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The Example of Hamburg/Germany

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Abstract

In the intermediate and long run energy prices and hence transportation costs are expected to increase significantly. According to the reasoning of the New Economic Geography this will strengthen the spreading forces and thus affect the economic landscape. Other influencing factors on the regional distribution of economic activity include the general trends of demographic and structural change. In industrialized countries, the former induces an overall reduction of population and labor force whereas the latter implies an ongoing shift to the tertiary sector and increased specialization. Basically, cities provide better conditions to cope with these challenges than rural regions. Since the general trends affect all economic spaces similarly, especially city-specific factors have to be considered in order to derive the impact of rising energy costs on future urban development. With respect to Hamburg regional peculiarities include the overall importance of the harbor as well as the existing composition of the industry and the service sector. The analysis highlights that rising energy and transportation costs will open up a range of opportunities for the metropolitan region.

1. Introduction

Decreasing transportation and communication costs which could be observed during the last several decades have been a central reason for intensified international division of labor. As a consequence there has been fast growing mobility of factors both between sectors as well as between countries, regions and cities. In this context, factor mobility mainly refers to capital and the highly skilled labor force whereas less qualified labor, in contrast, frequently remains quite immobile at a certain location. Single branches exhibit different extents between productivity and proximity, pay different wages, and are differently affected by transportation cost that furthermore strongly vary between the transport of people and of goods. Considering transportation costs, economists observe a trend reversal: Energy prices are expected to increase significantly in the future (e.g. Bräuninger, Matthies, and Weinert (2008)). Within integrated economic areas these costs represent the majority of entire trade costs which consequently are also assumed to increase significantly.

Models of the New Economic Geography and urban economics highlight the overall importance of trade costs on the resulting economic landscape (see Krugman (1991), Fujita, Krugman, and Venables (2001), Krugman and Venables (1995) or Brakman, Garretsen, and van Marrewijk (2009) for excellent overviews). Accordingly, the existence of cities and regions results as the equilibrium outcome of the interaction between agglomeration forces on the one hand and spreading forces on the other hand. *Concentration forces* include the firms' access to relevant markets as well as the relationship between a firm's productivity and its proximity to other market players. This relationship is frequently industry specific, e.g. due to the sharing of information, the existence of a large pool of specialized labor and/ or suppliers. The resulting scale economies frequently induce increased specialization. However, as an economy evolves, diversity also contributes to prosperity (see Jacobs (1961) or Duranton and Puga (2005)). *Spreading forces* include aside from transportation costs also housing prices and congestion which both are at least to some extent a function of the city size.

Empirical findings highlight the emergence of urban systems that are characterized by the coexistence of multiple large and small economic centers. The corresponding strong interdependencies are accompanied by factor mobility between cities of different sizes as well as by strong inner-city mobility. Some cities are distinctively specialized while others (particularly the metropolitan cities) are at the same time specialized in some respects but

diversified if one considers the entire production structure (see e. g,. Duranton and Puga (2000, 2005) or Einig and Zaspel (2008) who focus on Germany). It is obvious that due to their variety of job and production opportunities, specialization does not contradict a diversified economic structure. In any case, cities play a central role in modern economies since they provide a wide range of both final goods and services, attract labor force and thereby also induce commuting, and serve as places for living and working.

In modern economies the impact of transportation costs is manifold: In the context of the first and second sector, goods' transportation and easy access to the world market is an important issue. Considering the tertiary sector, mostly transportation of people comes into focus. Then an additional determinant of the entire transportation costs is time. In any case, an efficient connection to infrastructure networks might compensate for increased physical transportation costs.

In order to evaluate the probable effects of rising energy costs one also has to consider the overall trends, namely demographic and structural change. They affect the economic structures independent of the concrete location similarly. Structural change implies a shift from the first and secondary sector to the tertiary sector whereas demographic change impacts on the amount and the composition of the population and labor force (including migration). Both mentioned trends will crucially impact the development of regional production structures (see Glaeser (2008)). At a less aggregate level, still few is known on specific city structures and how they will cope with future challenges. Due to regional peculiarities there is no one-size-fits-all implication but there will be regions that benefit and those that loose as a consequence of the induced changes. Cities compete against each other in order to attract qualified labor which is a prerequisite for being successful in the intermediate and long run and there is "the need for policy to anticipate the mobility of people and firms." (Glaeser (2008), abstract).

In order to derive statements on opportunities and risks and thus to derive clear-cut policy recommendations for successful future urban development, this paper focuses on Germany's second biggest city and the corresponding metropolitan region, Hamburg. The metropolitan region disposes of a sound industrial base as well as of important specializations in the tertiary sector. Due to its geographical location, the harbor is of overall importance for Hamburg's

economy. Firms located there have easy access to the world market which is of major importance for the manufacturing sector. Increasing energy prices might thus make firms' location close to the harbor more attractive. In this respect Hamburg competes with other European harbor cities, like e. g. Rotterdam in the Netherlands. With respect to the service sector, where first-nature geography advantages do not exist, the metropolitan region competes with other metropolises worldwide, especially for qualified labor Population and labor force forecasts highlight that contrary to the German trend, Hamburg is expected to remain a growing city during the next decades. Considering migration, commuting, structural change, and regional specialization it becomes apparent that all these aspects are differently affected by changing transportation costs. Finally, it's the interplay of different forces that shapes the future structure and hence the economic success of the metropolis. Policy recommendations include ongoing investment in the public infrastructure network, integration of working and living quarters as well as strengthening those fields which are characterized by strong scale economies. Consolidating the arguments it turns out that the assumed trend of increasing energy and transportation costs will open up a range of opportunities for the metropolitan region of Hamburg.

The remainder of the paper is as follows. After a short look at some key characteristics of Germany's ten biggest cities in Section 2, Sections 3-5 detail general arguments arising in the context of demographic change and migration, commuting and specialization and applies them to Hamburg. Section 6 analyzes how changing transportation costs act in this context and derives policy recommendations for successful city development while Section 7 briefly concludes.

2. Taking stock: Some facts on Germany's ten biggest cities

Especially cities possess ideal starting positions to cope with the challenges of demographic and structural change towards knowledge-based societies. Nevertheless cities also compete against each other especially for the acquisition of firms and qualified labor which both are important sources for ongoing economic success. Table 1 gives a short overview on some key economic characteristics of Germany's ten biggest cities that will be addressed throughout the paper and thus will help to contextualize Hamburg's specificities.

[insert Table 1 about here]

It becomes obvious that even these top ten are quite heterogeneous. There is no clear-cut relation between the sheer size of a city as measured by population or employed persons on the one hand and productivity as measured by income per capita on the other hand. The migration balance reveals that there is also no automatism between city size and population growth but that there are both growing and shrinking metropolitan cities. Considering the commuting balance the second biggest city, Hamburg, is ranked second while the biggest city, Berlin, is only ranked seventh. Altogether, some 18 % of the headquarters of firms with more than 200 employees are based in Germany's ten biggest cities but again city size does not automatically go hand in hand with a large number of headquarters where 'small' Düsseldorf is ranked fifth while 'big' Munich is ranked last.

These findings highlight that although in the future all cities will face the same challenges, the corresponding implications will probably strongly vary even within the group of the metropolises. Hence it is worth to take a closer look at a single city – namely Hamburg in the context of this paper – to derive-clear cut policy recommendations concerning future urban development.

3. Demographic change in Germany

Germany is an industrialized country with an ageing society. Population size increases as long as the sum of the natural population balance (number of births minus number of deaths) and the migration balance is above zero. Labor force is shrinking if the number of people at employable age goes down and if at the same time age specific employment rates stay constant.

The size of the labor force together with its age structure determine both quality and quantity of labor supply, an important argument for the firms' choice of location, especially in those branches that use qualified labor as the dominating input. Attractive conditions on labor markets (i.e. a large number of jobs, low unemployment rates and high wages) are important pull factors relevant to the location decision of private individuals (see, e.g., Burkert, Niebuhr, and Wapler (2008)). Migration decisions, especially of highly qualified people, increasingly also depend on so-called "soft location factors", like quality of life, family friendliness and

attractive offerings concerning the housing market, education system and public infrastructure. With respect to all these arguments cities have advantages over rural regions. Nevertheless, a short look at Table 1 already highlights that there arise quite large differences even within the group of Germany's top ten.

[insert Figure 1 about here]

Figure 1 exhibits estimations regarding both the population and the labor force growth until 2025. The national demographic development is characterized by a population decline at a rate of 1.9 % and an even higher shrinkage of persons at employable age by 5.0 %. This is the immediate consequence of the ongoing demographic change. Figure 1 also highlights that the expected development strongly varies across the cities although, with the exception of Berlin, both population and labor force growth go in the same direction. Dortmund and Essen are expected to continue shrinking. Compared to the other top-ten cities, these are economically less successful (see Bräuninger and Stiller (2008) and Table 1) and therefore less attractive for immigrants. Highest growth rates until 2025 are expected to arise in the cities Bremen, Düsseldorf and Stuttgart.

In Hamburg, fertility rates have been distinctly below the replacement level since the 1970s. Recent demographic forecasts are based on the assumption that fertility rates will not recover in the near future and hence the metropolis will only go on growing if it attracts migrants which compensate for the negative natural population balance, a fact that can already be observed for the last 20 years. Currently, Hamburg is one of Germany's economically most prosperous cities. It still exhibits above average growth rates of population and in spite of its already big size, Hamburg's migration balance is still expected to grow at a rate of 0.8 % (population) and a rate of 2.5 % (labor force).

To summarize: In the future, all cities are likewise confronted with the challenges of demographic change. Since current age structures, fertility rates and migration balances differ across space the overall development will affect the cities differently. In order to cope with these challenges cities compete for qualified labor. If labor force shortages arise, they will impede knowledge-based structural change, a trend that can already be observed in old

industrialized cities in the Ruhr area or in smaller cities in East-Germany. The mentioned forecasts in Figure 1 highlight that even Germany's top-ten cities are not equally successful in this respect. For rural areas it is even harder to succeed in this competition and it is widely expected that already existing disparities between cities and rural regions will be reinforced by demographic change.

4. Commuting

Some basic reasonings

It is a stylized fact that cities in general attract more in-commuters than rural areas do, thereby supporting the logic of gravitation models (see Alonso (1978)). This also explains why the proportion of employed people living in neighboring municipalities of large cities and commuting there decreases the farther the municipality is located from the city. Einig and Pütz (2007) show that high-order centers are the most important centers of employment and therefore both their commuter belts as well as commuting distances have been increasing allowing people to take advantage of better employment opportunities. However, in some regions there has been a trend of increased reverse commuting; the rise in commuting distances of people living in urban areas and working in suburban areas is a sign of increased work opportunities in suburban areas. Suburbanization might lead to a polycentric structure of a city with multiple employment centers in the environs of the city.

A high density of employment opportunities in the city center usually leads to congestion which increases travel times. Nonetheless, it is possible that the urban infrastructure is of better quality and quantity due to high demand relative to the suburban one; this might cause more people in urban areas and large municipalities to use public transportation as a means to travel to and from work compared to people in rural areas and smaller municipalities.

The willingness to increase commuting distance or time or to migrate is greater, the higher the qualification, income and working position. Haas and Hamann (2008) found that the highest percentage of commuters is highly qualified people, particularly in western parts of Germany. At the same time they frequently work in those branches where proximity matters for productivity; contrastingly, low skilled people commute less frequently. Especially centers of employment offer more job opportunities for (highly) skilled people than for low skilled people. People with higher income and/or a higher working position travel longer distances, use less public transport and more frequently motorized transport (e.g. Breiholz et al. (2005)).

Recent developments of commuting in Germany

Commuting behavior differs across different German regions because it is determined by the spatial structure and the available infrastructure. Whereas intra-municipality commuters live disproportionately in larger municipalities, inter-municipality commuters live mostly in smaller ones (e.g. Breiholz et al. (2005) for a detailed overview). There has been a steady increase in the relative number of commuters despite a decrease in the absolute number of commuters due to a general fall in employment (e.g. Haas and Hamann (2008)). The recent trend in Germany is an increase in the number of people commuting long distances and a decrease in the number of people travelling short distances to and from their workplace. However, despite a change in the distance commuted, the time spent commuting to and from work has remained nearly constant (see Breiholz et al. (2005)). The mode of transportation chosen depends upon the distance and intra- or inter-municipality commuting. According to the Bundesministerium für Verkehr, Bau und Stadtentwicklung (2006) the degree of motorization decreases the larger the population in a municipality due to a better supply of alternative modes, congestion caused by high traffic and scarce parking space.

Recent developments of commuting in Hamburg

The city of Hamburg is a center of employment where employment opportunities have steadily increased over time. There is a positive balance between the number of employees working there, which amounted to 797 514 people in 2008, and the number of employees living there, which was 584 327 people in 2008 (Bundesagentur für Arbeit (2008)); consequently the number of in-commuters is greater than the number of out-commuters and the commuting balance amounts to 213 187 (see also Table 1).

Contrary to the Germany-wide trend of an overall decrease of commuters, the trend in Hamburg is positive (see Figure 2). From 1970 to 2006 the number of in-commuters in Hamburg more than doubled from 134 500 in 1970 to 318 500 in 2006 whereas the number of out-commuters amounted to 97 900 in 2006 which is more than five times the number of out-commuters in 1970 that was 18 200.

[insert Figure 2 about here]

Klupp and Schweiger (2006) find that purchasing prices and living costs for privately owned properties in Hamburg decrease the farther the location is distanced from the city centre. However, pecuniary commuting costs to and from the city centre vary extremely depending upon the distance and mode of transport chosen. It was found that using public transport is financially less expensive than commuting by car, however, the additional time costs of using the former rather than the latter means of transport increase considerably the more distanced the housing is located away from the city centre.

[insert Figure 3 about here]

Figure 3 depicts the percentage of employed people that live in neighboring municipalities and commute to Hamburg. As expected, it shows that the closer a municipality is located to Hamburg, the larger is the fraction of people commuting to Hamburg.

[insert Figure 4 about here]

The change in the proportion of employed persons living in neighboring municipalities and commuting to Hamburg from 1999 to 2008 is depicted in Figure 4. Whereas in most municipalities there has been an increase in in-commuters to Hamburg, in some municipalities the opposite has occurred which might be due to an increase in employment opportunities in suburban areas. This especially applies to the area South-West of Hamburg, a region which developed quite successfully during the last decade. It is also possible that more firms have relocated to suburban areas to take advantage of lower rents and more available space than in urban areas. Consequently, more people might have considered changing the location of employment and choosing a job closer to their housing location in order to benefit from lower commuting costs. Other reasons for reverse commuting could be an increase in unemployment or retirement. However, these basic arguments cannot be unequivocally assigned to certain districts of Hamburg.

5. Structural change and regional specialization

Specialization in Germany

Since the beginning of the Industrial Revolution the ongoing structural change from the first to the secondary sector and nowadays to the service sector is an undoubted fact and there is broad consensus among economists that this trend will persist during the next several decades. Most importantly, in Germany, the service sector is assumed to be the driving force for the development of both employment and productivity of the entire economy – a situation which already could be observed in the past (see e. g., Eichengreen and Gupta (2009)). It has been accompanied by strong regional specialization thereby relying on two dimensions: *sectoral* specialization refers to a certain branch (e.g., in Hamburg, among others, aerospace industries or life sciences) while *functional* specialization arises as a consequence of organizational change and relies on the regional separation of management and production activities of multi-unit firms. This may be motivated as follows: Many manufacturing firms in large cities conduct their business activities at their headquarters located in the central business district (CBD), while their manufacturing plants remain in the suburbs (see Duranton and Puga (2005)). In addition, many business firms (e.g. investment banks) in large cities have recently moved a part of their office activities to the suburbs. Some activities such as face-to-face communication with other business firms are conducted at the front-office located in the CBD of big cities while the rest of their activities, e .g. back-office activities such as legal and accounting, billing, planning, or employee training, are located in the suburbs (see Ota and Fujita (1993), Chandler (1977), Kim (1999) or Shilton and Stanley (1999)). Table 1 supports the hypothesis that the internationally observable trend of spatial separation of production and management activities also applies for Germany where altogether almost 18 % of all firm head quarters concentrate in the ten biggest cities. This spread of activities across space can be motivated for those activities where the relationship between proximity and productivity is not so pronounced as to allow for a compensation of high concentration costs of big cities. Hence the wages paid, e.g. for back-office activities or manufacturing, are not high enough to outweigh high costs of living arising in big cities. The corresponding labor markets then evolve away from the city centers thereby also affecting the location decision of integrated firms.

Usually sectoral and functional specializations go hand in hand, a fact that will be shown illustratively for the metropolis of Hamburg. The following discussion refers to the statistical classification of economic activities in the European Community and the corresponding ISIC (international standard industrial classification) classes.[1]

[insert Figures 5a and 5b about here]

A rather rough measure for the trend to functional specialization is provided if one looks at Germany's regional distribution of employment in the following two fields: Considering "industry, without construction" the link between proximity and productivity is not very pronounced and employment is quite spread across space (see Figure 5a). In contrast, the field "financial intermediation, real estate, renting and business activities" is mostly concentrated in the big cities since probably proximity strongly matters for productivity (see Figure 5b).

Altogether, production plants move away from the big city centers and cluster in suburbs or smaller cities in which the benefits from joint acquisition of intermediates and 'cheap' labor dominate, thereby also leading to regional specialization. Centralization in the financial branch is mostly the result of the benefits of sharing business service suppliers across firms and sectors thereby also providing job opportunities for services that are closely related to other firm's activities. Hence, headquarters from different sectors and business services cluster in a few large cities while there emerge suburbs and specialized smaller cities that attract those activities where localization externalities are weaker.

Specialization in Hamburg

Although Hamburg possesses several important industrial enterprises, its most significant economic activities are in the service sector that covers the three fields "financial intermediation" (35.1 %), "wholesale and retail" (29 %) and "private and public services" (18.8 %). Hence, altogether the service sector accounts for 82.9 % of the overall gross value added. In contrast, the industrial sector accounts for 16.3 % while the economic importance of

[1] According to this classification the three sectors (primary, secondary, and tertiary) cover altogether six fields each of them including up to 28 branches. The six fields are included in Figure 6 while some branches are listed in Table 2. See http://www.fifoost.org/database/nace/nace-en_2002c.php for details (retrieved on August 19, 2009).

the primary sector with a contribution of 0.2 % is negligible (Statistikamt Nord (2009)). This distribution of economic activity also reflects Hamburg's employment changes of the last decade as displayed in Figure 6. During the period 1999-2007 overall employment in Hamburg increased by 8.6 % which was solely driven by the tertiary sector with a contribution of 55.2 % of the fields "financial intermediation, real estate, renting and business activities", followed by "public administration and defence" with 11.7 % while "wholesale and retail trade" remained nearly constant. In contrast, employment in the first and secondary sectors was shrinking.

[insert Figure 6 about here]

Taking a closer look at the single branches highlights that they contribute quite differently to value creation of a single sector, thereby setting ground for sectoral specialization patterns (see Table 2).

For Hamburg it turns out what is also discussed within the literature of urban economics that nowadays it is both, sectoral and functional specializations, that shape the economic character of the metropolis. The major importance of the service sector for Hamburg has been pointed out before. But taking a closer look, the picture becomes more differentiated and illustrates that Hamburg also possesses some specialization advantages within the field "industry, without construction" and hence in the secondary sector.

Table 2 summarizes Hamburg's specialization pattern as measured by the national wide employment share of employees and the location quotient to identify regional specialization advantages more precisely. The location quotient is a widely accepted measure for regional specialization that calculates the ratio between national and regional employment shares of any considered branch. It may also be interpreted as an indicator for either the importance of proximity and productivity or as capturing first-nature geography advantages. A value of unity reflects an average (national) occurrence and hence no specialization. The more the value exceeds unity, the more specialized is Hamburg while the contrary applies for values falling below unity. Due to its overall importance, the listing in Table 2 begins with detailing the tertiary sector followed by those branches in the secondary sector where Hamburg also

exhibits specialization advantages. The primary sector does not appear since Hamburg has no advantage in any branch here. For the sake of simplicity, only those branches are shown that refer to a location quotient that exceeds unity. Again, the classification is drawn from the EU (see Footnote 1).

[insert Table 2 about here]

It is obvious that Hamburg has strong specialization advantages in the field "financial intermediation, real estate, renting and business activities" with location quotients exceeding unity in all but two branches. Remarkable are the branches "advertising and market research" as well as "insurance" with each of them accounting for a national wide employment share of nearly 10 % and high location quotients exceeding 3.

The field "wholesale and retail trade" is composed of 16 branches with 13 of them possessing a location quotient that exceeds unity. Here, the special role of the Hamburg harbor (and hence first-nature geography advantages) becomes apparent. It accounts for a national employment share of 33.86 % and a remarkable location quotient of 11.66 thus highlighting the outstanding specialization of Hamburg. It is followed – but with great distance - by various parts of the entertainment branch.

Considering "public and private services" slightly specialized and non-specialized branches are nearly equilibrated: the location quotient in six branches exceeds unity while in eight branches it falls below. Remarkable are "creative activities" with a share of employees of 5.96 % and a location quotient of 2.05.

The field "industry, without construction" covers 28 branches where Hamburg only possesses specialization advantages in four of them. Considering the metropolis, the label "manufacture of other transport equipment" is mainly composed of aerospace industry and ship building. The strong specialization in the field of "coke and refined petroleum" is also based on Hamburg as a harbor city. This illustrates the complementarity of the branch to the harbor in the service sector, e. g. water transport. In the fields of "construction" and "agriculture" Hamburg clearly possesses no specialization advantages. Consequently, they do not show up in Table 2.

6. Overall impact of rising transport costs

As argued before, ongoing prosperity of a city is mostly determined by the local economic structure and the continuous availability of qualified labor. Since (especially highly qualified) labor is mobile, there is a dual inducement between job creation by firms on the one hand and the quality of the local labor markets as given by private individuals on the other hand. In this respect cities and regions compete against each other for qualified labor. It is also broadly accepted that successful cities of the future are those where the service sector continuously evolves over time and where additionally the secondary sector keeps on playing a significant role. According to the reasoning in the NEG, increasing transportation costs basically act as a dispersion force thereby fostering an overall decentralization of economic activity and weakening the role of economic centers like the metropolises. Put differently, existing economic structures only persist if increasing transportation costs are compensated by a respective increase in localization economies and hence the emergence of a corresponding production structure. Another option to strengthen the role of economic centers is to compensate those forces that increase transportation costs, e.g. to outweigh higher physical transportation costs by the provision of a more efficient infrastructure network that helps saving transportation time. This argument especially becomes important if the tertiary sector, and hence mobility of people, plays a significant role for the local economic potential.

Commuting vs. migration: If an increase in pecuniary transport costs is compensated by an increase in real income, consumers might not be induced to change their behavior. The Bundesministerium für Verkehr, Bau und Stadtentwicklung (2006) finds that within the last 30 years the increase in prices for transportation has been compensated by a similar increase in real income so that the household's fraction of real expenses for transportation has remained constant. In addition, improvements in technology and in the quality and quantity of the available infrastructure made transportation faster, causing a decrease in time costs of commuting for which consumers might be willing to accept higher pecuniary costs. This applies mostly to qualified labor. Consequently, metropolises can react to changing transportation costs in advancing the quality of the infrastructure network which enhances the metropolis' (international) accessibility and hence facilitates commuting. A similar result will probably be induced by the creation of work-life quarters thereby reducing overall

commuting. This argument is especially convincing in the tertiary sector where no need to separate production and living areas exists.[2]

Hamburg has already been active in this respect. As a consequence there are locational advantages which not only result from its harbor but also from excellent road, rail and air connections thereby allowing high mobility not only of goods but also of people.

Referring to the inner-city structure the associated guiding principle of 'Farsighted Growth' (Leitbild Hamburg: Wachsen mit Weitsicht) by the Senate of Hamburg aspires to substantially develop a central quarter named "HafenCity" in Hamburg to create a dynamic, international and growing center (Hamburg Marketing GmbH (2009a)). It is the largest urban development project in Europe. The HafenCity Hamburg is being built in the former harbor covering an area of 1.57 million square meters and will increase the city center by 40 % within the next 25 years. It is projected that until the year 2020 about 40 000 people will work and 12 000 people will live there. A prerequisite to achieve a sustainable urban development of the HafenCity is to keep pace with the increased demand for transport infrastructure (Hamburg Marketing GmbH (2009b)). Apart from the necessity to build new parking spaces, roads and bridges or to extend existing ones, an efficient public transportation system needs to be developed. Nowadays, there is frequent bus transport to and from the HafenCity but only two stops of two underground lines are located in close proximity. In the future, two new underground stops will be built until the end of 2011 and an additional underground line will improve the connection of the HafenCity by public transportation by 2012. Then, the HafenCity will be reached from the central station within three minutes and it is expected that 35 000 passengers will use the new underground line per day (Borrée (2009)). Despite a change in transportation prices, this urban development project might induce firms to settle and more people to commute into Hamburg and the HafenCity in order to take advantage of employment possibilities. Especially the increase in the quantity and quality of the public transportation system might thus contribute to ongoing economic prosperity.[3]

[2] Such a separation might be reasonable in order to prevent people from pollution and contamination that arises within some production processes.

[3] Other urban development projects include the International Building Exhibition IBA 2013 and the envisaged 'Sprung über die Elbe' (Leap across the Elbe) which also take into account possible expansion of the living and working spaces in or close to the center of Hamburg.

Specialization: Higher transportation costs affect the existing economic structures via various channels thereby also impacting on sectoral and/ or functional specialization. It is obvious that both the extent of localization economies and the role of transportation costs strongly differ across the considered branches as argued along with Table 2. A high location quotient is an indication for the emergence of localization externalities or for first-nature geography advantages such that the natural geographical conditions additionally gain importance. This applies clearly to Hamburg's specificities as a harbor city which allows for easy access to the North Sea and the Baltic Sea thereby connecting the metropolitan region directly to the global market.

Most important, though not the only concentration force, are first-nature geography advantages for all activities in the field of "wholesale and retail trade" which are closely related to the harbor (see Table 2). Due to complementarities, specialization not only arises in the branch of "water transport" but also concerning "warehousing", "air transport" and "wholesale trade". Note that the Hamburg harbor is in strong competition with other European harbors, e. g. Rotterdam in the Netherlands, and that the entire cost of goods' transportation is composed of the costs for water and inland transport. Due to its geographical location quasi in the midlands and its connection to the highly-productive German infrastructure network, Hamburg has an advantage over other European harbors since the majority of transportation costs result from transporting goods beyond the sea. At a regional level the overall importance of the Hamburg harbor for the metropolitan region might attract firms mainly in the manufacturing sector for which easy access to the world market is of major importance.

But this advantage might become less important if, as a consequence of increasing energy prices, the ratio between land costs and overall transportation costs decreases. Given this, the overall efficiency not only of the harbor but also of the corresponding hinterland infrastructure becomes important. Additionally, there arise indirect effects on those branches related to the harbor which includes nearly all branches mentioned in the field of "wholesale and retail trade" in Table 2. Above, also in the secondary sector, especially "manufacture of other transport equipment" (which in Hamburg mainly refers to ship and plane building) and "manufacture of coke and refined petroleum products" are closely linked to the existence and the efficiency of the harbor. However, these branches are mainly dominated by first-order

geography arguments or political reasons; hence, changing transportation costs probably will not affect the industrial composition there.

In the field “financial services, real estate and business activities” first-nature geography does not matter but the existing specializations are clearly driven by localization externalities. Whether or not transportation affects firms’ location choice then depends upon the importance of face-to-face contacts. In this field, changing transportation costs mostly gain relevance with respect to mobility of people instead of goods and then travel time becomes an important cost component. A region might thus compensate the spreading tendencies by reducing time costs. In Hamburg this argument mostly applies to “activities of head offices; management and consulting activities” while e.g. other related activities in the context of functional specialization such as “legal and accounting activities” or “office administrative, office support and other business support activities” are expected to be less affected by changing transportation costs. Consequently, the recommendation for the metropolitan region of Hamburg is to proceed in enhancing the efficiency of its public infrastructure, e.g. by better access to the airport, the railway network or the inner-city public transportation network to reduce the firms’ time costs in those branches that are characterized by strong economies of scale and given that mobility of people is a central cost factor.

7. Conclusions

The economic landscape is the outcome of the interaction between concentration and spreading forces. Generally, high transportation costs act as a dispersion force thereby affecting the location and settlement choices of individuals and firms. The analysis reveals some differentiated conclusions for future urban development of the metropolitan region of Hamburg which are based both on regional peculiarities and general trends.

Several forecasts predict a considerable rise in the price of energy in the next several decades such that despite technological progress transportation costs are likely to increase. According to the reasoning of the NEG and urban economics this will crucially affect the spatial equilibrium both at a national and a regional level. Additional factors that have to be taken into account include demographic change, and correspondingly an ageing society together with increased competition for qualified labor, as well as structural change and hence the transition from the first and secondary to the tertiary sector and thus to knowledge-based

economies. These general trends will affect all industrialized countries similarly. Aside from the general trends, regional peculiarities also have to be considered in order to assess the impact of increasing energy and transportation costs on future urban development.

This paper disentangles the various single effects and applies them to Germany's second biggest city and the corresponding metropolitan region, Hamburg. The analysis highlights that, based on the premise of maintaining the prevailing economies of scale and given that the resulting potential for the industry and the industrial sector is exhausted, increasing energy and transportation costs will open up a range of opportunities for the metropolitan region. As Hamburg, due to the harbor, has excellent access to the global market, the metropolitan region is likely to become increasingly appealing to export-oriented industrial sectors which might attract additional firms. Besides, knowledge-based sectors have been constantly growing in the past and are expected to do so in the future. The corresponding activities, which are characterized by a strong importance of face-to-face contacts, mostly require modern telecommunications and the related infrastructure rather than modes of transportation. Nevertheless, in this context mobility of people might not be neglected since they are frequently business travelers. An efficient infrastructure network is thus also important to attract people and firms who are active in those fields characterized by strong economies to scale. If mobility is an important issue, a reduction of time costs acts in contra to the discussed spreading forces. Otherwise, and especially since these jobs are not necessarily located at the metropolitan region, there arises the danger that jobs migrate from Hamburg to other German or European centers which all compete for qualified labor.

Rising transportation costs will probably also affect the settlement decisions of private households such that the city attracts people to live there in order to reduce commuting costs. Several urban development concepts, among them the HafenCity project, are aimed at strengthening the districts closes to the city center and to integrate living and working spaces. This could cut the cost of traveling to and from work. However, aside from pure activities in the city center, expansion in the district centers should also be considered.

Overall, Hamburg's migration forecast is positive while commuting, although Germany wide an overall increase can be observed, also displays some characteristics of the emergence of suburbs in the south-western part of the center. Given the emergence of well functioning

suburbs, this extends the source of prosperity for the entire metropolitan region which thus becomes even more attractive.

Considering Hamburg's specialization patterns and the interdependencies between the secondary and tertiary sector, the situation of Hamburg is quite promising. The industrial basis is provided by the harbor and the aerospace industry. In these latter cases there are also strong complementarities between secondary and tertiary sectors. Additionally there are pronounced specialization advantages in most branches of the service sector. A closer look reveals that the associated fields and branches are quite differently affected by transportation costs. At the same time there are no first-nature geography advantages such that these activities will necessarily remain in the city of Hamburg.

At a regional level the overall importance of the Hamburg harbor for the metropolitan region might attract firms mainly in the manufacturing sector for which easy access to the world market is of major importance.

Policy recommendations include to continuously develop the infrastructure network of the metropolitan region together with the corresponding hinterland connections in order to keep transportation of goods and people efficient. There is already some evidence for the emergence of an economic sub-center in the South-Western part of the city center. Altogether, the challenge lies in integrating the ongoing trends together with city-specific factors into a coherent urban development strategy. If this is successful, rising energy prices open up opportunities for Hamburg.

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Tables and Figures

Table 1: Some characteristics of Germany's ten biggest cities

City	Population, 2007	Employees, 2007	Productivity (GDP per employee) in €, 2007	Forecast of balance of migration, 2006-2015	Commuting balance, 2008	Headquarters with 200 and more employees, in%, 2008
Berlin	3 407 625	1 604 006	52 841	67 300	97 765	4,31
Hamburg	1 761 711	1 089 853	78 967	20 700	213 187	3,22
München	1 302 376	938 170	78 160	4 800	187 011	0,66
Köln	991 882	653 426	67 543	6 500	131 991	1,93
Frankfurt/ Mai	655 338	604 536	84 358	-9 800	257 944	2,12
Stuttgart	595 775	467 184	76 574	8 400	146 132	1,31
Dortmund	587 195	293 047	60 742	-3 200	23 165	0,84
Essen	582 759	309 482	67 757	3 500	42 580	1,05
Düsseldorf	579 075	474 375	83 374	21 500	160 974	1,72
Bremen	547 632	325 355	70 904	22 900	84 174	0,95

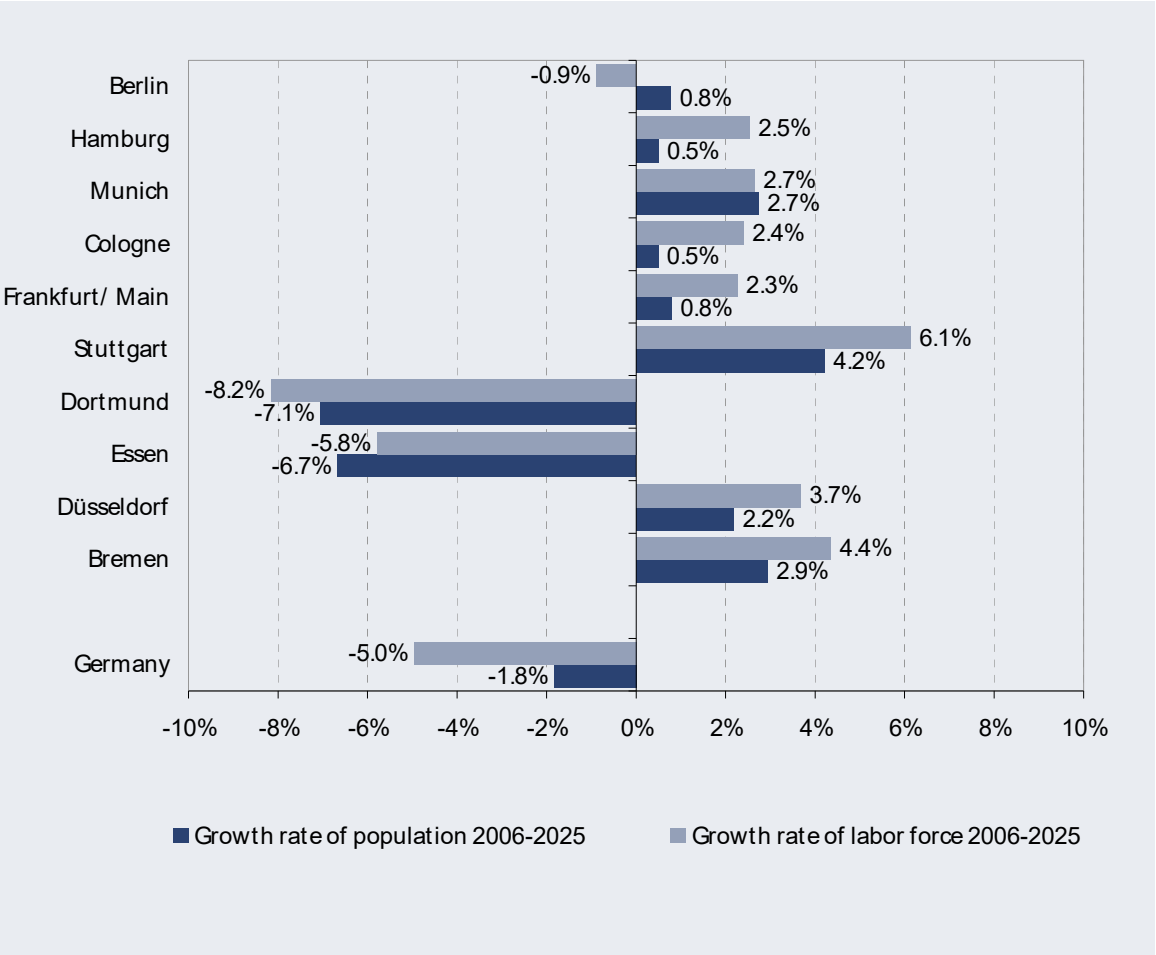
Sources: Arbeitskreis Volkswirtschaftliche Gesamtrechnungen der Länder (2008); Bundesagentur für Arbeit (2008, 2009); Statistische Ämter des Bundes und der Länder (2009); Bundesinstitut für Bau-, Stadt- und Raumforschung (2007), Calculations HWWI.

Table 2: Specialization patterns in Hamburg 2008

Tertiary Sector		
Financial intermediation, real estate, renting and business activities	**Share of employees in %**	**Location quotient**
Advertising and market research	10.32	3.55
Insurance, reinsurance and pension funding, except compulsory social security	9.51	3.28
Other professional, scientific and technical activities	7.66	2.64
Rental and leasing activities	5.74	1.98
Travel agency, tour operator and other reservation service and related activities	5.71	1.97
Activities of head offices; management consultancy activities	5.06	1.74
Legal and accounting activities	4.7	1.62
Security and investigation activities	4.54	1.56
Real estate activities	4.42	1.52
Architectural and engineering activities; technical testing and analysis	4.25	1.46
Services to buildings and landscape activities	4.18	1.44
Activities auxiliary to financial services and insurance activities	4.16	1.43
Office administrative, office support and other business support activities	3.92	1.35
Employment activities	3.86	1.33
Financial service activities, except insurance and pension funding	3.68	1.27
Wholesale and retail trade; repair of motor vehicles and household goods, hotels and restaurants; transport and communication	**Share of employees in %**	**Location Quotient**
Water transport	33.86	11.66
Motion picture, video and television programme production, sound recording and music publishing activities	8.52	2.93
Information service activities	8.26	2.85
Publishing activities	7.62	2.62
Programming and broadcasting activities	7.6	2.62
Warehousing and support activities for transportation	6.07	2.09
Computer programming, consultancy and related activities	4.9	1.69
Air transport	4.56	1.57
Wholesale trade, except of motor vehicles and motorcycles	4.31	1.49
Food and beverage service activities	3.63	1.25
Land transport and transport via pipelines	3.52	1.21
Postal and courier activities	3.15	1.08
Telecommunications	3.13	1.08
Public and private services	**Share of employees in %**	**Location Quotient**
Creative, arts and entertainment activities	5.96	2.05
Libraries, archives, museums and other cultural activities	4.66	1.6
Gambling and betting activities	4.27	1.47
Repair of computers and personal and household goods	3.96	1.36
Sports activities and amusement and recreation activities	3.5	1.2
Activities of households as employers of domestic personnel	3.16	1.09
Secondary Sector		
Industry, without construction	**Share of employees in %**	**Location quotient**
Manufacture of other transport equipment	16.94	5.83
Manufacture of coke and refined petroleum products	13.76	4.74
Manufacture of tobacco products	6.28	2.16
Sewerage	5.01	1.72

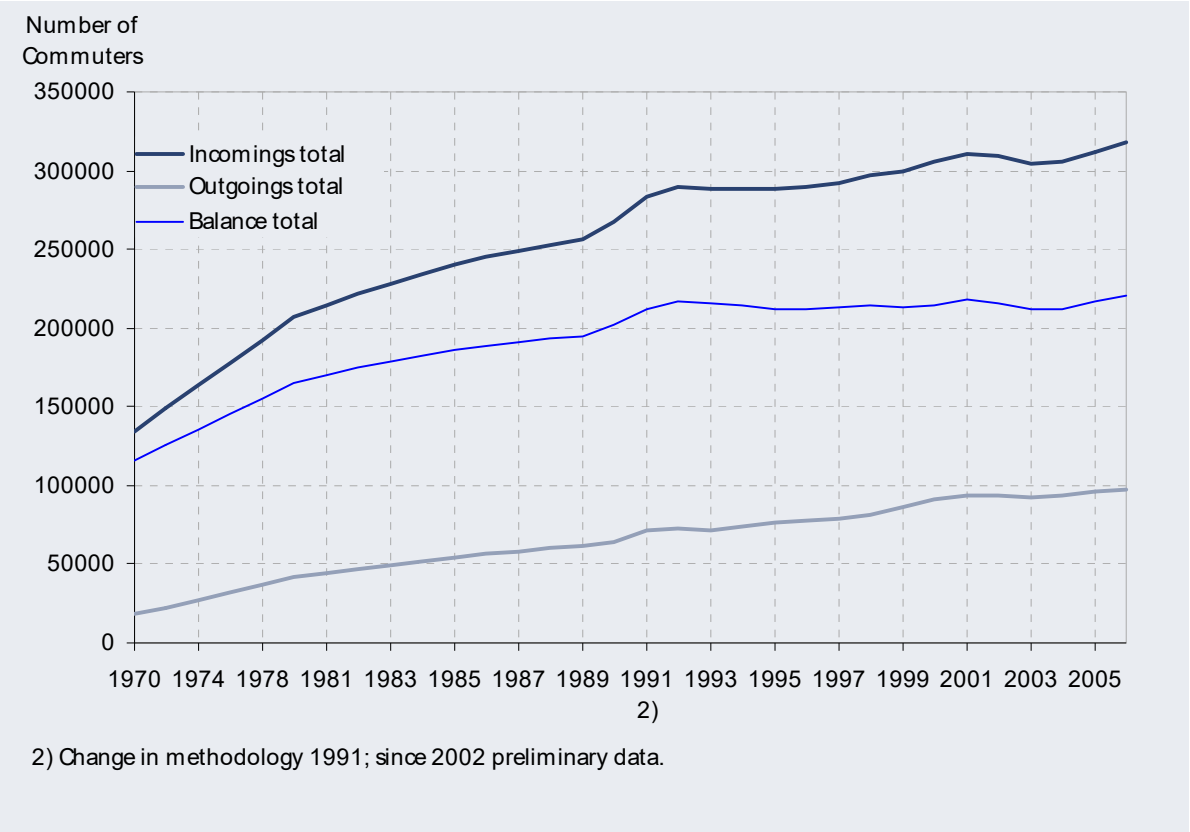
Sources: Bundesagentur für Arbeit (2008); Calculations HWWI.

Figure 1: Forecast of population and labor force development, 2006 to 2025



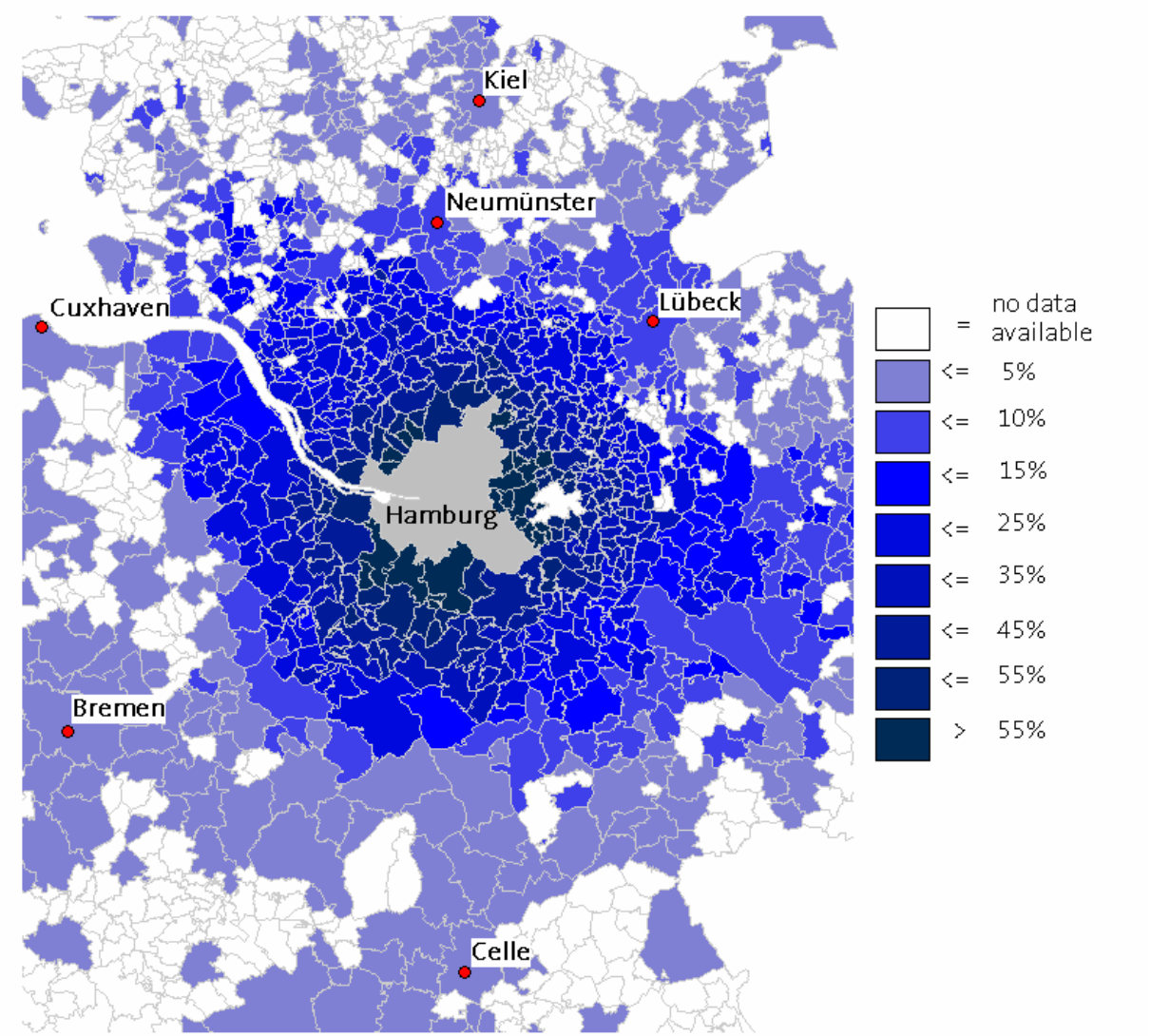
Sources: Bundesinstitut für Bau-, Stadt- und Raumforschung (2009); HWWI.

Figure 2: Commuting in Hamburg 1970-2006



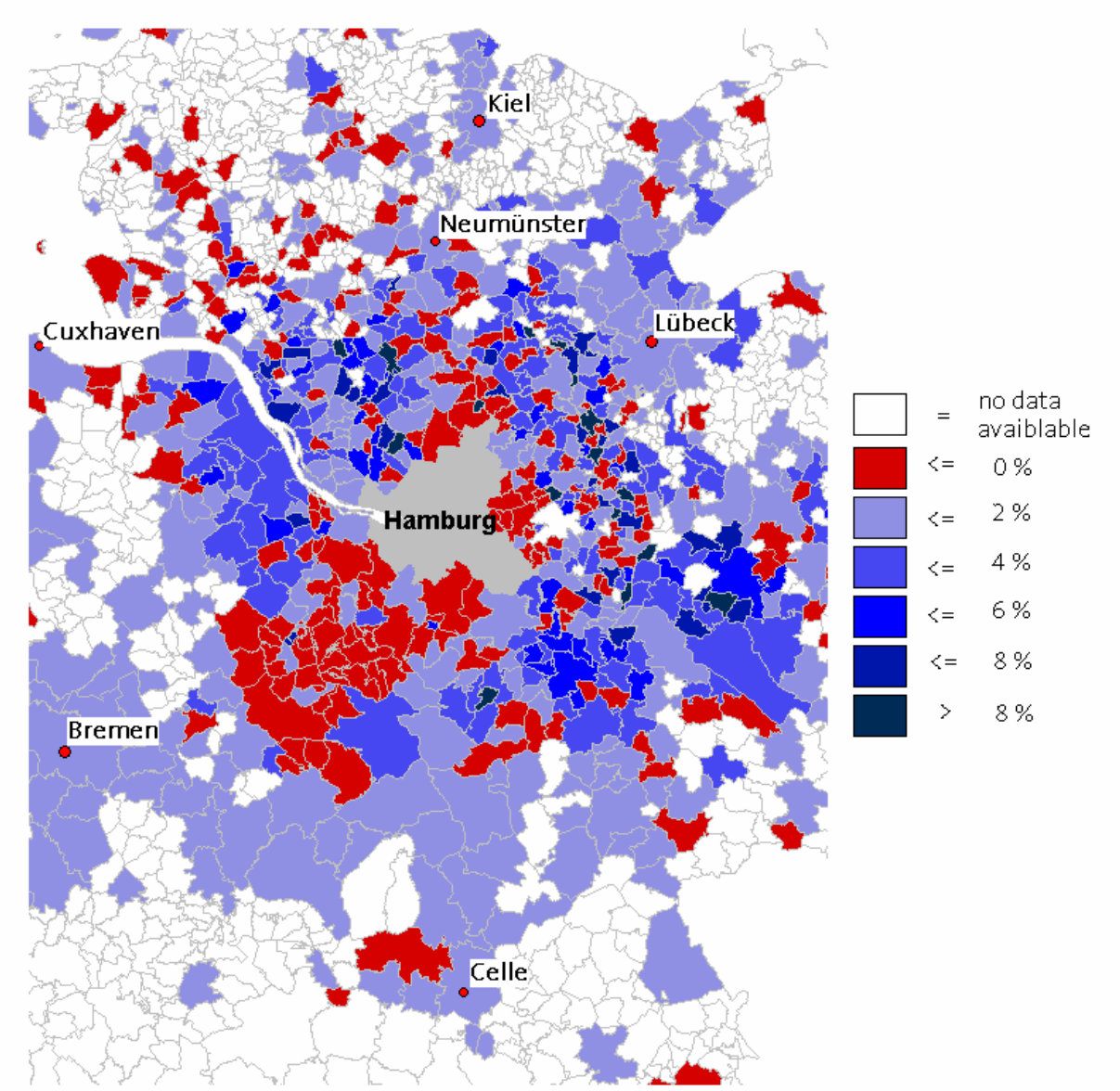
Sources: Bundesagentur für Arbeit (2006); Statistisches Amt für Hamburg und Schleswig-Holstein (2006).

Figure 3: Proportion of employed persons of neighboring municipalities commuting to Hamburg in 2008



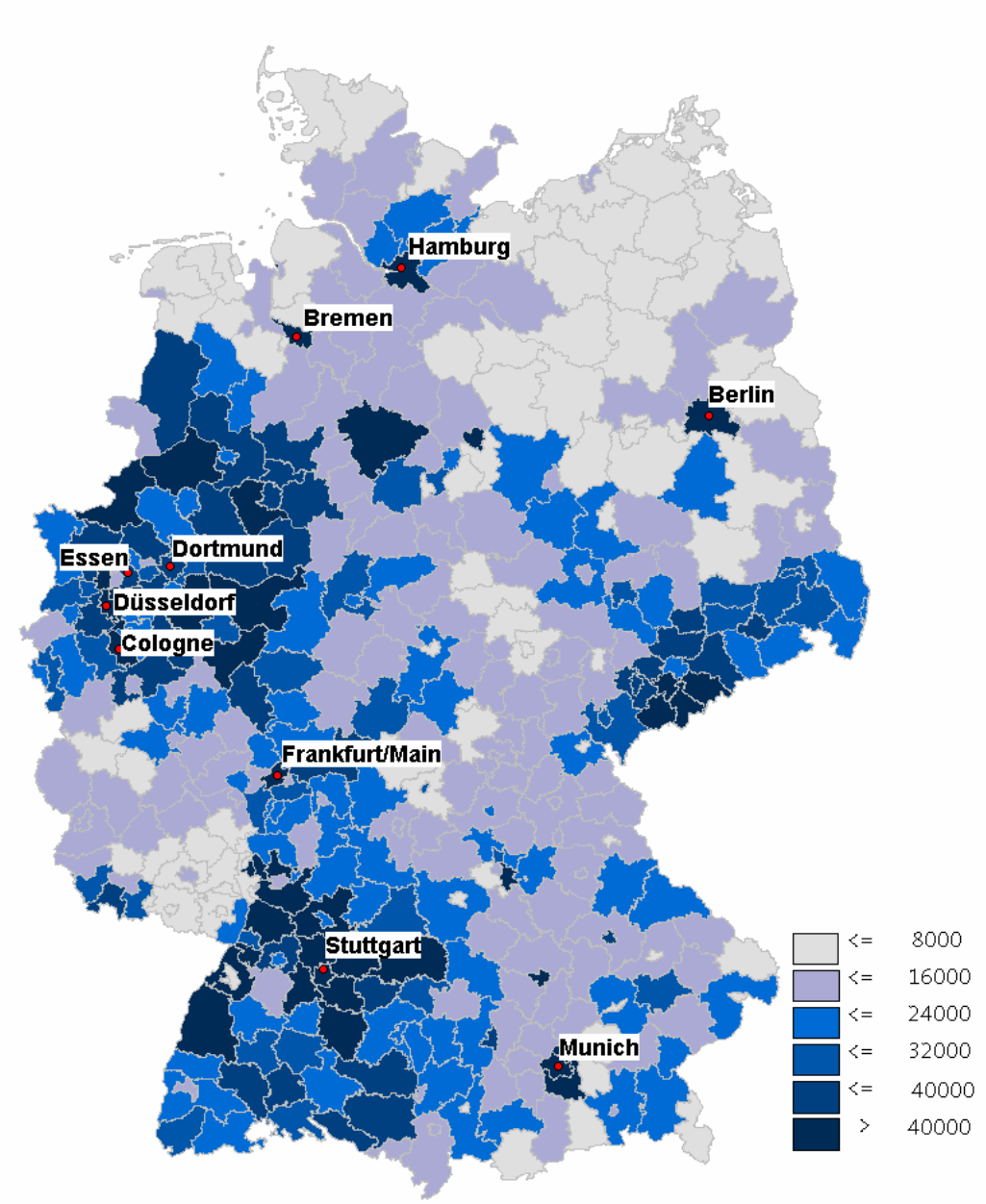
Sources: Bundesagentur für Arbeit (2009); HWWI.

Figure 4: Change in proportion of employed persons of neighboring municipalities commuting to Hamburg 1999-2008



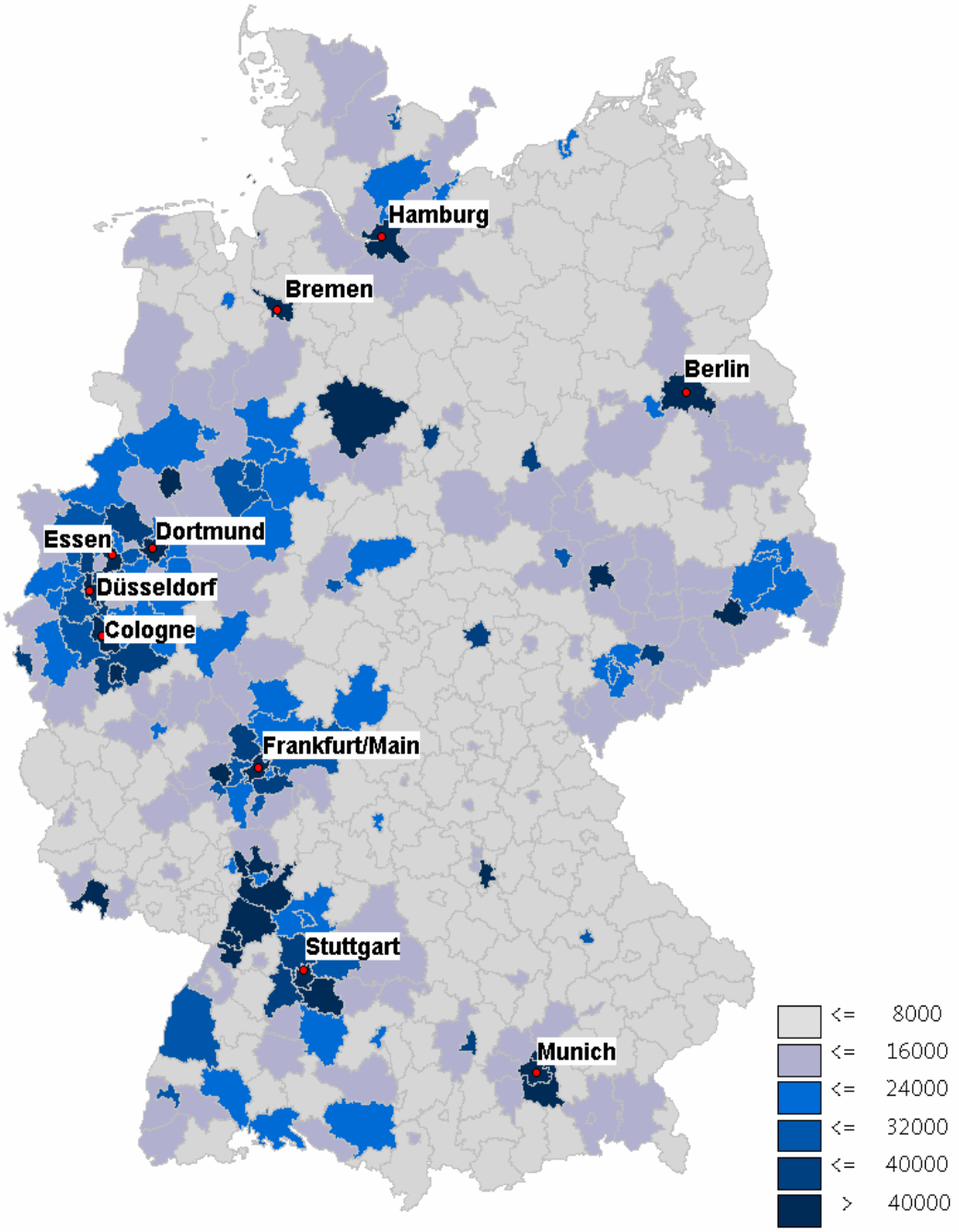
Sources: Bundesagentur für Arbeit (2009); HWWI.

Figure 5a: Employed persons in the field industry, without construction, 2007



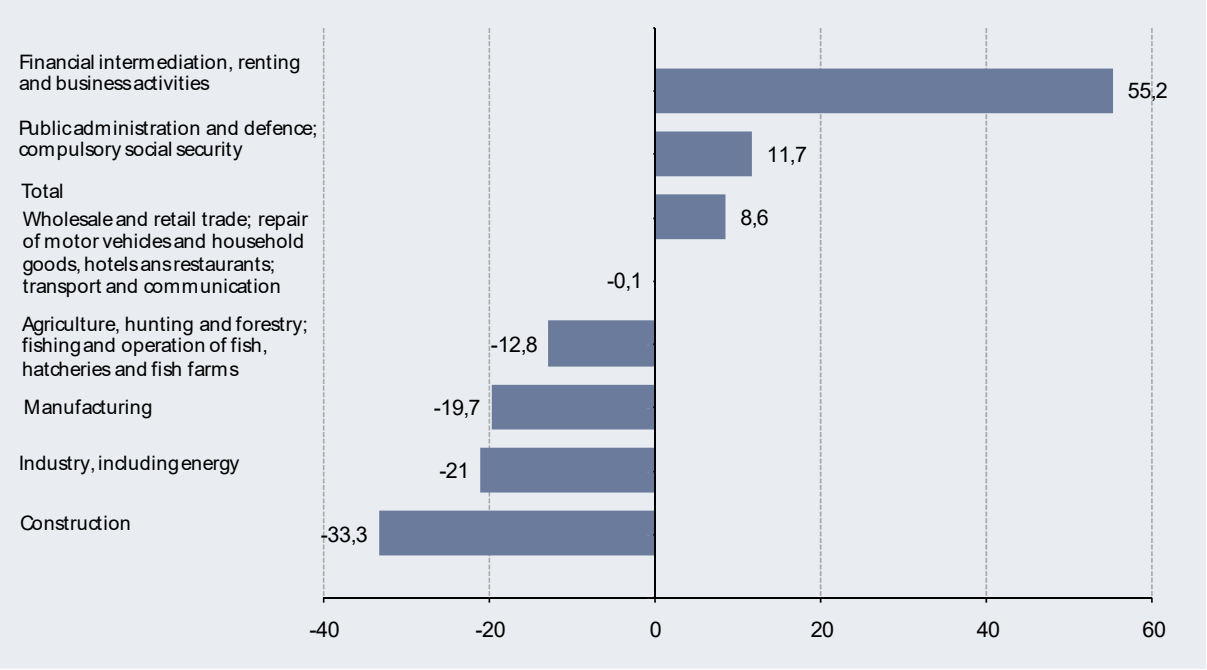
Sources: Statistische Ämter des Bundes und der Länder (2009); HWWI.

Figure 5b: Employed persons in the field financial intermediation, real estate, renting and business activities, 2007



Sources: Statistische Ämter des Bundes und der Länder (2009); HWWI.

Figure 6: Employment change in Hamburg, 1999-2007



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