed effects.[17] Table 6 presents the results from a Wald test of the year-specific treatment lags for 2000–2006 and 2001–2007 all being equal.[18] We reject the null alternative of Hypothesis 2 in all cases, which indicates that a dynamic treatment effect is present. However, visual inspection of the estimates in Figure 8 does not reveal any clear dynamic pattern after the opening of the Øresund Bridge in 2000. For both MLI and NAV based on the number of persons employed, the treatment effects are statistically insignificant for most of the years in the post-opening period. If

[17] The full regression results of the specification used to obtain the estimated treatment effects in Figure 8 are presented in Table 19 to Table 22, specification 2, in the appendix. The specification corresponds to specifications 4 and 10 in Table 4, Table 5, Table 11, and Table 12 with the only difference being that the single treatment variable has been replaced by multiple year-specific treatment effects, in accordance with the regression equation in (6).

[18] The years 2000–2006 and 2001–2007 are the longest time periods possible to test given the restrictions imposed by the clustered data.

instead based on value-added, both measures mainly yield positive and significant results, but the effects appear to be relatively constant over time.

Figure 8 also allows us to assess the plausibility of the identifying assumption of our difference-in-difference regressions. Except for the MLI based on the number of persons employed, all measures yield at least one year-specific treatment effect prior to the opening of the Øresund Bridge that is different from zero at the 5% significance level. We therefore reject the null hypothesis presented in connection to the regression equation in (6). This rejection implies that regions exhibit different trends in the dependent variable prior to treatment and gives us reason to believe that the identifying assumption of parallel counterfactual trends is being violated. The estimates of the other specifications conform with these results (see Table 19 to Table 22 in the appendix). Still, the test is only indicative as it cannot establish with certainty whether the identifying assumption is violated.

To conclude, the estimated treatment effects provide some indications that the pace of structural change is affected differently across contiguous and non-contiguous Swedish regions by the opening of the Øresund Bridge. The estimates do not conform with the null alternative of Hypothesis 1, which predicts a uniform effect across regions. However, the results are weak and relatively inconclusive with regards to the direction of the effect when the measures of pace are based on the number of persons employed. In contrast, measures based on value-added yield more stable and significant, positive effects on the treatment region. Interestingly, and as will be further discussed in the next section, this direction in the impact on regional differences is opposite to what is found in Denmark. Related to Hypothesis 2, we find no apparent pattern in the dynamic effect on regional differences in the pace of structural change when allowing for year-specific treatment effects after the opening of the bridge. However, the estimated treatment effects should be interpreted with prudence. The regressions for testing regional trends prior to treatment suggest that the identifying assumption of parallel counterfactual trends for treatment and control regions is violated. Nonetheless, even if this is true, the difference-in-difference approach resolves some of the problems associated with other applicable econometric methods. Using another identification strategy thus risks lowering the reliability of the estimated treatment effects.

Table 4: Sweden – Modified Lilien index (MLI) based on number of persons employed

VARIABLES	(1) MLI employed	(2) MLI employed	(3) MLI employed	(4) MLI employed	(5) MLI employed	(6) MLI employed	(7) MLI employed	(8) MLI employed	(9) MLI employed	(10) MLI employed	(11) MLI employed	(12) MLI employed
Treatment 2000	3.16e-06**	2.57e-06**	1.12e-06	1.12e-06	-7.03e-06	-1.64e-05**						
	(1.06e-06)	(1.07e-06)	(1.07e-06)	(1.08e-06)	(4.56e-06)	(6.08e-06)						
Treatment 2001							2.94e-06*	2.48e-06	1.22e-06	1.22e-06	-2.46e-06	-7.02e-06
							(1.40e-06)	(1.75e-06)	(2.29e-06)	(2.30e-06)	(4.79e-06)	(6.21e-06)
Log of regional value-added		3.73e-05***	3.79e-05***	3.79e-05***	0.000131*	0.000135		3.76e-05***	3.79e-05***	3.79e-05***	0.000129*	0.000126
		(8.22e-06)	(8.19e-06)	(8.22e-06)	(5.98e-05)	(8.04e-05)		(7.87e-06)	(7.65e-06)	(7.68e-06)	(6.17e-05)	(8.84e-05)
Construction			-2.17e-06	-2.17e-06	-6.27e-06**	-1.12e-05**			-2.20e-06	-2.20e-06	-3.74e-06*	-4.31e-06*
			(1.26e-06)	(1.27e-06)	(2.27e-06)	(4.09e-06)			(1.56e-06)	(1.57e-06)	(1.88e-06)	(1.91e-06)
Regional employment high-tech jobs						3.81e-08						5.46e-08**
						(2.10e-08)						(1.82e-08)
Regional transport infrastructure						-1.49e-09						-1.74e-09
						(2.48e-09)						(2.54e-09)
Constant	9.38e-06***	-0.000418***	-0.000425***	-0.000429***	0.00835	0.00784	9.36e-06***	-0.000421***	-0.000425***	-0.000430***	0.00876	0.00870
	(5.96e-07)	(9.59e-05)	(9.55e-05)	(9.56e-05)	(0.00461)	(0.00614)	(5.75e-07)	(9.18e-05)	(8.92e-05)	(8.92e-05)	(0.00578)	(0.00785)
Observations	1,560	1,560	1,560	1,560	1,560	1,222	1,560	1,560	1,560	1,560	1,560	1,222
Adjusted R-squared	0.027	0.029	0.029	0.180	0.185	0.180	0.027	0.029	0.029	0.180	0.185	0.179
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Sweden – Modified Lilien index (MLI) based on value-added

VARIABLES	(1) MLI value-added	(2) MLI value-added	(3) MLI value-added	(4) MLI value-added	(5) MLI value-added	(6) MLI value-added	(7) MLI value-added	(8) MLI value-added	(9) MLI value-added	(10) MLI value-added	(11) MLI value-added	(12) MLI value-added
Treatment 2000	1.03e-05**	6.61e-06	3.36e-05***	3.37e-05***	3.24e-06	-1.17e-05						
	(3.72e-06)	(4.28e-06)	(6.64e-06)	(6.67e-06)	(1.47e-05)	(2.90e-05)						
Treatment 2001							1.01e-05**	7.22e-06	2.50e-05***	2.50e-05***	-4.79e-06	-2.05e-05**
							(3.74e-06)	(5.01e-06)	(6.64e-06)	(6.68e-06)	(9.57e-06)	(8.53e-06)
Log of regional value-added		0.000234**	0.000223**	0.000224**	0.000389**	0.000444**		0.000234**	0.000229**	0.000230**	0.000389**	0.000434**
		(8.97e-05)	(8.11e-05)	(8.11e-05)	(0.000145)	(0.000160)		(8.97e-05)	(8.53e-05)	(8.54e-05)	(0.000141)	(0.000144)
Construction			4.03e-05***	4.03e-05***	2.80e-05***	3.50e-05*			3.09e-05***	3.09e-05***	2.49e-05***	3.55e-05***
			(5.94e-06)	(5.97e-06)	(6.14e-06)	(1.57e-05)			(4.88e-06)	(4.90e-06)	(3.94e-06)	(3.50e-06)
Regional employment high-tech jobs						-7.57e-08						-5.39e-08
						(2.16e-07)						(1.90e-07)
Regional transport infrastructure						1.36e-08*						1.35e-08
						(7.01e-09)						(7.20e-09)
Constant	3.52e-05***	-0.00263**	-0.00250**	-0.00253**	-0.0105	0.0252***	3.51e-05***	-0.00263**	-0.00257**	-0.00260**	-0.0102	0.0225**
	(8.32e-06)	(0.00103)	(0.000933)	(0.000933)	(0.00634)	(0.00719)	(8.31e-06)	(0.00103)	(0.000982)	(0.000983)	(0.00640)	(0.00867)
Observations	1,558	1,558	1,558	1,558	1,558	1,220	1,558	1,558	1,558	1,558	1,558	1,220
Adjusted R-squared	0.031	0.035	0.035	0.234	0.233	0.189	0.031	0.035	0.035	0.234	0.233	0.190
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

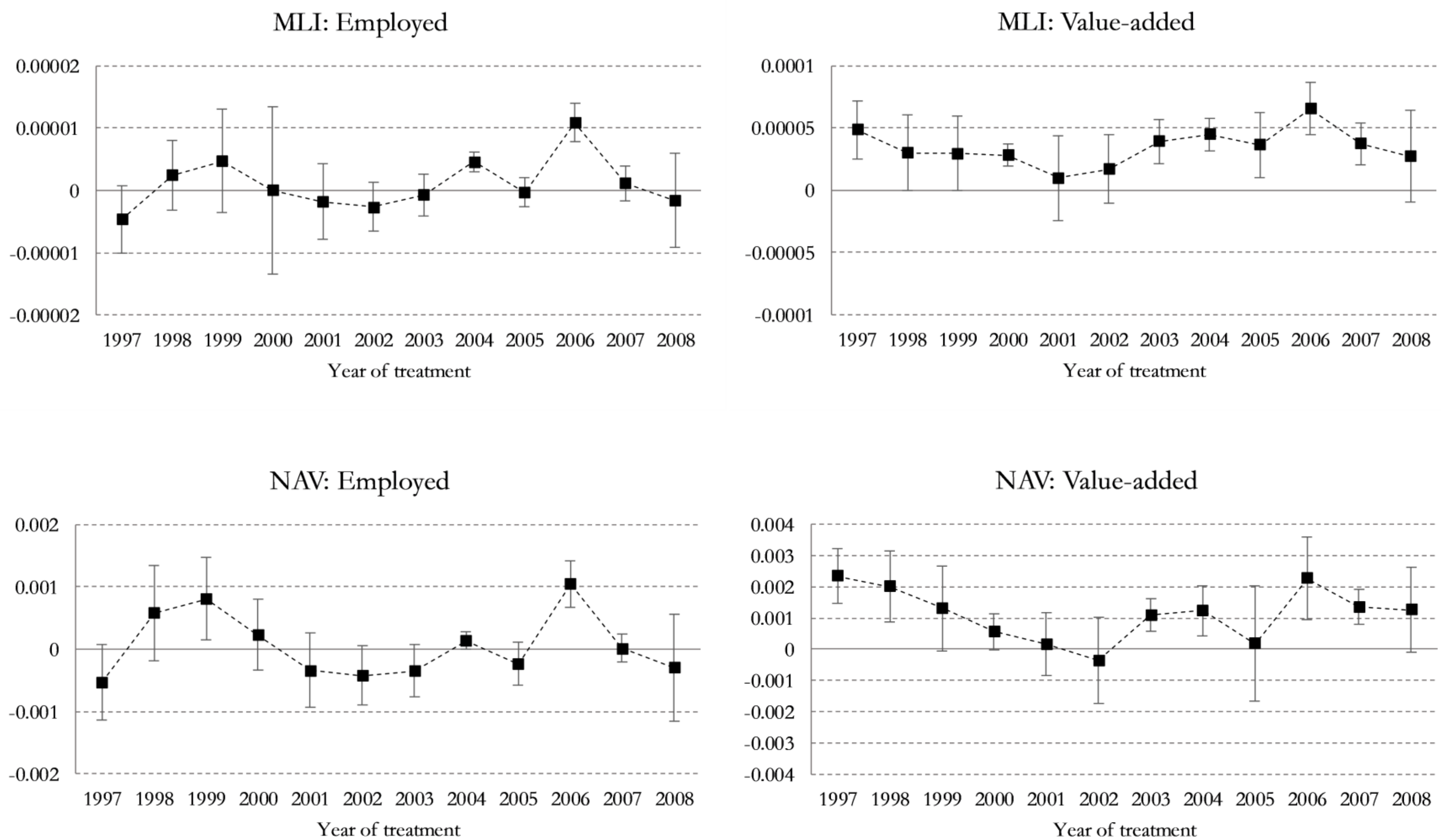

Figure 8: Sweden – Point estimates with 95% confidence intervals for year-specific treatment effects β

Table 6: Sweden – Wald test of year-specific treatment lags being equal

Null hypothesis	(1) MLI employed	(2) MLI value-added	(3) NAV employed	(4) NAV value-added
Treatment 2000–2006 all equal	61.70	601.07	206.38	67.64
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Treatment 2001–2007 all equal	11138.43	78.83	238.87	47.88
	(0.0000)	(0.0000)	(0.0000)	(0.0000)

F-statistics of Wald test with corresponding p-values in brackets
*** p<0.01, ** p<0.05, * p<0.1

Conclusion

In previous studies of the effects of international economic integration on structural change, countries are commonly treated as homogenous entities, thereby not allowing for different effects across sub-national regions. We attempt to fill this void by investigating if international economic integration, achieved through improvements of cross-border transport infrastructure, has different effects across regions on the pace of structural change. Our hypotheses detail how the effects may vary across regions by suggesting that improved cross-border transport infrastructure impacts the pace of structural change differently for contiguous and non-contiguous regions. Through a case study, we assess if this spatial pattern arose in connection to the opening of the Øresund Bridge in 2000. We empirically test the hypotheses by using a difference-in-difference identification strategy applied to regional data on both the Danish and Swedish sides of the bridge.

For the Danish regions, the absolute majority of estimated treatment effects for employment-based measures of the pace of structural change are negative and statistically significant. This indicates that the opening of the Øresund Bridge lowered the pace of structural change in the contiguous region of Hovedstaden compared to the other regions. The estimated year-specific treatment effects are statistically different from each other after the opening of the bridge, but no clear dynamic pattern is visible.

In contrast to Denmark, the estimated treatment effects on the Swedish side of the bridge are weak and show mixed positive and negative signs for measures based on employment. If the measures instead are constructed using regional value-added, several treatment coefficients turn positive and significant. Although the year-specific treatment effects are found to be statistically different from each other after the opening of the bridge, no clear dynamic trend is observable by visual inspection.

The estimation results for Sweden, although being relatively mixed, provide indications of a positive treatment effect. This suggests that the pace of structural change increased in the contiguous region of Sydsverige compared to non-contiguous regions due to the opening of the Øresund Bridge. The direction of the effect is opposite to the one indicated by the results for Denmark. These opposite outcomes are not necessarily a cause of concern, since regional differences between Hovedstaden and Sydsverige can motivate the different signs of the treatment effect. First, Hovedstaden is considerably larger in economic size than Sydsverige, and we can thus expect to see different specialization and agglomeration patterns arising from the opening of the bridge. Since Hovedstaden represents a much larger share of the national economy than Sydsverige, it is plausible that structural change in Hovedstaden, in itself, has even larger effects on the structural change of other Danish regions. This could serve to explain the estimated negative treatment effect in Denmark. By an analogous reasoning, the feedback effects on Sydsverige from structural change occurring in Hovedstaden can motivate the positive treatment effect observed for Sweden. Second, although Denmark and Sweden share many similarities, important differences do exist in national and local institutions and regulations. For example, differences in tax levels and social security systems are likely to influence the decisions of firms and workers in connection with the opening of the Øresund Bridge (OECD, 2003). In turn, this has consequences for the structure of regional economies by affecting cross-border, interregional, and intraregional reallocations of production factors. As noted by OECD (2003), improvements in resource allocation made possible by the bridge are hindered by regulatory and fiscal differences in the Øresund region, which instead contribute to the generation of contingent rents. Differences in institutions and policies can potentially provide explanations for the opposite signs of the treatment effect in Denmark and Sweden. Finally, we would like to highlight the initial differences in industry composition between Hovedstaden and Sydsverige. Based on employment and value-added, the service industries dominate the economies of both regions during the whole sample period. However, the relative shares of the manufacturing and agricultural industries were larger in Sydsverige, with the latter being roughly ten times the size in Hovedstaden. If the effects of opening the bridge differ across industries, which is plausible, the estimated effects on regional differences in the pace of structural change are probably linked to these initial structural dissimilarities. This link does not appear to be dominant in explaining the results, however, as the negative direction in Denmark remains stable when the Danish treatment region is enlarged to encompass the whole of Zealand, which makes its industry composition more similar to Sydsverige (see Table 23 to Table 28 in the appendix). Nonetheless, the structural dissimilarities are not completely eliminated by this enlargement, and other differences, for example in economic size, between the Danish and Swedish treatment regions are made even greater.

In order to interpret the treatment effects from our difference-in-difference regressions as the true causal effects of opening the Øresund Bridge, the identifying assumption that treatment and control regions exhibit parallel counterfactual trends in the pace of structural change needs to be true. Since the assumption is impossible to verify directly, we are limited to conducting tests to assess its plausibility. The tests indicate that the identifying assumption is being violated in both the Danish and

Swedish regressions. However, as noted before, the tests are only indicative, and we are therefore unable to establish with certainty whether the identifying assumption actually is violated.

Taking a step back to consider the ideal circumstances for answering the research question, we would like to have access to data at a less aggregated level in space and consider cases where exogenous shocks either improve or worsen the quality of cross-border transport infrastructure. With more granular spatial data, we could further analyse the continuous spatial scale along which we believe that regional differences in the pace of structural change arise. In considering cases of exogenous shocks to the quality of cross-border transport infrastructure, we could avoid the concerns of our case study that the decision of when and where to construct the Øresund Bridge correlates with other factors that affect the regional pace of structural change. Exploitation of sources of exogenous variation would allow us to use alternative econometric models to identify the causal effect in a reliable way. For example, future studies could possibly use the introduction of border controls between Denmark and Sweden in late 2015–arguably an exogenous event following from migration flows–to instrument for changes in the transport costs associated with crossing the Øresund Bridge. Given that we do not have access to this kind of data, we assess that the difference-in-difference identification strategy used in this paper provides estimates of the treatment effect that are good enough, even if our tests indicate that the identifying assumption might be violated. We base this judgement on several considerations. Related to our choice of case study, the construction of the Øresund Bridge constitutes a considerable improvement to the cross-border transport infrastructure between Denmark and Sweden, and its treatment effect is relatively sharp in time when it opened on 1 July 2000. In comparison to other cases of improved cross-border transport infrastructure, this makes the opening of the Øresund Bridge ideal for empirical analysis, especially so using a difference-in-difference framework. Furthermore, while other econometric models can be used to study the case, the difference-in-difference identification strategy is the most suitable given the structure of the data. Even if the identifying assumption of parallel counterfactual trends is indeed violated, difference-in-difference models still have the potential to reduce threats to internal validity–for example related to omitted variable bias and mismeasurement–compared to other applicable econometric models (Bertrand, et al., 2004; Meyer, 1995).

As an indicative answer to the research question, the estimated treatment effects in our case study suggest that international economic integration, achieved through improvements of cross-border transport infrastructure, has different effects across regions on the pace of structural change. The different effects are related to the spatial proximity of regions to the improved cross-border transport infrastructure. The arising regional differences seem to be dynamic over time, although no apparent pattern is discernible. Regardless, since our tests indicate that the identifying assumption of the econometric strategy is violated, we stress that this answer is uncertain and must be interpreted with caution.

Concerning the internal validity of the study, the indicated violation of the identifying assumption is the main concern. It is important to understand the nature of this threat to internal validity. Given the research question we ask, the indicated violation does not threaten the study's internal validity by rendering its methodology faulty. Rather the ex post results make the difference-in-difference strategy questionable as a method to test the hypotheses. However, from an ex ante perspective, the empirical results do not affect the soundness of the methodology in itself. Thus, the internal validity of the employed methodological approach remains intact despite the indicated violation of the identifying assumption.

There are several reasons why the identifying assumption of the difference-in-difference strategy may be violated. First, there is a possibility that workers and firms in contiguous regions–anticipating the consequences of the new cross-border link–adjusted their actions prior to the opening of the Øresund Bridge. Such anticipatory adjustments can explain non-parallel trends in the pace of structural change. If this is the case, we would expect to see significant effects on the number of Øresund border-crossings before the opening of the bridge. However, no such pattern is discernible in Figure 1, as the number of border-crossings by people and vehicles appears relatively stable before year 2000.

Second, the construction of the Øresund Bridge in itself may have affected the pace of structural change disproportionally in contiguous regions. We attempt to control for this by including a dummy variable for the construction period 1996–1999. Per se, a dummy control is rather brute and may be unable to capture important nuances of the construction process. Therefore, the control may not fully remove non-parallel trends arising from the construction of the bridge.

Third, the difference-in-difference identification strategy builds on the assumption that changes impacting all units of observation, and that are not controlled for at the unit-level, have the same effects across treatment and control groups. In our case, this translates into that contiguous and non-contiguous regions should experience the same effect on the pace of structural change from events that impact all regions, for example technological innovations, amendments of national laws, and international business cycles. This, obviously, is a potent source of violations of the identifying assumption. As a way to address this concern, we include region-specific time trends in some specifications, but this does not alter the conclusion with regards to the validity of the identifying assumption.

The problems of internal validity aside, caution is also required when considering the study's external validity. This mainly stems from our empirical investigation being a case study. It naturally follows that the generalizability of the results is limited. This is especially true as our results indicate that the treatment effect has opposite signs on the Danish and Swedish sides of the Øresund Bridge. The impact of improved cross-border transport infrastructure on regional differences in the pace of structural change therefore seems to be sensitive to the specifics of the case under consideration.

Furthermore, as briefly discussed in the introduction of this paper, it may well be the case that our results are influenced by dynamics of urban, rather than merely international, economic integration. For example, the sharp increase in commuting across the strait from 2000 indicates that Copenhagen and Malmö entered into a centre-periphery relationship in a new cross-border urban agglomeration after the opening of the Øresund Bridge. With Copenhagen being the dominant economic concentration, the new fixed link between the two cities generates a natural sorting in the location decisions of firms and workers. In essence, Malmö becomes an urban sub-centre in the periphery of the agglomeration with more affordable housing, while Copenhagen remains the centre of gravity for economic activity, especially by hosting businesses with high value-creation. Even if the empirical results are influenced by dynamics pertaining to urban integration, the fact that it occurs across the Danish-Swedish national border still makes it a case of international economic integration, albeit at a local level in the integrating countries. As a case study, the opening of the Øresund Bridge thus conforms with the purpose and research question of the paper. However, the distinction between international and urban integration has implications for the external validity of the study. Since the two forces of integration–international and urban–are intertwined in our case study, we are unable to differentiate between their separate effects. Thus, the results presented in this paper are primarily informative about cases where improved cross-border transport infrastructure, in addition to international economic integration, also generates urban integration. If possible, future studies can provide a more nuanced picture by separately identifying the effects of these two sources of integration. As a working hypothesis, we believe that the separate effect of international economic integration on regional differences in the pace of structural change is relatively equal across integrating countries, while the dynamics of agglomeration and specialization arising from integrating urban areas–especially if these are dissimilar in size and structure–can explain the different signs of the treatment effect observed in this paper for Denmark and Sweden.

We suggest two additional ways in which future studies can complement this paper. It would be of interest to compare the results from our empirical case study with a large-sample study. Based on our experience from working with this paper, the main problems of a large-sample study would probably be related to finding reliable and comparable data, identifying a suitable econometric strategy, and incorporating the specifics of the cases included. As a second complement to the findings of this paper, future studies could investigate the determinants of the opposite treatment effects observed in Denmark and Sweden. We provide a tentative discussion of potential explanations, but a more thorough review of the matter is encouraged.

If future studies confirm our two main results–that international economic integration, achieved through improvements of cross-border transport infrastructure, can explain regional differences in the pace of structural change, and that the direction of the effect does not necessarily need to be the same in the integrating countries–several interesting implications follow. First, if improved cross-border transport infrastructure can explain regional differences in the pace of structural change, regional disparities in associated costs, for example in unemployment levels, are likely to follow. These costs and their distribution should be taken into account in cost-benefit and distributional analyses of proposed cross-border transport infrastructure projects. Such analyses may advise policy initiatives aimed at mitigating project-related cost asymmetries across regions. Second, there are potential negative consequences of our finding that improvements of cross-border transport infrastructure can yield opposite treatment effects in the integrating countries. This and other asymmetric economic effects across integrating countries may make it more difficult to agree on improvements of cross-border transport infrastructure. If the asymmetries are substantial, projects may be effectively hindered altogether, even if they are deemed profitable when the sum of effects is considered. To avoid this situation, some sort of redistributive compensation scheme between connecting countries may be required. Improvements of cross-border transport infrastructure are made more feasible by distributing the economic benefits more equally between integrating countries, and greater international economic integration is thereby achievable.

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Appendix A: Regression results

Table 7: Denmark – Norm of absolute values (NAV) based on number of persons employed

VARIABLES	(1) NAV employed	(2) NAV employed	(3) NAV employed	(4) NAV employed	(5) NAV employed	(6) NAV employed	(7) NAV employed	(8) NAV employed	(9) NAV employed	(10) NAV employed
Treatment 2000	-0.000555***	-0.000543***	-0.000674***	-0.000674***	0.000440**					
	(2.59e-05)	(8.53e-05)	(9.85e-05)	(9.92e-05)	(0.000142)					
Treatment 2001						-0.000743***	-0.000782***	-0.000941***	-0.000941***	-0.000574*
						(4.43e-05)	(4.39e-05)	(7.92e-05)	(7.97e-05)	(0.000214)
Log of regional value-added		-0.000181	-2.33e-05	-2.33e-05	0.00243		0.000697	0.000619	0.000619	0.00210
		(0.00143)	(0.00136)	(0.00136)	(0.00135)		(0.000785)	(0.000829)	(0.000835)	(0.00140)
Construction			-0.000181*	-0.000181*	0.000183**			-0.000286**	-0.000286**	-0.000215
			(7.46e-05)	(7.51e-05)	(6.38e-05)			(9.04e-05)	(9.10e-05)	(0.000111)
Constant	0.00179***	0.00389	0.00208	0.00168	0.148*	0.00181***	-0.00608	-0.00523	-0.00562	0.133
	(0.000124)	(0.0162)	(0.0153)	(0.0155)	(0.0664)	(0.000132)	(0.00887)	(0.00936)	(0.00944)	(0.0728)
Observations	975	975	975	975	975	975	975	975	975	975
Adjusted R-squared	0.020	0.019	0.018	0.378	0.378	0.022	0.021	0.021	0.381	0.379
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8: Denmark – Modified Lilien index (MLI) based on hours worked

VARIABLES	(1) MLI hours worked	(2) MLI hours worked	(3) MLI hours worked	(4) MLI hours worked	(5) MLI hours worked	(6) MLI hours worked	(7) MLI hours worked	(8) MLI hours worked	(9) MLI hours worked	(10) MLI hours worked
Treatment 2000	-1.24e-06	-2.38e-06	1.95e-06	1.95e-06	1.26e-05***					
	(1.09e-06)	(2.16e-06)	(2.68e-06)	(2.69e-06)	(1.51e-06)					
Treatment 2001						-4.22e-06**	-6.17e-06**	-5.34e-06**	-5.34e-06**	-8.26e-06***
						(1.07e-06)	(1.83e-06)	(1.82e-06)	(1.83e-06)	(9.20e-07)
Log of regional value-added		1.79e-05	1.27e-05	1.27e-05	1.60e-06		3.49e-05	3.53e-05	3.53e-05	5.95e-07
		(2.34e-05)	(2.41e-05)	(2.42e-05)	(2.61e-05)		(2.31e-05)	(2.32e-05)	(2.34e-05)	(2.93e-05)
Construction			5.99e-06***	5.99e-06***	9.31e-06***			1.51e-06**	1.51e-06**	6.49e-07
			(7.79e-07)	(7.84e-07)	(4.48e-07)			(4.67e-07)	(4.70e-07)	(6.63e-07)
Constant	8.25e-06***	-0.000197	-0.000137	-0.000137	0.000719	8.55e-06***	-0.000390	-0.000394	-0.000395	0.000712
	(1.20e-06)	(0.000265)	(0.000273)	(0.000272)	(0.00136)	(1.15e-06)	(0.000263)	(0.000264)	(0.000264)	(0.00159)
Observations	975	975	975	975	975	975	975	975	975	975
Adjusted R-squared	0.020	0.019	0.020	0.197	0.200	0.022	0.023	0.022	0.199	0.199
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Denmark – Modified Lilien index (MLI) based on value-added

VARIABLES	(1) MLI value-added	(2) MLI value-added	(3) MLI value-added	(4) MLI value-added	(5) MLI value-added	(6) MLI value-added	(7) MLI value-added	(8) MLI value-added	(9) MLI value-added	(10) MLI value-added
Treatment 2000	1.20e-06	3.00e-06	5.85e-06	5.85e-06	1.94e-06					
	(2.38e-06)	(5.21e-06)	(8.49e-06)	(8.54e-06)	(1.51e-05)					
Treatment 2001						-2.63e-07	5.87e-07	8.81e-07	8.81e-07	-1.14e-05
						(1.90e-06)	(4.28e-06)	(5.04e-06)	(5.07e-06)	(6.48e-06)
Log of regional value-added		-2.82e-05	-3.16e-05	-3.16e-05	-9.18e-05		-1.52e-05	-1.50e-05	-1.50e-05	-0.000103
		(5.15e-05)	(5.30e-05)	(5.33e-05)	(8.48e-05)		(5.06e-05)	(5.06e-05)	(5.10e-05)	(7.48e-05)
Construction			3.95e-06	3.95e-06	2.40e-06			5.27e-07	5.27e-07	-2.33e-06
			(5.37e-06)	(5.40e-06)	(7.87e-06)			(2.57e-06)	(2.58e-06)	(3.22e-06)
Constant	1.25e-05**	0.000332	0.000372	0.000356	-0.00759	1.27e-05**	0.000185	0.000183	0.000168	-0.00811
	(3.30e-06)	(0.000583)	(0.000600)	(0.000603)	(0.00553)	(3.27e-06)	(0.000573)	(0.000573)	(0.000577)	(0.00485)
Observations	975	975	975	975	975	975	975	975	975	975
Adjusted R-squared	0.017	0.016	0.015	0.139	0.136	0.017	0.016	0.015	0.139	0.137
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Denmark – Norm of absolute values (NAV) based on value-added

VARIABLES	(1) NAV value-added	(2) NAV value-added	(3) NAV value-added	(4) NAV value-added	(5) NAV value-added	(6) NAV value-added	(7) NAV value-added	(8) NAV value-added	(9) NAV value-added	(10) NAV value-added
Treatment 2000	-3.41e-05	0.000198	0.000284	0.000284	-0.000282					
	(0.000160)	(0.000372)	(0.000550)	(0.000554)	(0.000894)					
Treatment 2001						1.78e-05	0.000222	0.000272	0.000272	-0.000323
						(0.000150)	(0.000322)	(0.000365)	(0.000367)	(0.000487)
Log of regional value-added		-0.00363	-0.00373	-0.00373	-0.00825		-0.00365	-0.00362	-0.00362	-0.00876
		(0.00413)	(0.00415)	(0.00418)	(0.00572)		(0.00378)	(0.00380)	(0.00383)	(0.00531)
Construction			0.000119	0.000119	-8.30e-05			8.93e-05	8.93e-05	-6.07e-05
			(0.000362)	(0.000364)	(0.000495)			(0.000236)	(0.000237)	(0.000280)
Constant	0.00265***	0.0438	0.0450	0.0430	-0.665	0.00264***	0.0440	0.0438	0.0417	-0.691*
	(0.000343)	(0.0468)	(0.0471)	(0.0474)	(0.353)	(0.000340)	(0.0428)	(0.0431)	(0.0434)	(0.323)
Observations	975	975	975	975	975	975	975	975	975	975
Adjusted R-squared	0.015	0.014	0.013	0.258	0.257	0.015	0.014	0.013	0.258	0.257
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Sweden – Norm of absolute values (NAV) based on number of persons employed

VARIABLES	(1) NAV employed	(2) NAV employed	(3) NAV employed	(4) NAV employed	(5) NAV employed	(6) NAV employed	(7) NAV employed	(8) NAV employed	(9) NAV employed	(10) NAV employed	(11) NAV employed	(12) NAV employed
Treatment 2000	0.000194*	0.000173	-1.96e-05	-1.96e-05	-0.000751**	-0.00180***						
	(9.65e-05)	(0.000107)	(9.90e-05)	(9.94e-05)	(0.000258)	(0.000451)						
Treatment 2001							9.73e-05	8.01e-05	-0.000129	-0.000129	-0.000768**	-0.00120**
							(0.000116)	(0.000128)	(0.000133)	(0.000133)	(0.000233)	(0.000345)
Log of regional value-added		0.00136*	0.00144*	0.00144*	0.00905**	0.00704		0.00141*	0.00147*	0.00147*	0.00871*	0.00598
		(0.000666)	(0.000663)	(0.000666)	(0.00371)	(0.00533)		(0.000659)	(0.000656)	(0.000659)	(0.00398)	(0.00625)
Construction			-0.000287	-0.000287	-0.000642***	-0.00122**			-0.000365**	-0.000365**	-0.000537***	-0.000578**
			(0.000156)	(0.000157)	(0.000172)	(0.000361)			(0.000141)	(0.000142)	(0.000144)	(0.000186)
Regional empl. high-tech jobs						-2.16e-06						-7.43e-08
						(1.30e-06)						(2.11e-06)
Regional transport infrastructure						1.16e-08						-1.42e-08
						(2.66e-07)						(2.67e-07)
Constant	0.00232***	-0.0129	-0.0138	-0.0141	0.501	0.150	0.00232***	-0.0134	-0.0142	-0.0145*	0.456	0.154
	(6.08e-05)	(0.00773)	(0.00768)	(0.00768)	(0.313)	(0.382)	(6.10e-05)	(0.00763)	(0.00758)	(0.00760)	(0.368)	(0.512)
Observations	1,560	1,560	1,560	1,560	1,560	1,222	1,560	1,560	1,560	1,560	1,560	1,222
Adjusted R-squared	0.030	0.029	0.029	0.286	0.288	0.293	0.029	0.029	0.029	0.286	0.289	0.293
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 12: Sweden – Norm of absolute values (NAV) based on value-added

VARIABLES	(1) NAV value-added	(2) NAV value-added	(3) NAV value-added	(4) NAV value-added	(5) NAV value-added	(6) NAV value-added	(7) NAV value-added	(8) NAV value-added	(9) NAV value-added	(10) NAV value-added	(11) NAV value-added	(12) NAV value-added
Treatment 2000	0.000128	5.98e-05	0.000853***	0.000853***	-0.000825	-0.000954						
	(0.000170)	(0.000132)	(0.000202)	(0.000203)	(0.000699)	(0.00142)						
Treatment 2001							0.000185	0.000132	0.000703**	0.000703**	-0.000790	-0.00109**
							(0.000198)	(0.000193)	(0.000259)	(0.000260)	(0.000436)	(0.000418)
Log of regional value-added		0.00432	0.00401	0.00401	0.00354	0.00623		0.00431	0.00413	0.00413	0.00318	0.00555
		(0.00425)	(0.00411)	(0.00413)	(0.00969)	(0.00849)		(0.00423)	(0.00415)	(0.00417)	(0.00950)	(0.00783)
Construction			0.00118***	0.00118***	0.000660	0.000946			0.000996***	0.000996***	0.000793***	0.00115***
			(0.000201)	(0.000202)	(0.000392)	(0.000699)			(0.000182)	(0.000182)	(0.000180)	(0.000165)
Regional empl. high-tech jobs						1.00e-06						2.40e-06
						(8.82e-06)						(7.51e-06)
Regional transport infrastructure						4.54e-07						4.43e-07
						(2.58e-07)						(2.73e-07)
Constant	0.00367***	-0.0445	-0.0408	-0.0430	-0.0169	0.205	0.00366***	-0.0443	-0.0422	-0.0444	-0.0570	0.110
	(0.000248)	(0.0489)	(0.0474)	(0.0476)	(0.669)	(0.390)	(0.000243)	(0.0488)	(0.0479)	(0.0481)	(0.734)	(0.485)
Observations	1,560	1,560	1,560	1,560	1,560	1,222	1,560	1,560	1,560	1,560	1,560	1,222
Adjusted R-squared	0.035	0.035	0.035	0.327	0.327	0.290	0.035	0.035	0.035	0.327	0.328	0.290
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Appendix B: Robustness regressions

Table 13: Denmark – Robustness check for Modified Lilien index (MLI) based on number of persons employed

	(1)	(2)	(3)
VARIABLES	MLI employed	MLI employed	MLI employed
Treatment 1996	-1.01e-06		
	(6.80e-07)		
Treatment 1997	-3.71e-06***	-2.70e-06**	-1.10e-05***
	(3.92e-07)	(9.45e-07)	(1.25e-06)
Treatment 1998	-7.03e-06***	-6.02e-06***	-2.26e-05***
	(1.15e-06)	(7.52e-07)	(4.63e-06)
Treatment 1999	-2.42e-06*	-1.41e-06	-2.62e-05***
	(9.82e-07)	(1.61e-06)	(5.30e-06)
Treatment 2000	3.17e-06**	3.17e-06**	-4.23e-05**
	(1.09e-06)	(1.09e-06)	(1.11e-05)
Treatment 2001	-5.08e-06***	-5.08e-06***	-5.89e-05**
	(7.12e-07)	(7.12e-07)	(1.35e-05)
Treatment 2002	-4.64e-06*	-4.64e-06*	-6.67e-05**
	(1.95e-06)	(1.95e-06)	(1.58e-05)
Treatment 2003	-6.22e-06***	-6.22e-06***	-7.65e-05**
	(1.03e-06)	(1.03e-06)	(1.72e-05)
Treatment 2004	-1.24e-05***	-1.24e-05***	-9.10e-05***
	(1.86e-06)	(1.86e-06)	(1.80e-05)
Treatment 2005	-6.55e-06***	-6.55e-06***	-9.34e-05**
	(9.30e-07)	(9.30e-07)	(2.23e-05)
Treatment 2006	-4.34e-08	-4.34e-08	-9.52e-05**
	(1.98e-06)	(1.98e-06)	(2.14e-05)
Treatment 2007	-2.30e-05**	-2.30e-05**	-0.000126***
	(6.11e-06)	(6.11e-06)	(2.59e-05)
Treatment 2008	-8.17e-06***	-8.17e-06***	-0.000120**
	(7.67e-07)	(7.67e-07)	(2.72e-05)
Log of regional value-added	-7.04e-06	-7.04e-06	-6.40e-06
	(1.17e-05)	(1.17e-05)	(3.34e-05)
Construction		-1.01e-06	-1.34e-05**
		(6.80e-07)	(3.30e-06)
Constant	8.33e-05	8.33e-05	7.28e-05
	(0.000132)	(0.000132)	(0.00220)
Observations	975	975	975
Adjusted R-squared	0.211	0.211	0.210
Region FE	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Regional linear time trend	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 14: Denmark – Robustness check for Modified Lilien index (MLI) based on hours worked

VARIABLES	(1) MLI hours worked	(2) MLI hours worked	(3) MLI hours worked
Treatment 1996	9.29e-06***		
	(7.24e-07)		
Treatment 1997	1.23e-06**	-8.06e-06***	-2.50e-06*
	(3.75e-07)	(5.14e-07)	(1.09e-06)
Treatment 1998	2.78e-06	-6.51e-06***	4.83e-06
	(1.36e-06)	(1.36e-06)	(4.00e-06)
Treatment 1999	1.01e-05***	8.16e-07	1.81e-05**
	(1.60e-06)	(8.99e-07)	(4.68e-06)
Treatment 2000	1.33e-05***	1.33e-05***	4.36e-05***
	(2.09e-06)	(2.09e-06)	(9.10e-06)
Treatment 2001	1.69e-06	1.69e-06	3.65e-05**
	(1.58e-06)	(1.58e-06)	(1.02e-05)
Treatment 2002	5.59e-06**	5.59e-06**	4.37e-05**
	(1.26e-06)	(1.26e-06)	(1.17e-05)
Treatment 2003	-2.05e-06	-2.05e-06	4.14e-05*
	(4.52e-06)	(4.52e-06)	(1.52e-05)
Treatment 2004	-1.37e-06	-1.37e-06	4.85e-05**
	(2.07e-06)	(2.07e-06)	(1.51e-05)
Treatment 2005	-1.82e-06	-1.82e-06	5.55e-05**
	(4.12e-06)	(4.12e-06)	(1.58e-05)
Treatment 2006	-4.16e-07	-4.16e-07	5.90e-05**
	(3.07e-06)	(3.07e-06)	(1.81e-05)
Treatment 2007	-4.84e-06	-4.84e-06	5.95e-05*
	(4.83e-06)	(4.83e-06)	(2.17e-05)
Treatment 2008	2.25e-06	2.25e-06	7.26e-05**
	(2.72e-06)	(2.72e-06)	(2.08e-05)
Log of regional value-added	2.03e-05	2.03e-05	-3.35e-05***
	(2.72e-05)	(2.72e-05)	(5.29e-06)
Construction		9.29e-06***	1.62e-05***
		(7.24e-07)	(2.69e-06)
Constant	-0.000224	-0.000224	-0.00289***
	(0.000306)	(0.000306)	(0.000254)
Observations	975	975	975
Adjusted R-squared	0.199	0.199	0.199
Region FE	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Regional linear time trend	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 15: Denmark – Robustness check for Modified Lilien index (MLI) based on value-added

VARIABLES	(1) MLI value-added	(2) MLI value-added	(3) MLI value-added
Treatment 1996	5.05e-06		
	(5.39e-06)		
Treatment 1997	5.04e-06	-1.01e-08	1.13e-05
	(3.54e-06)	(2.57e-06)	(1.25e-05)
Treatment 1998	-2.24e-06	-7.29e-06**	1.58e-05
	(4.53e-06)	(2.21e-06)	(2.98e-05)
Treatment 1999	1.04e-05	5.30e-06	4.06e-05
	(8.18e-06)	(3.08e-06)	(4.87e-05)
Treatment 2000	1.28e-05	1.28e-05	7.46e-05
	(8.64e-06)	(8.64e-06)	(9.08e-05)
Treatment 2001	1.76e-06	1.76e-06	7.27e-05
	(7.16e-06)	(7.16e-06)	(0.000104)
Treatment 2002	9.04e-06	9.04e-06	8.68e-05
	(1.12e-05)	(1.12e-05)	(0.000122)
Treatment 2003	-1.15e-05	-1.15e-05	7.71e-05
	(1.05e-05)	(1.05e-05)	(0.000134)
Treatment 2004	1.03e-05	1.03e-05	0.000112
	(1.19e-05)	(1.19e-05)	(0.000151)
Treatment 2005	1.49e-05	1.49e-05	0.000132
	(1.04e-05)	(1.04e-05)	(0.000164)
Treatment 2006	1.98e-05	1.98e-05	0.000141
	(1.18e-05)	(1.18e-05)	(0.000181)
Treatment 2007	1.44e-05	1.44e-05	0.000146
	(7.28e-06)	(7.28e-06)	(0.000191)
Treatment 2008	3.12e-06	3.12e-06	0.000147
	(8.88e-06)	(8.88e-06)	(0.000197)
Log of regional value-added	-6.33e-05	-6.33e-05	-0.000172*
	(4.72e-05)	(4.72e-05)	(7.41e-05)
Construction		5.05e-06	1.91e-05
		(5.39e-06)	(2.67e-05)
Constant	0.000716	0.000716	-0.0150*
	(0.000535)	(0.000535)	(0.00608)
Observations	975	975	975
Adjusted R-squared	0.134	0.134	0.132
Region FE	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Regional linear time trend	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 16: Denmark – Robustness check for Norm of absolute values (NAV) based on number of persons employed

VARIABLES	(1) NAV employed	(2) NAV employed	(3) NAV employed
Treatment 1996	0.000307		
	(0.000147)		
Treatment 1997	-0.000307**	-0.000614**	-0.000830***
	(9.65e-05)	(0.000215)	(0.000115)
Treatment 1998	-0.000689**	-0.000996***	-0.00143***
	(0.000211)	(0.000132)	(0.000223)
Treatment 1999	-0.000137	-0.000444	-0.00110**
	(7.15e-05)	(0.000210)	(0.000253)
Treatment 2000	0.000227*	0.000227*	-0.000960
	(0.000106)	(0.000106)	(0.000576)
Treatment 2001	-0.000600***	-0.000600***	-0.00199*
	(4.20e-05)	(4.20e-05)	(0.000762)
Treatment 2002	-0.000442	-0.000442	-0.00202
	(0.000252)	(0.000252)	(0.00102)
Treatment 2003	-0.000733***	-0.000733***	-0.00253*
	(0.000139)	(0.000139)	(0.00105)
Treatment 2004	-0.00166***	-0.00166***	-0.00368**
	(0.000201)	(0.000201)	(0.000895)
Treatment 2005	-0.000730***	-0.000730***	-0.00299*
	(0.000136)	(0.000136)	(0.00134)
Treatment 2006	-0.000471**	-0.000471**	-0.00291*
	(0.000150)	(0.000150)	(0.00117)
Treatment 2007	-0.00171**	-0.00171**	-0.00436**
	(0.000399)	(0.000399)	(0.00134)
Treatment 2008	-0.000871***	-0.000871***	-0.00374*
	(0.000105)	(0.000105)	(0.00158)
Log of regional value-added	0.00131	0.00131	0.00191
	(0.000735)	(0.000735)	(0.00186)
Construction		0.000307	-1.57e-06
		(0.000147)	(0.000294)
Constant	-0.0135	-0.0135	0.159
	(0.00829)	(0.00829)	(0.115)
Observations	975	975	975
Adjusted R-squared	0.380	0.380	0.378
Region FE	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Regional linear time trend	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 17: Denmark – Robustness check for Norm of absolute values (NAV) based on hours worked

VARIABLES	(1) NAV hours worked	(2) NAV hours worked	(3) NAV hours worked
Treatment 1996	0.000885***		
	(0.000131)		
Treatment 1997	2.30e-05	-0.000862***	-0.000312
	(0.000123)	(0.000109)	(0.000205)
Treatment 1998	0.000157	-0.000728**	0.000388
	(0.000195)	(0.000229)	(0.000397)
Treatment 1999	0.000937***	5.18e-05	0.00174**
	(0.000199)	(7.30e-05)	(0.000482)
Treatment 2000	0.000983***	0.000983***	0.00400**
	(0.000130)	(0.000130)	(0.000900)
Treatment 2001	-0.000187	-0.000187	0.00331**
	(9.77e-05)	(9.77e-05)	(0.00102)
Treatment 2002	0.000478**	0.000478**	0.00438**
	(0.000109)	(0.000109)	(0.00117)
Treatment 2003	-9.70e-06	-9.70e-06	0.00443**
	(0.000244)	(0.000244)	(0.00144)
Treatment 2004	-0.000340*	-0.000340*	0.00471**
	(0.000153)	(0.000153)	(0.00163)
Treatment 2005	-0.000385	-0.000385	0.00533**
	(0.000377)	(0.000377)	(0.00153)
Treatment 2006	-0.000188	-0.000188	0.00585**
	(0.000284)	(0.000284)	(0.00201)
Treatment 2007	-0.000744**	-0.000744**	0.00581**
	(0.000222)	(0.000222)	(0.00204)
Treatment 2008	0.000185	0.000185	0.00732**
	(0.000328)	(0.000328)	(0.00213)
Log of regional value-added	0.00220	0.00220	-0.00124
	(0.00193)	(0.00193)	(0.00131)
Construction		0.000885***	0.00162***
		(0.000131)	(0.000281)
Constant	-0.0236	-0.0236	-0.108
	(0.0217)	(0.0217)	(0.0618)
Observations	975	975	975
Adjusted R-squared	0.358	0.358	0.357
Region FE	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Regional linear time trend	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 18: Denmark – Robustness check for Norm of absolute values (NAV) based on value-added

	(1)	(2)	(3)
VARIABLES	NAV value-added	NAV value-added	NAV value-added
Treatment 1996	1.47e-05		
	(0.000283)		
Treatment 1997	0.000526	0.000511*	0.000502
	(0.000418)	(0.000236)	(0.000670)
Treatment 1998	-0.000407*	-0.000422**	-0.000414
	(0.000165)	(0.000137)	(0.00111)
Treatment 1999	0.000514	0.000500	0.000545
	(0.000562)	(0.000302)	(0.00211)
Treatment 2000	0.000254	0.000254	0.000173
	(0.000464)	(0.000464)	(0.00379)
Treatment 2001	-0.000319	-0.000319	-0.000533
	(0.000437)	(0.000437)	(0.00438)
Treatment 2002	0.000786	0.000786	0.000308
	(0.000769)	(0.000769)	(0.00529)
Treatment 2003	-0.000616	-0.000616	-0.00113
	(0.000694)	(0.000694)	(0.00565)
Treatment 2004	0.00100	0.00100	0.000585
	(0.000736)	(0.000736)	(0.00634)
Treatment 2005	0.00119	0.00119	0.000972
	(0.000716)	(0.000716)	(0.00683)
Treatment 2006	0.000741	0.000741	0.000117
	(0.000649)	(0.000649)	(0.00751)
Treatment 2007	0.000928*	0.000928*	0.000225
	(0.000409)	(0.000409)	(0.00781)
Treatment 2008	0.000136	0.000136	-0.000520
	(0.000683)	(0.000683)	(0.00814)
Log of regional value-added	-0.00598	-0.00598	-0.0121*
	(0.00397)	(0.00397)	(0.00470)
Construction		1.47e-05	-0.000166
		(0.000283)	(0.00115)
Constant	0.0685	0.0685	-1.045**
	(0.0450)	(0.0450)	(0.355)
Observations	975	975	975
Adjusted R-squared	0.254	0.254	0.252
Region FE	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Regional linear time trend	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 19: Sweden – Robustness check for Modified Lilien index (MLI) based on number of persons employed

VARIABLES	(1) MLI employed	(2) MLI employed	(3) MLI employed	(4) MLI employed	(5) MLI employed
Treatment 1996	-2.83e-06**			4.51e-07	-7.43e-06*
	(1.11e-06)			(5.57e-06)	(3.25e-06)
Treatment 1997	-7.45e-06**	-4.62e-06*	-1.12e-05**	-7.67e-06	-1.56e-05**
	(2.72e-06)	(2.28e-06)	(4.35e-06)	(4.79e-06)	(5.26e-06)
Treatment 1998	-3.54e-07	2.47e-06	-6.51e-06	-4.34e-07	-8.31e-06
	(1.69e-06)	(2.36e-06)	(7.97e-06)	(3.28e-06)	(4.89e-06)
Treatment 1999	1.90e-06	4.73e-06	-9.08e-06		-7.88e-06
	(2.91e-06)	(3.51e-06)	(1.14e-05)		(7.25e-06)
Treatment 2000	6.28e-08	6.28e-08	-2.57e-05	-1.01e-05	-1.01e-05
	(5.69e-06)	(5.69e-06)	(2.32e-05)	(1.02e-05)	(1.02e-05)
Treatment 2001	-1.76e-06	-1.76e-06	-2.96e-05	-1.21e-05*	-1.21e-05*
	(2.58e-06)	(2.58e-06)	(2.29e-05)	(5.64e-06)	(5.64e-06)
Treatment 2002	-2.61e-06	-2.61e-06	-3.62e-05	-1.56e-05*	-1.56e-05*
	(1.66e-06)	(1.66e-06)	(2.44e-05)	(6.69e-06)	(6.69e-06)
Treatment 2003	-6.43e-07	-6.43e-07	-3.75e-05	-1.37e-05	-1.37e-05
	(1.41e-06)	(1.41e-06)	(2.89e-05)	(7.62e-06)	(7.62e-06)
Treatment 2004	4.64e-06***	4.64e-06***	-3.56e-05	-9.46e-06	-9.46e-06
	(6.49e-07)	(6.49e-07)	(3.17e-05)	(1.05e-05)	(1.05e-05)
Treatment 2005	-2.60e-07	-2.60e-07	-4.49e-05	-1.48e-05	-1.48e-05
	(9.68e-07)	(9.68e-07)	(3.48e-05)	(8.80e-06)	(8.80e-06)
Treatment 2006	1.09e-05***	1.09e-05***	-3.74e-05	-4.34e-06	-4.34e-06
	(1.30e-06)	(1.30e-06)	(3.81e-05)	(9.40e-06)	(9.40e-06)
Treatment 2007	1.15e-06	1.15e-06	-5.57e-05		
	(1.21e-06)	(1.21e-06)	(4.25e-05)		
Treatment 2008	-1.62e-06	-1.62e-06	-5.72e-05		
	(3.18e-06)	(3.18e-06)	(4.39e-05)		
Log of regional value-added	3.84e-05***	3.84e-05***	0.000141*	0.000136	0.000136
	(8.29e-06)	(8.29e-06)	(6.28e-05)	(8.39e-05)	(8.39e-05)
Construction		-2.83e-06**	-1.01e-05*	-7.88e-06	
		(1.11e-06)	(4.92e-06)	(7.25e-06)	
Regional employment high-tech jobs				4.32e-08**	4.32e-08**
				(1.69e-08)	(1.69e-08)
Regional transport infrastructure				-9.51e-10	-9.51e-10
				(3.39e-09)	(3.39e-09)
Constant	-0.000435***	-0.000435***	0.00220	0.00928	0.00928
	(9.68e-05)	(9.68e-05)	(0.00744)	(0.00512)	(0.00512)
Observations	1,560	1,560	1,560	1,222	1,222
Adjusted R-squared	0.177	0.177	0.183	0.176	0.176
Region FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Regional linear time trend	NO	NO	YES	YES	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 20: Sweden – Robustness check for Modified Lilien index (MLI) based on value-added

VARIABLES	(1) MLI value-added	(2) MLI value-added	(3) MLI value-added	(4) MLI value-added	(5) MLI value-added
Treatment 1996	1.34e-05				2.92e-05
	(9.50e-06)				(1.72e-05)
Treatment 1997	6.18e-05***	4.84e-05***	9.07e-05***	3.84e-05***	6.76e-05***
	(6.74e-06)	(9.88e-06)	(1.66e-05)	(7.89e-06)	(1.23e-05)
Treatment 1998	4.35e-05***	3.01e-05**	0.000121***	2.11e-05	5.02e-05***
	(7.44e-06)	(1.27e-05)	(2.52e-05)	(1.35e-05)	(4.64e-06)
Treatment 1999	4.29e-05***	2.95e-05*	0.000166***	1.63e-05	4.55e-05***
	(8.78e-06)	(1.27e-05)	(3.27e-05)	(1.32e-05)	(6.55e-06)
Treatment 2000	2.81e-05***	2.81e-05***	0.000277***	2.64e-05	2.64e-05
	(3.72e-06)	(3.72e-06)	(6.39e-05)	(1.55e-05)	(1.55e-05)
Treatment 2001	9.70e-06	9.70e-06	0.000308***	9.37e-06	9.37e-06
	(1.45e-05)	(1.45e-05)	(7.61e-05)	(2.26e-05)	(2.26e-05)
Treatment 2002	1.68e-05	1.68e-05	0.000359***	1.08e-05	1.08e-05
	(1.16e-05)	(1.16e-05)	(8.10e-05)	(1.21e-05)	(1.21e-05)
Treatment 2003	3.90e-05***	3.90e-05***	0.000429***	3.09e-05**	3.09e-05**
	(7.42e-06)	(7.42e-06)	(9.40e-05)	(1.16e-05)	(1.16e-05)
Treatment 2004	4.49e-05***	4.49e-05***	0.000482***	5.61e-05**	5.61e-05**
	(5.48e-06)	(5.48e-06)	(0.000109)	(1.88e-05)	(1.88e-05)
Treatment 2005	3.63e-05**	3.63e-05**	0.000519***	2.28e-05**	2.28e-05**
	(1.11e-05)	(1.11e-05)	(0.000112)	(8.57e-06)	(8.57e-06)
Treatment 2006	6.55e-05***	6.55e-05***	0.000595***	5.39e-05***	5.39e-05***
	(9.05e-06)	(9.05e-06)	(0.000127)	(1.17e-05)	(1.17e-05)
Treatment 2007	3.75e-05***	3.75e-05***	0.000606***		
	(7.13e-06)	(7.13e-06)	(0.000146)		
Treatment 2008	2.70e-05	2.70e-05	0.000650***		
	(1.55e-05)	(1.55e-05)	(0.000145)		
Log of regional value-added	0.000218**	0.000218**	0.000377**	0.000401**	0.000401**
	(7.60e-05)	(7.60e-05)	(0.000152)	(0.000150)	(0.000150)
Construction		1.34e-05	8.10e-05***	2.92e-05	
		(9.50e-06)	(1.92e-05)	(1.72e-05)	
Regional employment high-tech jobs				-4.39e-08	-4.39e-08
				(2.01e-07)	(2.01e-07)
Regional transport infrastructure				1.91e-08**	1.91e-08**
				(6.87e-09)	(6.87e-09)
Constant	-0.00246**	-0.00246**	0.0829***	0.0319***	0.0319***
	(0.000873)	(0.000873)	(0.0234)	(0.00832)	(0.00832)
Observations	1,558	1,558	1,558	1,220	1,220
Adjusted R-squared	0.230	0.230	0.230	0.185	0.185
Region FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Regional linear time trend	NO	NO	YES	YES	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 21: Sweden – Robustness check for Norm of absolute values (NAV) based on number of persons employed

VARIABLES	(1) NAV employed	(2) NAV employed	(3) NAV employed	(4) NAV employed	(5) NAV employed
Treatment 1996	-0.000506**			-0.000704*	-0.000989**
	(0.000177)			(0.000341)	(0.000302)
Treatment 1997	-0.00103***	-0.000522*	-0.000930	-0.00138***	-0.00166**
	(0.000279)	(0.000257)	(0.000518)	(0.000308)	(0.000501)
Treatment 1998	7.81e-05	0.000584	0.000108	-0.000176	-0.000461
	(0.000219)	(0.000324)	(0.000950)	(0.000207)	(0.000452)
Treatment 1999	0.000307	0.000813**	7.19e-05		-0.000285
	(0.000241)	(0.000279)	(0.00121)		(0.000527)
Treatment 2000	0.000231	0.000231	-0.00116	-0.000452	-0.000452
	(0.000240)	(0.000240)	(0.00223)	(0.000657)	(0.000657)
Treatment 2001	-0.000337	-0.000337	-0.00177	-0.000883*	-0.000883*
	(0.000251)	(0.000251)	(0.00250)	(0.000465)	(0.000465)
Treatment 2002	-0.000420*	-0.000420*	-0.00219	-0.00107*	-0.00107*
	(0.000201)	(0.000201)	(0.00266)	(0.000501)	(0.000501)
Treatment 2003	-0.000343*	-0.000343*	-0.00226	-0.000975	-0.000975
	(0.000175)	(0.000175)	(0.00317)	(0.000552)	(0.000552)
Treatment 2004	0.000140*	0.000140*	-0.00192	-0.000428	-0.000428
	(6.06e-05)	(6.06e-05)	(0.00348)	(0.000847)	(0.000847)
Treatment 2005	-0.000230	-0.000230	-0.00253	-0.000877	-0.000877
	(0.000145)	(0.000145)	(0.00385)	(0.000623)	(0.000623)
Treatment 2006	0.00105***	0.00105***	-0.00142	0.000419	0.000419
	(0.000157)	(0.000157)	(0.00414)	(0.000636)	(0.000636)
Treatment 2007	2.03e-05	2.03e-05	-0.00301		
	(9.35e-05)	(9.35e-05)	(0.00463)		
Treatment 2008	-0.000294	-0.000294	-0.00310		
	(0.000366)	(0.000366)	(0.00489)		
Log of regional value-added	0.00145*	0.00145*	0.00973**	0.00713	0.00713
	(0.000659)	(0.000659)	(0.00398)	(0.00578)	(0.00578)
Construction		-0.000506**	-0.000909	-0.000285	
		(0.000177)	(0.000484)	(0.000527)	
Regional employment high-tech jobs				-1.67e-06	-1.67e-06
				(1.74e-06)	(1.74e-06)
Regional transport infrastructure				4.64e-08	4.64e-08
				(3.56e-07)	(3.56e-07)
Constant	-0.0142	-0.0142	0.259	0.467	0.467
	(0.00764)	(0.00764)	(0.725)	(0.352)	(0.352)
Observations	1,560	1,560	1,560	1,222	1,222
Adjusted R-squared	0.285	0.285	0.287	0.292	0.292
Region FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Regional linear time trend	NO	NO	YES	YES	YES

Robust standard errors in brackets
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 22: Sweden – Robustness check for Norm of absolute values (NAV) based on value-added

VARIABLES	(1) NAV value-added	(2) NAV value-added	(3) NAV value-added	(4) NAV value-added	(5) NAV value-added
Treatment 1996	-0.000223			-0.000212	3.13e-05
	(0.000429)			(0.000492)	(0.000675)
Treatment 1997	0.00211***	0.00234***	0.00404***	0.00168***	0.00192**
	(0.000248)	(0.000368)	(0.000631)	(0.000412)	(0.000594)
Treatment 1998	0.00179***	0.00201***	0.00538***	0.00103***	0.00127**
	(0.000179)	(0.000476)	(0.000964)	(0.000185)	(0.000372)
Treatment 1999	0.00108**	0.00131*	0.00636***		0.000243
	(0.000364)	(0.000580)	(0.00120)		(0.000349)
Treatment 2000	0.000565*	0.000565*	0.00984***	-0.000501	-0.000501
	(0.000246)	(0.000246)	(0.00273)	(0.000877)	(0.000877)
Treatment 2001	0.000160	0.000160	0.0111***	-0.00129	-0.00129
	(0.000428)	(0.000428)	(0.00302)	(0.000886)	(0.000886)
Treatment 2002	-0.000362	-0.000362	0.0123***	-0.00214*	-0.00214*
	(0.000582)	(0.000582)	(0.00328)	(0.00101)	(0.00101)
Treatment 2003	0.00110***	0.00110***	0.0154***	-0.00100	-0.00100
	(0.000224)	(0.000224)	(0.00367)	(0.000747)	(0.000747)
Treatment 2004	0.00124***	0.00124***	0.0172***	-0.000396	-0.000396
	(0.000337)	(0.000337)	(0.00435)	(0.00116)	(0.00116)
Treatment 2005	0.000185	0.000185	0.0178***	-0.00254***	-0.00254***
	(0.000780)	(0.000780)	(0.00441)	(0.000340)	(0.000340)
Treatment 2006	0.00226***	0.00226***	0.0216***	-0.000623	-0.000623
	(0.000559)	(0.000559)	(0.00491)	(0.000662)	(0.000662)
Treatment 2007	0.00135***	0.00135***	0.0224***		
	(0.000235)	(0.000235)	(0.00586)		
Treatment 2008	0.00126*	0.00126*	0.0239***		
	(0.000576)	(0.000576)	(0.00556)		
Log of regional value-added	0.00375	0.00375	0.00269	0.00443	0.00443
	(0.00402)	(0.00402)	(0.0104)	(0.00838)	(0.00838)
Construction		-0.000223	0.00231**	0.000243	
		(0.000429)	(0.000868)	(0.000349)	
Regional employment high-tech jobs				2.19e-06	2.19e-06
				(8.19e-06)	(8.19e-06)
Regional transport infrastructure				6.80e-07**	6.80e-07**
				(2.55e-07)	(2.55e-07)
Constant	-0.0400	-0.0400	3.597***	-0.00470	-0.00470
	(0.0463)	(0.0463)	(0.911)	(0.491)	(0.491)
Observations	1,560	1,560	1,560	1,222	1,222
Adjusted R-squared	0.325	0.325	0.325	0.288	0.288
Region FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Regional linear time trend	NO	NO	YES	YES	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Appendix C: Danish regressions with enlarged treatment region

Table 23: Denmark – Norm of absolute values (NAV) based on number of persons employed with enlarged treatment region (DK01+DK02)

VARIABLES	(1) NAV employed	(2) NAV employed	(3) NAV employed	(4) NAV employed	(5) NAV employed	(6) NAV employed	(7) NAV employed	(8) NAV employed	(9) NAV employed	(10) NAV employed
Treatment 2000	-0.000425***	-0.000391***	-0.000451***	-0.000451***	0.000467*					
	(2.09e-05)	(5.86e-05)	(7.00e-05)	(7.06e-05)	(0.000172)					
Treatment 2001						-0.000580***	-0.000586***	-0.000699***	-0.000699***	-0.000473
						(5.71e-05)	(3.35e-05)	(8.74e-05)	(8.81e-05)	(0.000294)
Log of regional value-added		-0.000809	-0.000754	-0.000754	0.000549		0.000152	0.000108	0.000108	0.000512
		(0.00173)	(0.00168)	(0.00169)	(0.00117)		(0.00111)	(0.00116)	(0.00117)	(0.00201)
Construction			-8.67e-05	-8.67e-05	0.000210			-0.000200	-0.000200	-0.000165
			(0.000101)	(0.000101)	(9.93e-05)			(0.000124)	(0.000125)	(0.000152)
Constant	0.00267***	0.0123	0.0116	0.0110	0.238**	0.00161***	-0.000109	0.000535	-1.10e-05	0.0915
	(0.000400)	(0.0224)	(0.0217)	(0.0220)	(0.0706)	(0.000116)	(0.0143)	(0.0150)	(0.0153)	(0.161)
Observations	780	780	780	780	780	780	780	780	780	780
Adjusted R-squared	0.016	0.015	0.013	0.392	0.392	0.018	0.017	0.016	0.394	0.392
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 24: Denmark – Modified Lilien index (MLI) based on number of persons employed with enlarged treatment region (DK01+DK02)

VARIABLES	(1) MLI employed	(2) MLI employed	(3) MLI employed	(4) MLI employed	(5) MLI employed	(6) MLI employed	(7) MLI employed	(8) MLI employed	(9) MLI employed	(10) MLI employed
Treatment 2000	-3.93e-06***	-3.02e-06***	-4.13e-06***	-4.13e-06***	5.24e-06					
	(5.42e-07)	(2.67e-07)	(2.32e-07)	(2.34e-07)	(3.49e-06)					
Treatment 2001						-5.32e-06***	-4.82e-06***	-6.26e-06***	-6.26e-06***	-3.25e-06
						(7.91e-07)	(1.85e-07)	(4.71e-07)	(4.75e-07)	(2.50e-06)
Log of regional value-added		-2.21e-05	-2.11e-05	-2.11e-05	-1.72e-05		-1.31e-05	-1.36e-05	-1.36e-05	-1.65e-05
		(2.35e-05)	(2.36e-05)	(2.38e-05)	(3.04e-05)		(2.06e-05)	(2.08e-05)	(2.10e-05)	(3.42e-05)
Construction			-1.60e-06***	-1.60e-06***	1.38e-06			-2.55e-06**	-2.55e-06**	-2.15e-06**
			(2.35e-07)	(2.37e-07)	(9.38e-07)			(5.56e-07)	(5.61e-07)	(6.35e-07)
Constant	1.90e-05*	0.000292	0.000280	0.000276	0.000722	5.51e-06***	0.000177	0.000185	0.000180	-0.000512
	(6.56e-06)	(0.000304)	(0.000306)	(0.000308)	(0.00145)	(8.78e-07)	(0.000266)	(0.000270)	(0.000272)	(0.00203)
Observations	780	780	780	780	780	780	780	780	780	780
Adjusted R-squared	0.027	0.026	0.025	0.193	0.195	0.029	0.028	0.027	0.195	0.195
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 25: Denmark – Norm of absolute values (NAV) based on hours worked with enlarged treatment region (DK01+DK02)

VARIABLES	(1) NAV hours worked	(2) NAV hours worked	(3) NAV hours worked	(4) NAV hours worked	(5) NAV hours worked	(6) NAV hours worked	(7) NAV hours worked	(8) NAV hours worked	(9) NAV hours worked	(10) NAV hours worked
Treatment 2000	-4.72e-05	-0.000141	0.000177	0.000177	0.00119***					
	(7.61e-05)	(0.000146)	(0.000212)	(0.000214)	(0.000146)					
Treatment 2001						-0.000299**	-0.000447**	-0.000405*	-0.000405*	-0.000571***
						(8.95e-05)	(0.000102)	(0.000128)	(0.000129)	(2.06e-05)
Log of regional value-added		0.00227	0.00198	0.00198	2.96e-05		0.00390*	0.00391*	0.00391*	0.000264
		(0.00243)	(0.00258)	(0.00260)	(0.000738)		(0.00141)	(0.00140)	(0.00142)	(0.00195)
Construction			0.000458**	0.000458**	0.000767***			7.48e-05	7.48e-05	2.25e-05
			(0.000129)	(0.000130)	(5.18e-05)			(0.000118)	(0.000119)	(0.000105)
Constant	0.00187***	-0.0280	-0.0245	-0.0247	0.207**	0.00184***	-0.0489*	-0.0492*	-0.0494*	-0.0394
	(0.000209)	(0.0313)	(0.0332)	(0.0334)	(0.0475)	(0.000205)	(0.0182)	(0.0181)	(0.0181)	(0.155)
Observations	780	780	780	780	780	780	780	780	780	780
Adjusted R-squared	0.010	0.009	0.009	0.376	0.377	0.011	0.011	0.009	0.377	0.375
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 26: Denmark – Modified Lilien index (MLI) based on hours worked with enlarged treatment region (DK01+DK02)

VARIABLES	(1) MLI hours worked	(2) MLI hours worked	(3) MLI hours worked	(4) MLI hours worked	(5) MLI hours worked	(6) MLI hours worked	(7) MLI hours worked	(8) MLI hours worked	(9) MLI hours worked	(10) MLI hours worked
Treatment 2000	-2.41e-07	-1.39e-06	2.26e-06	2.26e-06	1.30e-05***					
	(1.45e-06)	(2.39e-06)	(2.94e-06)	(2.96e-06)	(1.09e-06)					
Treatment 2001						-3.17e-06	-4.96e-06*	-4.50e-06	-4.50e-06	-7.34e-06***
						(1.48e-06)	(1.93e-06)	(1.96e-06)	(1.97e-06)	(4.60e-07)
Log of regional value-added		2.81e-05	2.47e-05	2.47e-05	-8.10e-06		4.70e-05	4.72e-05	4.72e-05	-6.08e-06
		(3.28e-05)	(3.37e-05)	(3.40e-05)	(1.92e-05)		(2.48e-05)	(2.47e-05)	(2.49e-05)	(3.62e-05)
Construction			5.27e-06***	5.27e-06***	8.50e-06***			8.03e-07	8.03e-07	-1.89e-08
			(8.81e-07)	(8.88e-07)	(1.14e-07)			(5.89e-07)	(5.94e-07)	(5.83e-07)
Constant	9.11e-06	-0.000359	-0.000318	-0.000317	0.00151	6.95e-06*	-0.000602	-0.000605	-0.000604	-0.00141
	(4.11e-06)	(0.000423)	(0.000435)	(0.000435)	(0.00128)	(2.38e-06)	(0.000320)	(0.000319)	(0.000319)	(0.00257)
Observations	780	780	780	780	780	780	780	780	780	780
Adjusted R-squared	0.024	0.023	0.023	0.198	0.201	0.025	0.026	0.025	0.199	0.199
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 27: Denmark – Norm of absolute values (NAV) based on value-added with enlarged treatment region (DK01+DK02)

VARIABLES	(1) NAV value-added	(2) NAV value-added	(3) NAV value-added	(4) NAV value-added	(5) NAV value-added	(6) NAV value-added	(7) NAV value-added	(8) NAV value-added	(9) NAV value-added	(10) NAV value-added
Treatment 2000	-0.000430***	-0.000404	-0.000621**	-0.000621**	-0.00182***					
	(3.35e-05)	(0.000184)	(0.000172)	(0.000174)	(0.000229)					
Treatment 2001						-0.000319***	-0.000263	-0.000288	-0.000288	-0.000906*
						(1.08e-05)	(0.000201)	(0.000141)	(0.000143)	(0.000288)
Log of regional value-added		-0.000625	-0.000424	-0.000424	-0.00267		-0.00148	-0.00149	-0.00149	-0.00396
		(0.00487)	(0.00485)	(0.00489)	(0.00712)		(0.00464)	(0.00466)	(0.00470)	(0.00788)
Construction			-0.000313	-0.000313	-0.000704*			-4.51e-05	-4.51e-05	-0.000153
			(0.000212)	(0.000213)	(0.000253)			(0.000155)	(0.000156)	(0.000190)
Constant	0.00221***	0.0105	0.00804	0.00609	-0.585	0.00272***	0.0215	0.0216	0.0197	-0.557
	(0.000190)	(0.0629)	(0.0627)	(0.0632)	(0.487)	(0.000176)	(0.0599)	(0.0602)	(0.0608)	(0.527)
Observations	780	780	780	780	780	780	780	780	780	780
Adjusted R-squared	0.002	0.001	-0.000	0.248	0.248	0.002	0.000	-0.001	0.247	0.246
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 28: Denmark – Modified Lilien index (MLI) based on value-added with enlarged treatment region (DK01+DK02)

VARIABLES	(1) MLI value-added	(2) MLI value-added	(3) MLI value-added	(4) MLI value-added	(5) MLI value-added	(6) MLI value-added	(7) MLI value-added	(8) MLI value-added	(9) MLI value-added	(10) MLI value-added
Treatment 2000	-4.39e-06***	-4.76e-06**	-6.88e-06**	-6.88e-06**	-2.02e-05***					
	(1.79e-07)	(1.36e-06)	(1.76e-06)	(1.77e-06)	(2.69e-06)					
Treatment 2001						-4.23e-06**	-4.47e-06	-5.27e-06*	-5.27e-06*	-1.62e-05**
						(9.93e-07)	(1.98e-06)	(1.88e-06)	(1.90e-06)	(3.22e-06)
Log of regional value-added		8.99e-06	1.10e-05	1.10e-05	-4.38e-05		6.39e-06	6.09e-06	6.09e-06	-6.12e-05
		(3.33e-05)	(3.41e-05)	(3.43e-05)	(5.97e-05)		(3.42e-05)	(3.41e-05)	(3.44e-05)	(5.95e-05)
Construction			-3.07e-06	-3.07e-06	-7.55e-06*			-1.42e-06	-1.42e-06	-3.50e-06*
			(1.98e-06)	(2.00e-06)	(2.73e-06)			(1.02e-06)	(1.03e-06)	(1.41e-06)
Constant	8.89e-06**	-0.000104	-0.000128	-0.000141	-0.00743	1.44e-05***	-7.09e-05	-6.63e-05	-7.92e-05	-0.00834
	(2.20e-06)	(0.000429)	(0.000441)	(0.000444)	(0.00408)	(2.14e-06)	(0.000442)	(0.000440)	(0.000444)	(0.00380)
Observations	780	780	780	780	780	780	780	780	780	780
Adjusted R-squared	0.005	0.004	0.003	0.126	0.124	0.005	0.004	0.003	0.125	0.124
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
Regional linear time trend	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1