Local Employment Multipliers in Norway

A Comparative Study of Norway, Sweden and the United States

Eirik Handegård Dyrstad

Thesis for Master of Philosophy in Economics

Department of Economics
UNIVERSITY OF OSLO
December 2014

Without labor nothing prospers

Sophocles (c. 496 – 406 B.C)

Local Employment Multipliers in Norway

A Comparative Study of Norway, Sweden and the United States

2014

Local Employment Multipliers in Norway: A Comparative Study of Norway, Sweden and the United States

Eirik Handegård Dyrstad

http://www.duo.uio.no

Trykk: Reprosentralen, Universitetet i Oslo

Preface

As this paper marks the end of my academic education, it seems proper to express gratitude to both those who have contributed directly to this analysis, and those who have supported me during my five year long journey

I would like to thank my supervisors Marianne Røed and Pål Schøne at Institutt for Samfunnsforskning for excellent counseling, comments and advice. I would also like to express thanks to Bjørn Dapi at the University of Oslo, who pulled the strings that enabled me to come in contact with ISF. Thanks too my old mate Per, who is currently writing his PhD dissertation in biology. I guess none of us would have guessed that we would end up as boring and probably all to serious academics a few years back! Thanks to my lifelong friend Sjur and his better half Heidi. You guys always make me feel welcome, and our movie nights have enabled me to get a mental pause from numbers, graphs and data problems. Thank you Magnus, for philosophical discussions, generally expressing your honest opinion and for teaching me advanced mathematics without making me feel like a fool. Trygve, your fearlessness truly inspires your older brother. You are my closest friend, a great musician, and soon the best teacher I never had. I would like to thank my parents. Your support is truly invaluable. My dad, the busy bee who somehow always finds the time. Who perceives the unspoken. My mom, who dares to challenge herself. Whom I've inherited the type of stubbornness from that has enabled me to reach my goals. To the rest of the family, who are not just blood relatives, but also my friends, thank you!

With all of this support, one thing seems crystal clear; any mistakes in this paper are my responsibility, and mine alone.

Abstract

In this paper I estimate long run local employment multipliers for Norway and compare the estimates with similar estimates obtained for Sweden and the United States. Using matched employer-employee and education register data ranging from 1996 to 2010, I find empirical evidence of statistically significant multipliers in Norway within the time period. More specifically, I show that when a local economy manages to generate new jobs in its traded sector, additional jobs are created in the local non-traded sector in the long run. This employment multiplier effect is presumably due to an increase in demand for non-traded goods, driven by the expansion of the local traded sector.

The estimates for Norway indicate that the magnitude of the average multiplier depends substantially on the type of jobs initially created in the local traded sector. In particular, the estimates suggest that the multiplier is roughly three times larger when the initial jobs generated in the traded sector require some tertiary education. An additional job in the local traded sector that requires tertiary education is estimated to generate roughly 2,5 jobs in the local non-traded sector on average, in the long run. This finding is in line with what has previously been found in Sweden and the United states, and possible explanations include average wage differences between workers with different degrees of education, differences in relative preferences for non-tradable goods and differences with respect to worker mobility.

Comparing estimates of the employment multipliers across the respective countries suggests that the average general multiplier is larger in the United States than in Sweden and Norway. However, an interesting finding is that the relative difference between the multiplier associated with tertiary education and the general multiplier is larger in the Scandinavian countries. The latter finding arguably implies that the type of jobs initially created in the local traded sector is of relatively greater importance in Norway and Sweden than in the United States. It also suggests that the difference between the skill-specific and general multiplier is not driven exclusively by income differences between workers with higher and lower levels of education, since the net income distribution in Scandinavia is more compressed than in the United States. Due to the nature of the data at hand, I am unable to isolate the driving forces behind the difference in the skill-specific and general multiplier. Further research is needed on this point.

Both the national and local governments in Norway routinely take measures and implement policies that aim at promoting employment and economic growth in general, using significant financial resources in the process. The estimates of the Norwegian employment multipliers should therefore be of interest. In essence, estimates of this kind can help policymakers to form reasonable expectations with respect to the ultimate effect of employment policies, and choose policies that are both cost efficient and likely to have the greatest effect. Viewed in isolation, the estimates obtained in this paper suggests that local economies should aim at creating jobs that require higher levels of human capital.

Table of contents

1 Introduction

A national economy can be divided into a number of local competitive economies. Local economies consist of industries with firms that produce goods and services that are either tradable or non-tradable on the national or international market. Firms that produce goods primarily for export purposes, such as software products, timber or salmon, are part of the *local traded sector*. These firms are exposed to national or international competition, and long run[1] prices on tradable goods are hence determined by national or international developments in supply and demand. Consequently, producers of tradable goods are price takers in the market, and prices on tradable goods do not reflect local economic conditions per se. The *local non-traded sector,* on the other hand, consists of firms that produce goods and services that are sold locally and are unfit for export. Examples of such goods are healthcare services, haircuts and restaurant meals. Competition between firms within this sector is restricted to the local economy, which suggests that long run prices on non-tradable goods reflect local economic conditions.

The local employment level in the two sectors is not independent of each other, but rather highly interconnected. When new jobs are created in the local traded sector, aggregated local revenue increases. The proportion of the additional revenue spent on non-tradable goods yields an increase in local demand and, in turn, production of non-tradable goods. This gives rise to the long run employment multiplier effect; whenever a local economy generates a new job in its traded sector, additional jobs are created the local non-traded sector. The multiplier effect is partially offset by general equilibrium effects induced by changes in local wages and prices, and depends crucially on the features that characterize local labor markets.

In this paper I estimate long run multipliers for local economies in Norway and compare them with similar estimates obtained by Moretti (2010) and Moretti and Thulin (2013) for the United

[1] The long run is a conceptual time period in which there are no fixed factors of production. Hence, there are no constraints that prevent firms from changing their production level by adjusting the capital stock, or entering or leaving an industry. Prices are completely flexible as to shifts in aggregate supply and demand, and there is full mobility of labor and capital between sectors in the economy. In economic literature, the long run usually refers to time periods that range over many years (Blanchard, 2010, pp. 27–28). In this paper, developments over 7 years are considered as long run developments.

States and Sweden. To my current knowledge, these estimates are unique in that no one has obtained such estimates for Norway before. Using matched employer - employee and educational register data[2] from 1996 to 2010, I quantify the change in the number of jobs in local economies non-traded sector following an exogenous increase in the number of jobs in the local traded sector, allowing for endogenous reallocation of factors and adjustment of local prices. More specifically, I undertake to types of regressions. First I estimate a general average employment multiplier based on the tradable sector as a whole. Second, I estimate a skill-specific employment multiplier in which I quantify the effect on employment in the local non-traded sector following an exogenous increase in local demand for high skilled labor in the traded sector. On the outset, differentiating between a general and skill-specific multiplier seems reasonable. In particular, the estimates of the multiplier obtained for United States and Sweden suggest that the multiplier´s magnitude depends crucially on the type of jobs initially created in the traded sector, presumably due to average wage differences across professions. For instance, Moretti (2010) finds that the United States employment multiplier is close to two times larger when the new jobs created in the traded sector require higher levels of human capital. The skill-specific estimate of the multiplier obtained for Sweden is roughly six times larger than the estimate of the country´s general average multiplier (Moretti and Thulin 2013). Their industry-specific estimates also suggest that high-tech industries have larger multipliers.

Other scholars have also estimated local employment multipliers, though not of the exact same nature. Jofre-Monseny et al. (2014) estimates the causal effect of increased local employment in the public sector in Spain on employment in the local private sector. They find that an increase in local public employment crowds-in local non-tradable jobs and crowds-out local tradable jobs in the long run. Faggio & Overman (2014) estimates the same relationship for England within a four year time period, reaching from 2003 to 2007. Interestingly enough, they find that increased local public employment changes the composition of the local private sector, but has no significant effect on overall local employment. Black et al. (2005) studies the coal boom that occurred in Kentucky, Ohio, Pennsylvania and West Virginia in 1970 and corresponding bust that occurred in the 1980s. They uncover relatively small multiplier effects yielding from additional jobs in the

[2] This Master-Thesis is related to the research project "Convergence or segregation? Regional imbalance and labour market flows" financed by The Norwegian Research Council (grant 217264/H20). The data has been provided and facilitated by the researchers at Institute for social research, Marianne Røed and Pål Schøne, who are connected to the project.

mining industry during the boom. An additional mining job during the boom generated 0,17 jobs on average in the non-tradable sector. An interesting finding in the study is that the multipliers magnitude depends on the direction of the shock; a loss of a mining job caused an average decline of 0,34 jobs in the local non-traded sector. Carrington (1996) focuses on the short run. His case study of the construction of the Trans-Alaskan Pipeline System suggests that the construction had a significant positive effect on employment in other non-tradable industries in Alaska.

Arguably, one would expect the general characteristics of the national economy, the labor force and the features that characterize local labor markets to implicitly manifest themselves in the magnitude of the long run employment multiplier. In this respect, labor market policies, consumer preferences, the degree of labor productivity and intensity in non-tradable industries, the net income distribution, workers degree of mobility and the characteristics of local housing markets are factors of importance. These factors vary within countries over time, and tend to differ in somewhat different degree between countries. It therefore seems plausible to expect multipliers of different magnitudes in Norway, Sweden and the United States within a given time period, and that country differences with respect to the multiplier change over time.

A comparison of multiplier magnitudes across the respective countries can, at least to some extent, attribute to greater knowledge of how Norwegian local labor markets work in general, how they differ, and in which aspects they are similar to other countries local labor markets. Both the national and local governments in Norway routinely implement policies that seek to promote local employment and economic growth in general, using significant financial resources in the process. In this respect, the estimates of the long run multipliers can be of guidance, and should be of interest to Norwegian policy markers who seek to promote employment in a cost effective manner. In essence, estimates of this kind can help policy makers to form more realistic expectations with respect to the ultimate effect of policies that aim to increase local employment, and to choose the policies that are likely to yield the greatest effect.

The remainder of this paper is organized as follows. In chapter two I present a simple conceptual framework that seeks to clarify the economic mechanism that yields the employment multiplier and identify the factors that, at least from a theoretical perspective, should affect its magnitude. The framework is based on Moretti (2011) and Moretti & Thulin (2013). In chapter three I present the data and describe how industries and workers are classified and allocated with respect to sectors, local labor markets and skill levels. In chapter four I present the econometric

specifications used to estimate the employment multipliers and argue why an instrumental shift-share variable is needed to obtain consistent estimates. Descriptive statistics from the Norwegian data is presented and compared with corresponding statistics for Sweden and the United States in chapter five. In chapter six I highlight relevant country differences with respect to labor market policies and discuss how policy differences are likely to affect labor mobility and hence the respective countries multipliers. The regression results are presented in chapter seven accompanied by a general discussion. Chapter eight summaries and concludes.

2 Conceptual framework

In this chapter I present a simple theoretical framework that aims at identifying the underlying structural parameters that determine the employment multipliers sign and magnitudes in the long run[3]. The framework is based on Moretti (2011) and Moretti & Thulin (2013).

2.1 Assumptions

Assume that the national economy can be dived into a given number of competitive local economies where tradable and non-tradable goods are produced. Non-tradable goods and services are, both from a practical and economical point of view, unfit for export. Examples of such goods can be restaurant meals or services such as personal training and haircuts. Since non-tradable goods only are consumed locally, competition between firms in the non-traded sector is restricted to the local economy. Consequently, long run prices on non-tradable goods reflect local economic conditions. The market for and consumption of tradable goods, on the other hand, is not bounded to the local economy in which they are produced. Tradable goods, like software products or coffee machines, can be exported, and firms that produce tradable goods are hence exposed to national or even international competition. Due to the extent of this competition, any single producer of a tradable good does not have the sufficient degree of market influence to affect the market price. Long run price developments yield from national or international developments in aggregated supply and demand, so these prices do not reflect local economic conditions per se. Producers of tradable goods therefor behave as price takers in the market place, and prices on tradable goods are hence considered fixed from the local producers point of view.

2.1.1 Firms

In the long run, firms are assumed to settle in the local economy where they maximize profits. A producer of a tradable good can therefore relocate from one local economy to another if for example local wages or rents become too high. Standard long run assumptions are made with respect to production functions; labor and capital are used as inputs in the production process and the law of diminishing marginal returns is assumed to hold. For simplicity, assume that capital

[3] A simplified mathematical version of the conceptual framework is provided in appendix 2. The model highlights how offsetting equilibrium effects affect the allocation of workers, local wages and housing costs following a local increase in labor demand.

inputs are sold on the international market, so the price on capital inputs are considered fixed. Labor is assumed to be perfectly mobile between sectors within local economies. The assumption is arguably appropriate in the long run and implies that local wages are equalized with the value of the marginal product of labor within local economies. In essence, local wages reflect the productivity of local workers.

2.1.2 Workers

Workers provide one unit of labor, consume one unit of housing and are considered either skilled or unskilled. The marginal product of a skilled worker is assumed to be higher than that of an unskilled worker for any given level of production. Combined with the assumption that workers are paid the value of their marginal product, this implies that skilled workers receive higher wages than unskilled workers. All workers settle in the local economy that maximizes their utility. I assume that workers indirect utility increases with local wages net of housing cost (real wages), amenities and that they have personal tastes for location. The latter factor is meant to capture workers degree of emotional attachment to a given local economy. Indeed, being born, having family or friends in a given local economy might make the local economy more attractive to a worker irrespective of local real wages and amenities.

Within this conceptual framework, personal tastes for location affect the degree of worker´s mobility, which, in turn, exclusively determines the elasticity of local labor supply. If workers are strongly emotionally attached to a given location, they are less willing to arbitrage away differences in real wages and amenities between local labor markets. In such a case, worker mobility is low and the elasticity of local labor supply is small. In the opposite case, where workers are less emotionally attached to any local economy, workers are relatively mobile and hence the elasticity is larger. The intuition is straightforward; ceteris paribus, a one percent increase in local wages should attract more workers to the local economy when workers are more mobile, and workers are relatively more mobile when they are less emotionally attached to any given local economy.

Two extreme cases are worth considering. If workers are infinitely emotionally attached to a given local economy, labor mobility is zero. In other words, workers do not respond to differences in real wages and amenities between local labor markets whatsoever. In such a case, any shift in local labor demand would only affect local wages, not local employment. It follows that the

employment multiplier is be zero. In the other extreme case, where workers only care about real wages and amenities, mobility is perfect across local labor markets and local labor supply is infinitely elastic. As a result, real wages net of amenities would be equalized across all local economies in the long run. None of the scenarios seem especially plausible in practice. Arguably, it is more realistic to assume that workers to some degree are more emotionally attached to some locations than others, but that they are willing to relocate if differences in real wages and amenities between local economies become large enough. Hence I assume that local labor supply increases with local wages, but not infinitely. Imposing this assumption suggests that a given worker prefers local economy *a* to local economy *b* if the sum of real wages, amenities in addition to his emotional valuation of local economy *a,* exceeds the equivalent sum for local economy *b*. Although somewhat parsimonious, the model captures main components that drive worker mobility, namely net wages, housing costs, amenities and personal taste for location.

2.1.3 The housing market

I assume that the elasticity of local housing supply is determined exogenously by local land law regulations and geographical conditions. The elasticity of housing supply will therefore be lower in local economies where these factors make it more difficult to produce new housing units. If the elasticity is zero, it is impossible to produce new housing units in the local economy. In such an extreme case, additional demand for local housing units would only affect housing prices. In the other extreme case, where the elasticity of local housing supply is infinite, additional demand for housing would not affect local housing prices at all. Arguably, as with the extreme cases discussed with respect to labor mobility and local labor supply, none of these extreme cases seem realistic in practice. I therefore assume that local housing supply is neither perfectly inelastic nor perfectly elastic.

2.2 The employment multiplier and its determinants

In spite of being somewhat simplistic in its form, the theory presented above captures and highlights the mechanism and key factors that yields the employment multiplier and determines its magnitude. For example, assume a permanent increase in labor demand in a specific tradable industry in a local economy. This can happen if the local economy manages to attract a new firm to the industry, or alternatively, if existing firms in the industry are exposed to a positive change in technology that makes workers more productive. An industry-specific increase in local labor demand in the traded sector creates more local jobs and wages in the industry rise. Given that the

elasticity of local labor and housing supply are neither perfectly elastic nor inelastic, the increase in local jobs and wages will attract some workers to move to the local economy, which in turn causes local employment and housing costs to increase. Since the local economy now has more workers and average local wages are higher, aggregate revenue in the local economy must increase. If some proportion of the additional revenue is spent locally on non-tradable goods, local demand for non-tradable goods increase and firms in the non-traded sector hire more workers to meet the additional demand. In effect, employment, wages and prices rise in the non-traded sector. Hence, theory suggests that the long-run employment multiplier is unambiguously positive; whenever a local economy generates a new job in the traded sector, additional jobs are created in the non-traded sector in the long run.

2.2.1 Key determinants of the employment multipliers magnitude

The magnitude of the employment multiplier will depend on several factors. First, it is affected by offsetting equilibrium effects on local wages and prices. Given that the elasticity of local labor and housing supply are not infinite, the initial increase in employment in the traded sector causes local wages, housing costs and the price of non-tradable goods to rise. The increase in local wages and cost of housing, in turn, yields an increase in production costs and hence a partial decline in the supply of non-tradable goods. This partially, but not fully, undoes the effect of the increase in demand for non-tradable goods following from the additional revenue generated by increased employment in the traded sector. In effect, the initial additional jobs created in a given industry in the traded sector partially crowds out jobs in other industries, in both the local non-traded sector and traded sectors in other local economies. The conceptual framework presented suggests that the increase in local wages and housing costs ultimately depends on the elasticity of local housing and labor supply. The increase in local wages and housing costs following increased employment in the traded sector is smaller when these elasticities are larger. Hence, theory suggests that the partial decline in local supply of non-tradable goods will be smaller, and hence the multiplier will be larger, in local economies where the supply of housing is less constrained and when workers are more mobile. In this respect, policies that affect the supply of housing and the degree of worker mobility should also affect the magnitude of the multiplier. For example, neo-classic economic theory postulates that an unemployed person is more inclined to relocate to a local labor market with open vacancies when unemployment benefits are smaller. If unemployment benefits are high however, firms must offer higher wages to attract new workers to the local labor market,

production costs increase more, the offsetting equilibrium effects are stronger and the employment multiplier is smaller.

Secondly, the multiplier is larger when consumers have stronger relative preferences for non-tradable goods. New jobs in the traded sector generate additional revenue in the local economy. The additional revenue, in turn, yields an increase in aggregate demand for goods and services. When consumers have stronger preferences for non-tradable goods, they spend a greater proportion of the additional revenue on non-tradable goods. All else equal, higher production of non-tradable goods requires more workers and hence the multiplier will be larger. In essence, the magnitude of the multiplier depends on the income elasticity of demand for tradable goods. As non-traded goods tend to be based in the service sector, the demand for such goods often has an income elasticity greater than one. Thus, the relative preferences for non-traded goods tend to be higher in rich countries.

The magnitude of the multiplier also depends on technology in the non-traded sector. Ceteris paribus, a more labor-intensive production process means that firms in the non-traded sector must hire more workers to meet any given additional demand caused by additional aggregate revenue generated in the traded sector. The multiplier will therefore be larger when the production of non-tradable goods is more labor intensive. The degree of labor intensity in the non-traded sector, in turn, is determined by the cost of labor relative to capital and the elasticity of substitution between the factor inputs. All else equal, an industry will be less labor intensive, and hence the employment multiplier will be smaller, when initial wages in the industry are high and the elasticity of substitution between capital and labor is small. Many non-tradable industries produce goods and services that require a great deal of labor, and it is therefore reasonable to expect that non-tradable industries are more labor intensive than tradable industries.

Lastly, the magnitude of the multiplier depends on the type of new jobs initially created in the traded sector. If firms equate wages with the value of the marginal product of labor in the long run, that is, if individual wages reflect productivity, jobs that require high levels of human capital will typically pay better than jobs that require less human capital. All else equal, when the additional revenue generated in the traded sector is higher, the corresponding additional demand for non-tradable goods will be higher. In turn this implies that the multiplier will be larger when the new jobs initially created in the traded sector require higher levels of human capital. An additional factor that might affect the magnitude of the multiplier with respect to human capital, is

the potential systematic difference in preferences between workers with high and low levels of human capital, respectively. That is, since highly educated workers earn more, they tend to have stronger relative preferences for non-tradable goods, with corresponding income elasticity greater than one.

The de facto difference in average wages between jobs that require high levels of human capital and jobs that do not is affected by multiple factors. First, all of the countries of interest in this paper practice some degree of redistribution of income. A higher degree of redistribution yields smaller differences in net wages between workers with high and low levels of human capital. Whether the initial jobs created in the traded sector require high levels of human capital or not is thus of less importance for the magnitude of the multiplier whenever the average net wage difference between jobs that require different levels of human capital is smaller. The same argument should also hold for all policies that ultimately result in smaller average wage differences. Such policies include both redistribution policies in general and specific labor market policies such as minimum wage laws and rights to unemployment benefits. Minimum wage laws, for example, affect the average wage difference by raising market wages beneath a given level directly. More generous unemployment benefits, at least in the general theoretical case, tends to affect the difference indirectly through raising the wage in low-income jobs more than high-income jobs. In essence, the relative importance of human capital with respect to the magnitude of the multiplier depends crucially on labor market institutions and policies within any given country or local labor market.

An industry-specific increase in labor demand in the traded sector might also affect employment in the rest of the industries in the traded sector, but the sign of this effect is unclear a priori. On the one hand these industries compete on the national or international market which means that the price of their goods cannot adjust to local economic conditions. The increase in production costs following the rise in local wages deteriorates these industries competitiveness and should therefore cause a decline in employment. On the other hand, an increase in production in one industry in the traded sector increases its demand for inputs. If these inputs were produced by other industries in the local traded sector, the industries would experience an increase in demand and eventually production and employment. The magnitude of this partial effect clearly depends on the geography of the industry supply chain. Even though industries tend to be geographically clustered, the magnitude is bound to be limited if the market for the intermediate tradable goods is truly national or international. Finally, if agglomeration economies are important, an increase in

production in one industry in the traded sector might result in more local agglomeration. In short, theory suggests that the multiplier effect on the traded sector should be negative unless agglomeration spillovers are large or the supply of intermediate goods is highly localized. The effect should therefore be qualitatively smaller than the employment effect on the non-traded sector. In this paper, I am interested in the causal effect of an exogenous increase in employment in the local traded sector on employment in the local non-traded sector. Future research is therefore needed with respect to the causal effect of increased employment in a given local traded sector on the employment in other local traded sectors.

It is important to highlight that each of the factors above, which I have identified as important for the magnitude of the multiplier, are by themselves partial effects. The magnitude of the employment multiplier is the result of a combination of all of these partial effects. It is not likely that a single partial effect is strong enough to exclusively determine the magnitude of the multiplier on its own. In chapter 5 and 6 I discuss differences and similarities between Norway, Sweden and the United States with respect to the key factors identified by the theoretical framework presented in this chapter. The purpose of the discussion is to highlight relevant differences between the respective countries labor force, policy regimes, housing markets and consumption patterns and thereby form reasonable relative expectations for the magnitude of the Norwegian employment multiplier.

3 Data and classifications

All regressions undertaken in this paper are performed with STATA 13. The register data used was provided by Statistics Norway.

3.1 Employment data

The year specific employment data includes detailed employment information on all individuals between 15-74 years of age and who are resident in Norway. All individuals included in the year specific data sets are assigned unique identification codes. The identification codes makes it possible to identify individuals across data sets and thereby trace their employment status over time. I use employment data from 15 years in total, within the time period 1996 to 2010. A given individual is classified as employed in a given year if he or she were employed on the 15th of October. Individuals with multiple part time jobs within the same sector in any given year are only counted as employed once[4].

3.1.1 Sector classification

The employment data also include five digit industry codes. The industry codes follow the Standard Industrial Classification (SIC2007). It was designed especially for Norwegian official statistics, and is based on the European Unions corresponding standard of industrial classification (NACE.Rev.2). The five digit industry codes enable individual employment classification with respect to sector, which is done using only the two first digits of the code. Following Thulin and Moretti's (2013) definition of tradable and non-tradable industries, which is based on the geographical range of their markets, industries within agriculture, fishing, manufacturing and extracting services are classified as tradable industries (SIC2007 0.1 - 3.9). On the outset and with

[4] Although this might seem somewhat misleading with respect to the aggregate number of occupied jobs in a given year, the alternative is arguably even more misleading. Some individuals are initially registered with more than ten part time jobs in a given year. These individuals are mainly self-employed and the vast majority works with various forms of consultancy. It seems counterintuitive to count, for example, an individual with ten part time jobs ten times when he has worked approximately the same number of hours in total as individuals with one full time job. The potential pitfall with this classification approach is that individuals with a part time job in both the tradable and non-tradable sector are counted twice. Fortunately, the data reveals that the vast majority of individuals with multiple part time jobs only work in one of the two sectors. In the end, less than 100 individuals are counted as employed twice in any given year, which hardly affects aggregation in any significant way.

respect to transparency, it should be noted that it is not obvious that the industries should be classified in this way. Indeed, there might be other ways in classifying the industries that is more precise or reasonable, and thereby more robust. One argument for classifying the industries in the manner described above is to make the regression results as comparable with the estimates obtained by Moretti & Thulin (2013) as possible.

3.1.2 Classification according to local labor markets

Lastly, the employment data sets contains information regarding the municipality in which individuals are resident, which in turn enables individual classification with respect to local labor market. Based on the implied theoretical definition of local labor markets, Norway's 428 municipalities are arguably initially unsuited to be considered as local labor markets in themselves. One reason for this is that the average traveling distance between municipalities is short enough to enable a vast group of individuals to work in a different municipality than where they resident. I therefore aggregate the 428 municipalities into 46 local labor markets based on Statistics Norway's classification of labor market regions (Singh Bhuller, 2009). Previous research with respect to local labor markets in Norway and internal labor mobility has often utilized the *Standard for Economic Regions* (NOS C 616) when differentiating between local labor markets. The standard divided Norway into 90 economic regions. A weakness with this classification of local labor markets is that the geographical range of regions is bounded by county boarders. The classification criteria for local labor market regions, on the other hand, include geographical factors, average commuting time and a minimum number of residents (Singh Bhuller, 2009, p. 1). Since county boarders do not bound worker mobility per se, these criteria are arguably more appropriate. As a robust check, I perform separate regressions where I use Norway's 19 counties as the basis of local labor markets. This is done to check the sensitivity of the estimates with respect to how local labor markets are classified.

3.2 Education data and classification of skill levels

I also have access to educational data from the same time period with individual identification codes that match those in the employment data. The educational data includes information regarding individuals' highest achieved educational level in any given year. This makes it possible to differentiate between individuals with different degrees of educational skills. As theory suggest that the skill-specific multiplier should be larger than the multiplier corresponding to the tradable sector as a whole, I classify individuals who have completed at least one year of tertiary education

as skilled and the rest as unskilled. As with the classification of tradable and non-tradable industries, the classification of skilled and unskilled workers might seem somewhat arbitrary. One could for example argue that there is little difference in skill between individuals who have only completed one year of tertiary education and individuals who have completed upper secondary education. Again, this classification is primarily done to ensure that the estimates of the multipliers are as comparable with the estimates obtained by Moretti and Thulin (2013) as possible.

4 Empirical approach

4.1 Justification of the empirical approach

There are two empirical challenges with respect to obtaining unbiased estimates of the long run multiplier effect. First, there might be constant differences across local economies that affect local productivity and hence employment. Indeed, factors such as local infrastructure, geography and weather conditions arguably differ quite substantially across local labor markets in Norway. Whenever a local economy experiences increased employment in its tradable sector, the magnitude of the corresponding increase in employment in the non-tradable sector might be affected by such time invariant factors. For example, a firm that produces a non-tradable good and which is located in a local economy with high-quality infrastructure is likely to respond differently to given increase in demand than an otherwise identical firm located in an economy with low-quality infrastructure. Even if the two firms initially had the same number of employees, same amount of capital inputs, produced the same quantity of the same good and experience an increase in demand of similar magnitude, employment decisions are bound to differ if the quality of the infrastructure for example affects the relative cost of investing in capital and labor. Purely hypothetically, if transportation costs are lower in local economies with better infrastructure, and there are transportation costs associated with investing in capital inputs, the relative cost of investing in capital inputs will be lower in local economies with better infrastructure. In this case one could imagine that the former firm would decide to invest in relatively more capital and less labor than the firm located in an economy with low-quality infrastructure. The hypothetical example above implies that individual heterogeneity with respect to time invariant characteristics across local labor markets can affect employment decisions made by firms. Such differences would yield biased estimates if not accounted for. Arguably, this potential problem is overcome by using a panel estimator with fixed regional effects. Hence my empirical approach only exploits variation in employment within each local labor market. Differences in time-invariant characteristics are eliminated by differentiating the number of employed within local labor markets over time.

Second, unobserved time-varying shocks could affect the size of the local non-traded sector and in turn the number of jobs in the traded sector. In particular, unobserved time-varying shocks to local labor supply could yield biased estimates. Unobserved shocks may occur if for example the

quantity or quality of local amenities, public services, perceptions of local school quality or local crime rates change over time. Such changes could potentially cause in or out migration and thereby affect local labor supply. In turn this would affect local wages, housing prices, and employment in the local traded sector. Since local prices change, employment in the non-traded sector would also be affected, but not because local labor demand in the tradable sector has changed. The sign of the bias corresponding to such unobserved shocks to local labor supply is unclear a priori and depends on whether the shock in question yields an increase or decrease in local labor supply. In order to obtain consistent estimates of the long run multiplier, I therefore construct a shift-share instrumental variable similar to the instrumental variable used by Thulin and Moretti (2013). The instrumental variable isolate exogenous shifts in demand for labor in the tradable sector and makes it possible to obtain consistent estimates.

4.2 Econometric specification

The empirical regression equation used to estimate the general long run employment multiplier is given by

$$\Delta E_{l,t}^{NT} = \propto_0 + \propto_1 \Delta E_{l,t}^{T} + \propto_2 dtime + \mu_{l,t} \qquad (1)$$
$$\Delta E_{l,t}^{A} \coloneqq E_{l,t}^{A} - E_{l,t-s}^{A} \ , A = NT, T$$
$$\mu_{l,t} = \lambda_l + \chi_{l,t}$$

Where *T* and *NT* denotes the tradable and non-tradable sector respectively, $E_{l,t}$ denotes the number of employed in local labor market *l* in year *t,* and $dtime$ is a time dummy that controls for unobserved national shocks to employment in the non-tradable sector. The residual error term $\mu_{l,t}$ is assumed to consist of two unobservable components. The first term, λ_l, captures local labor market fixed effects, while the latter term, $\chi_{l,t}$, is an idiosyncratic error term. In equation (1), $\propto_1$ is the measure of the general employment multiplier and hence the parameter of interest. To obtain the skill-specific estimate, I use the following specification

$$\Delta E_{l,t}^{NT} = \theta_0 + \theta_1 \Delta E_{l,t}^{TS} + \theta_2 dtime + \eta_{l,t} \qquad (2)$$
$$\Delta E_{l,t}^{B} \coloneqq E_{l,t}^{B} - E_{l,t-s}^{B} \ , B = NT, TS$$
$$\eta_{l,t} = \rho_l + \xi_{l,t}$$

Where $E_{l,t}^{TS}$ denotes the number of employed in the tradable sector with at least one year of tertiary education, and θ_1 is a measure of the skill-specific employment multiplier. As long as the residual error terms in equation (1) and (2) are not correlated with any of the right hand side variables, the specifications would yield consistent estimates of the general and skill-specific multiplier. If, however, the error terms are correlated with any of the right hand side variables, the estimates will be biased. As argued above, the latter case is highly likely. In order to obtain consistent estimates, I therefor use 85 tradable industries (*k)* based on the two first digits in the SIC2007 codes and calculate the instrument for employment growth in the whole tradable sector in local labor market *l* at time *t* as:

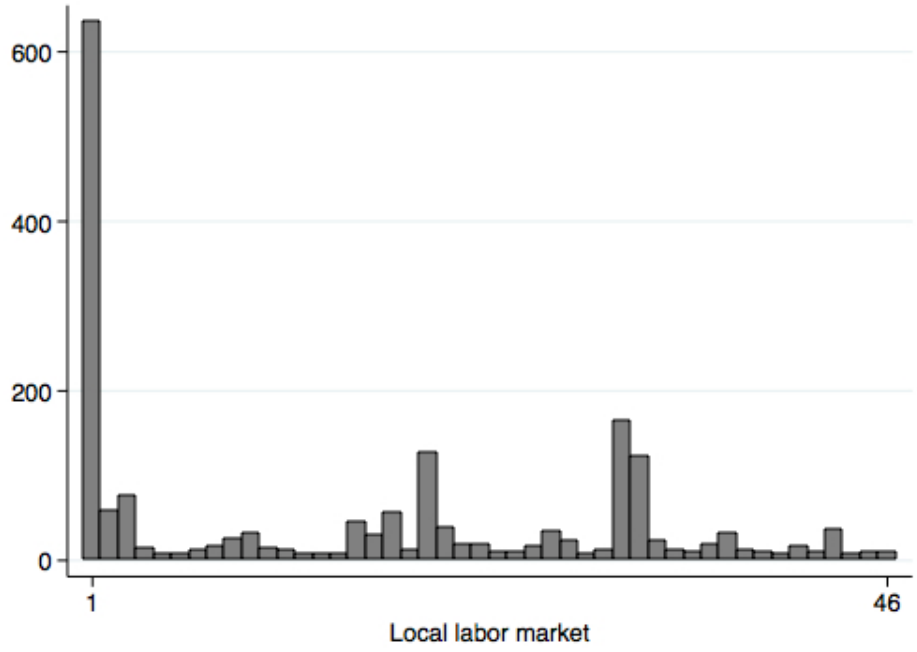
$$\sum_k E_{l,k,t-s}^T \left[ln\left(E_{k,t}^T - E_{l,k,t}^T\right) - ln\left(E_{k,t-s}^T - E_{l,k,t-s}^T\right)\right] \qquad (3)$$

When I estimate the skill-specific estimate, I calculate the instrument as

$$\sum_k E_{l,k,t-s}^{TS} \left[ln\left(E_{k,t}^{TS} - E_{l,k,t}^{TS}\right) - ln\left(E_{k,t-s}^{TS} - E_{l,k,t-s}^{TS}\right)\right] \qquad (4)$$

The main point of the instruments is to isolate the variation in employment in tradable industry *k* in local labor market *l* yielding from a nationwide change in employment in the given tradable industry. The instrument therefore includes the nationwide share and the industry mix components, but excludes the regional shift. A national shift in employment in a given tradable industry affects local labor markets differently due to differences in local compositions of industries, which are not random over time. Arguably, the instruments isolate local exogenous shifts in local labor demand in the traded sector as long as nationwide changes do not reflect local economic conditions. However, if a given local labor market´s share of a nation wide tradable industry is large enough, the instrument will not succeed in isolating the exogenous shift in local labor demand. In such a case, local shifts in labor demand in an industry would affect nation wide trends in labor demand, and a nation wide shift in labor demand would reflect economic conditions in the given local labor market. Hence, the instrumental strategy is best suited when there are many small local labor markets that by themselves have little impact on nation wide trends in labor demand in the tradable sector.

Figure 1: Average employment (1996, 2003 and 2010), thousands.



As figure 1 shows, Oslo (local labor market 1) is by far the largest local labor market with respect to the number of employed. Due to its relative size, it is presumably impossible to identify national trends in employment that does not reflect local trends in Oslo. This suggests that Oslo is unsuited for the instrumental variable approach and Oslo is therefore excluded from the baseline models. In these models, I also exclude Oslo when I calculate the instrumental variables. Separate regressions are undertaken where Oslo is included, and the relative size of these estimates suggests upward bias due to endogeneity. The instrumental variable strategy in this paper is adopted from Moretti and Thulin (2013). With respect to comparing the Norwegian and Swedish estimates, it should be emphasized that they find it necessary to exclude Stockholm from their baseline model, due to similar endogeneity issues. When I compare estimates of the Norwegian and Swedish multipliers, I therefor compare estimates yielding from the baseline models and the estimates from the models that include Oslo and Stockholm separately.

The employment level in any given year is expressed as three year moving averages. This is done to ensure that the employment level in a given year does not skew the regression results. I then calculate the average employment level over three year intervals before I take differences. These intervals are 1996-1998, 1999-2001, 2002-2004, 2005-2007 and 2008-2010. I then base the econometric analyses on changes in employment over two periods, 1996 – 2003 and 2003 – 2010. Hence, long run adaptations in local labor markets are assumed to occur within seven year time periods.

5 Descriptive statistics

5.1 Trend in the employment distribution

Table 1 summarizes the distribution of employed individuals in Norway according to sector for the baseline years 1996, 2003 and 2010. The table suggests a relatively well-known trend in the sectoral distribution of employment in Norway, which some scholars have interpreted as a symptom of the Dutch disease (Farbrot, 2010). Approximately 340 thousand employees worked in tradable industries in 1996, which accounted for roughly 20 percent of overall employment that year. By 2010, the number of employed in tradable industries had declined by nearly 50 thousand, and tradable industries accounted for only 14 percent of overall employment. Within the same time period, employment in the non-traded sector increased with roughly 26 percent (379.000 jobs), and employment in the non-traded sector accounted for 86 percent of overall employment. The trend in the Norwegian employment distribution is relatively similar to the trend found in Sweden by Moretti & Thulin (2013, p. 351). Between 1995 and 2007, employment in the Swedish non-traded sector increased with approximately 22 percent (530.000 jobs), and by 2007 the non-traded sector accounted for roughly 81 percent of overall employment in Sweden.

Table 1 Distribution of employed, by year - Norway

Year	1996	2003	2010
Employment, thousand			
Non-traded	1428.757	1597.275	1807.965
Traded	340.692	293.289	291.002
Total	1769.449	1890.564	2098.967
Share of total, percentage			
Non-traded	80.7	84.1	86.1
Skilled in sector	29.8	33.9	39.0
Traded	19.6	15.5	13.9
Skilled in sector	14.4	18.3	23.4

The trend in the sectoral employment distribution within the time period corresponds to a long run trend where the proportion of employed in the non-traded sector in Norway has increased steady over time. In 1930, 40 percent of Norwegian employees worked in primary industries. The share declined to 20 percent in 1960, and by 2007 only 3 percent of Norwegian employees worked in these industries. Within the same time period, the share of employed in public and private service

industries increased from roughly 36 percent in 1930 to 74 percent in 2007 (Hansen and Skoglund, 2008, pp. 42–43). The growth in public employment has been remarkable. In 1970, approximately 17 percent of employees worked in the public sector. By 2013, the number of jobs had tripled, and public employment accounted for 29 percent of total employment. The increase has primarily been driven by an expansion of the public healthcare system (Statistics Norway, 2014c).

5.2 Trend in education and skilled employees

Table 1 also highlights the increase in the share of employed that has accomplished at least one year of tertiary education. These are skilled workers by the definition used in this paper, and in total the number of employed skilled workers increased with 10 percentage points within the given time period. The increase in the proportion of skilled workers is approximately the same in the two sectors, but there is a great deal of dispersion across the local labor markets. Table A2 in appendix 1 provides detailed summary statistics with respect to employment rates across local labor markets according to sector and levels of skill. The table shows increased dispersion across local labor markets with respect to the share of skilled employees in the traded sector over the given time period, ranging from approximately 16 to 30 percent in 1996, 18 to 35 percent in 2003 and 21 to 43 percent in 2010. This is not surprising. The increase in the share of skilled workers implies that the average age of skilled workers has declined over time, and young workers with high levels of education tend to be more geographical mobile than older workers with less education. Another important factor is that local labor markets in Norway seem to have become more segmented with regard to demand for different skills (Stambøl et al., 1999, pp. 21–22).

Table 2 Teritary education statistics, by country

Year	1996	2000	2004	2008	2010
Norway					
Percentage of total labor force with tertiary education	27	31	32	34	36
Sweden					
Percentage of total labor force with tertiary education	26	29	27	30	34
United States					
Percentage of total labor force with tertiary education	33	35	39	.	42

Source: World Bank. Education Statistics - All Indicators.
Data extracted on 26 Nov 2014 10:10 UTC (GMT) from: http://databank.worldbank.org/

As table 2 shows, the proportion of skilled workers as share of the labor force has also increased in Sweden and the United States. Overall tertiary attainment levels have been high in the United

States for many years, and remain well above the OECD average of 30 percent. The growth in tertiary education attainment, however, has been relatively low in the United States compared to other OECD and G20 countries, including Norway and Sweden. For instance, between 2000 and 2010, tertiary attainment grew on average with 1,3 percent per year. In comparison, the average annual growth in Norway and Sweden was 2,8 and 3,3 percent, respectively (OECD, 2012 p. 37). The difference in rates is primarily driven by differences in enrollment to tertiary education among the young, which in turn is reflected in the share of individuals between 25 and 34 years of age who have attainted tertiary education. For instance, among individuals within the age interval, 42 percent had attained tertiary education in the United States and Sweden in 2010. The corresponding figure for Norway is 47 percent (ibid, p. 36). The age composition of the skilled share of the labor force is important with respect to the multiplier, because among skilled workers, the young tend to be more mobile than older workers. For example, about four percent of American college graduates in their early twenties move across states lines, but only one percent of college graduates in their 50s do the same (Borjas, 2013, p. 322).

5.3 Trend in average wages

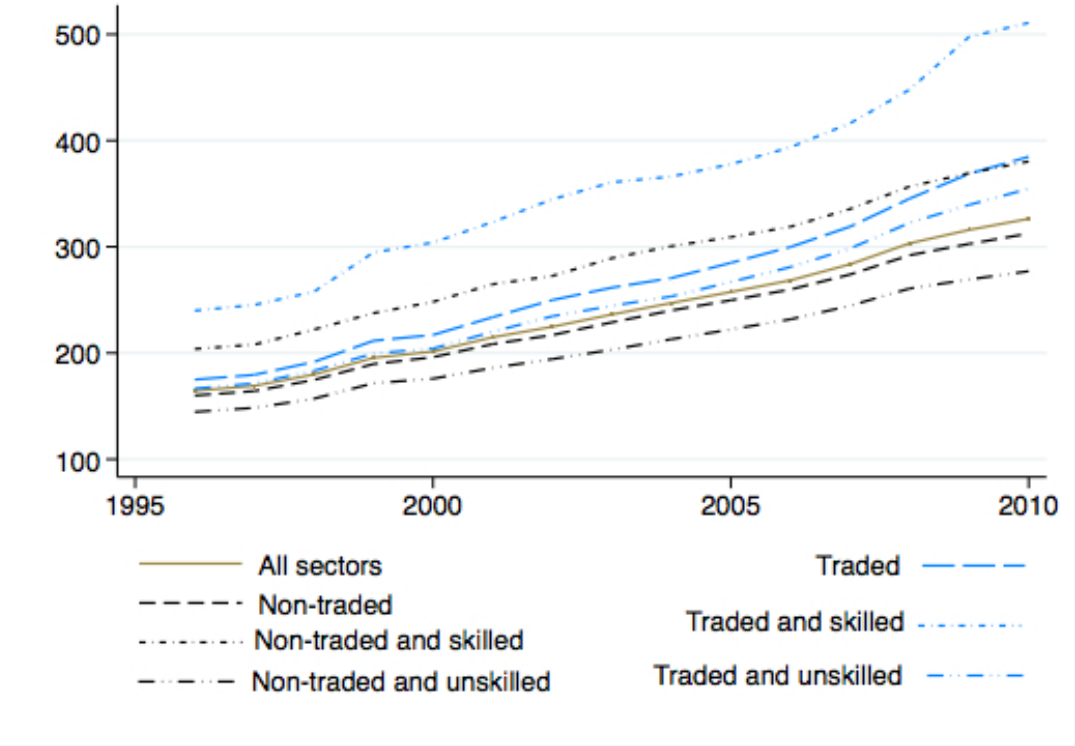
Average wage differences according to sector and level of skill is of interest with respect to the employment multiplier. All else equal, theory suggests that the difference between the skill-specific and general multiplier should be greater when the average wage difference between skilled and unskilled workers in the traded sector is larger. Table 3 shows average wages by sector and skill-level for the baseline years 1996, 2003 and 2010, while figure 2 illustrates the trends graphically.

Several aspects are worth noticing with respect to the average wage trends. First, the average wage level inn all sectors increase within the time period. This should hardly come as a surprise. GDP per capital increased steadily on average within the time period, and although the Gini-coefficient increased slightly during the same period, the net income distribution in Norway is relatively compressed seen from an international perspective (Statistics Norway, 2014a). Secondly, skilled workers are on average paid better than unskilled workers, both within and across the two sectors. On average, skilled jobs in the traded sector are highest paid, while unskilled workers in the non-traded sector have the lowest average wages.

Table 3 Average wages in Norway, thousand

Average Wages	1996	2003	2010
Total	164,417	236,235	326,365
Traded	174,979	261,511	384,794
Skilled	239,891	360,727	510,818
Unskilled	166,486	244,363	354,659
Non-traded	159,977	228,821	312,441
Skilled	203,821	289,263	380,308
Unskilled	144,525	203,132	276,987

Figure 2 Average wages, thousands



Workers with tertiary education tend to earn more on average during their life cycle than workers with less education. In 2010, Statistics Norway estimated that the average return from an additional year of education was approximately three percent, but this estimate is somewhat misleading viewed in isolation due to a great deal of heterogeneity with respect to type of tertiary education (Kirkebøen, 2010, p. 3). In particular, tertiary education within medicine, engineering, economics and administration tend to yield well paying jobs, opposed to tertiary education within history, teaching and aesthetics.

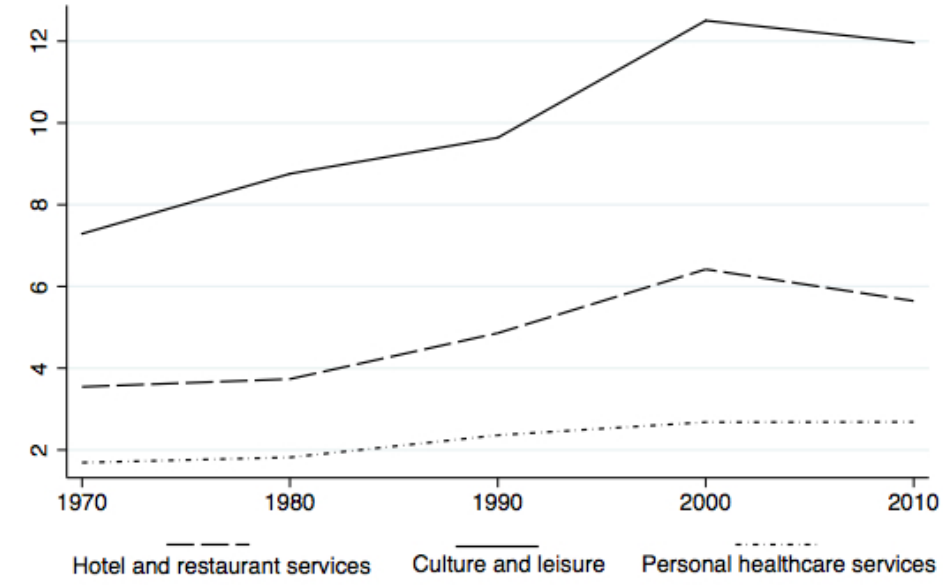
Lastly, it is worth noting that the difference in average wages diverge over the given time period. In particular, average wages in the traded sector tend to grow faster, and the average wage of skilled workers in the traded sector increases the most. Moretti (2010), and Moretti and Thulin (2013) find similar wage trends in the United States and Sweden. One possible explanation could be that the productivity in service professions tends to remain relatively constant over time, and many of the jobs in the non-traded sector are indeed service professions. Tradable industries, on the other hand, can benefit from technological progress, become more capital intensive over time and thereby use fewer workers in the production process. Another possible explanation is that the relative supply of workers in the traded sector has declined more over time than the relative decline in demand for traded goods. Scarce supply of workers in the traded sector would push up wages in the sector as industries in the sector compete for labor.

5.4 Trend in household consumption patterns

The long run trend in the employment distribution is reflected in the consumption pattern of Norwegian consumers, which has changed somewhat dramatically during several decades with significant real economic growth (St.meld nr. 58, 1996). Figure 3 is based on consumption data extracted from Norway's national account. The figure shows the percentage of aggregate national expenditure spent on selected non-tradable goods within the time period 1970 to 2010, and corresponds to the trend in the employment distribution. Over the last decades, the average Norwegian consumer has spent a greater and greater share of his disposable income on service goods.

All else equal, theory suggests that the difference between the skill-specific and general multiplier should be larger when the difference in spending on non-tradable goods between skilled and unskilled workers in the traded sector is larger. Table A7 and A8 in appendix 1 shows data from the consumer survey conducted by Statistics Norway. The two tables contain information regarding average household expenditure on selected categories of non-tradable goods and services, where households are sorted in deciles according to net income. The selected categories include health, transportation, culture and recreation, and hotel and restaurant services. Table A7 shows average household expenditure measured in Norwegian Kroner (NOK). Two things are worth noticing. First, higher income households spend more on all of the non-tradable goods in every given year than lower income households. At least in part, this suggests that the average income elasticity of demand for tradable goods is less than one.

Figure 3 Percentage of total national expenditure spent on selected non-tradable goods



Scource: Statistics Norway. Extracted 12.10.2014 from Statbank.

Secondly, average expenditure of all the non-tradable goods increase over time within the given deciles. Table A8 shows the percentage of total household expenditure spent on the selected categories of non-tradable goods. Although somewhat more nuanced, the general tendency is that higher income households tend to use a greater proportion of their total expenditure on non-tradable goods than lower income households. The exception is health services, where the trend is opposite. The negative association between general health status and education, and health status and income, is well documented in Norwegian studies (NOU 2009:10).

To summarize, the descriptive statistics provided in this chapter suggests an employment trend where the non-traded sector has expanded relatively to the traded sector, the share of skilled workers has increased in both sectors, average wage differences between skilled and unskilled workers has increased over time, and that households with higher disposable income tend spend more on non-tradable goods. In the following chapter I highlight and discuss country differences with respect to labor market policies that are likely to affect labor mobility and hence the magnitude of the employment multipliers.

6 Policies and labor mobility

The conceptual framework presented in chapter 2 suggests that the employment multipliers' magnitude partially depends on the magnitude of the offsetting equilibrium effects. It postulates that these offsetting equilibrium effects are weaker in magnitude, and hence the employment multiplier is larger, when the degree of worker mobility is higher. However, the framework does not incorporate a public sector, thereby excluding the effect that policies in general, and labor market policies in particular, affect local wages, amenities, housing prices and hence labor mobility. It also ignores historical factors, which I argue is important for mobility, and the demographic composition of the workforce. The aim of this chapter is to highlight cross-country differences with respect to important historical trends in mobility and policy approaches and discuss how these differences, viewed in isolation, are likely to affect labor mobility.

6.1 Country differences in labor market policy approaches

6.1.1 The welfare state, social expenditure and redistribution of income

The greatest difference with respect to economic policies in general and labor market policy approaches specifically, is undoubtedly found between the two Scandinavian countries on the one hand, and the United States on the other. Indeed, the Scandinavian welfare states have an international reputation for relatively generous welfare state entitlements (Stephens, 1995). With the exception of the share of homeowners, Sweden and Norway have historically been relatively similar across the dimensions that affect labor mobility. Worker protection laws, the influence of unions, rights to unemployment benefits and the demographic composition of the labor force are quite similar. Political programs have stipulated that most public services, such as social services and healthcare, should be provided at reasonable similar standard across economic regions, which has led to a strong presence of the public sector in local labor markets. In fact, in some labor markets the public sector has provided up to 45 percent of the jobs (Heikkilia et al., 1999, p. 4). The aim of equalizing living conditions, by means of an extensive welfare state and the taxation system, has also led to a comparatively strong equalization in terms of disposable income across both regions and individuals in general. In fact, the two Scandinavian countries are among the countries in Europe that show the largest degree of cohesion (Vogel, 1997).

Table 4 Social expenditure (percentage), income distribution and poverty measures, by country

Year	1995	2000	2005	2010
Norway				
Social expenditure, share of Gross Domestic Product	22,9	20,8	21,1	22,4
Social expenditure, share of Gross National Income	23,2	21,1	20,8	22,1
Social expenditure, share of Net National Income	27,7	24,4	23,8	25,7
Social expenditure, share of Total Government Expenditure	45	49,1	50,4	49,5
Gini (at disposable income, post taxes and transfers)	0,243	0,261	0,276	0,248
Gini (before taxes and transfers)	0,404	0,426	0,447	0,422
P90/P10 disposable income decile share	2,9	2,8	2,8	2,9
Poverty rate before taxes and transfers, Poverty line 50%	0,263	0,242	0,257	0,257
Poverty rate after taxes and transfers, Poverty line 50%	0,07	0,06	0,06	0,07
Sweden				
Social expenditure, share of Gross Domestic Product	31,8	28,2	28,7	27,9
Social expenditure, share of Gross National Income	32,6	28,4	28,5	27,2
Social expenditure, share of Net National Income	36,9	32,6	32,6	31,3
Social expenditure, share of Total Government Expenditure	49	51,2	53,4	53,2
Gini (at disposable income, post taxes and transfers)	0,211	0,243	0,234	0,269
Gini (before taxes and transfers)	0,438	0,446	0,432	0,441
P90/P10 disposable income decile share	2,5	2,8	2,8	3,3
Poverty rate before taxes and transfers, Poverty line 50%	0,296	0,271	0,267	0,277
Poverty rate after taxes and transfers, Poverty line 50%	0,03	0,05	0,05	0,09
United States				
Social expenditure, share of Gross Domestic Product	15	14,2	15,5	19,3
Social expenditure, share of Gross National Income	15,2	14	15,4	19,1
Social expenditure, share of Net National Income	17,8	16,4	18,1	22,7
Social expenditure, share of Total Government Expenditure	40,5	42	42,7	45,1
Gini (at disposable income, post taxes and transfers)	0,361	0,357	0,38	0,38
Gini (before taxes and transfers)	0,477	0,476	0,486	0,499
P90/P10 disposable income decile share	5,4	5,4	5,9	5,9
Poverty rate before taxes and transfers, Poverty line 50%	0,264	0,255	0,263	0,284
Poverty rate after taxes and transfers, Poverty line 50%	0,167	0,169	0,17	0,174

Data extracted on 02 Dec 2014 05:40 UTC (GMT) from OECD.Stat

Table 4 provides detailed comparative measures regarding the respective countries social expenditure, income distributions and measures of poverty. The difference in social expenditure between the countries suggests that the volume and responsibilities of the welfare states in the two Scandinavian countries are relatively extensive compared to the United States. In addition, the measures of the income distribution, redistribution of income and poverty combined suggests two important differences between the respective countries. First, the net income distribution is more compressed in the two Scandinavian countries than in the United States. Second, the countries have quite different approaches to redistribution of income. Indeed, income redistribution is relatively extensive in the Scandinavian countries compared to United States. The difference in

median income between workers with tertiary education and workers with lower educational levels is substantial in the United States, and the positive association between educational level and disposable income is arguably more clear cut than in the Scandinavian countries (Bureau of Labor Statistics, 2014). Viewed in isolation, this suggests that the difference between the skill-specific employment multiplier and the general employment multiplier should be larger in the United States than in Norway and Sweden.

The country differences highlighted in table 4 arguably reflect differences with respect to labor market policies. Although the relatively high degree of mobility among American workers partially can be explained by American history and culture, the country´s labor market laws and policies should, at least from a theoretical perspective, enhance and promote labor mobility to a greater extent than the Scandinavian countries corresponding policy approaches.

6.1.2 Employment protection

Table 5 shows that American workers are far less protected by employment laws than workers in the Scandinavian countries. In 2005, the median American employee´s tenure was four years. In comparison, the average tenure of employees in the Scandinavian countries was roughly ten years (World Bank, 2014). American labor laws give employers the right to fire or reallocate workers on relatively short notice, which implies that an American employer´s risk of getting stuck with inefficient employment levels during an economic downturn is lower than for employers in Norway and Sweden. In turn, it also implies that American employers should be more inclined to increase employment during economic upturns. Viewed in isolation, these laws should therefore generate a higher degree of volatility and mobility in the labor market than the labor laws in the Scandinavian countries. American labor unions are arguably also quite weak, which presumably in part explains why so few American workers are union members. For example, DiNardo & Lee (2002) estimates the causal effect of union membership on worker wages. With a regression discontinuity approach they find no significant difference in wages between industries with workers that are union members and industries with workers that are not union members. In the Scandinavian countries, on the other hand, strong labor unions have traditionally demanded equal pay for equal jobs across economic regions (Heikkilia et al., 1999, p. 4).

Table 5 Strictness of employment protection and union density, by country

Year	1995	2000	2005	2010
Norway				
Individual and collective dismissals (regular contracts)	2,33	2,33	2,33	2,33
Temporary contracts	3,13	3,00	2,75	3,00
Collective dismissals (additional restrictions)	2,50	2,50	2,50	2,50
Union Density, percent	57,3	54,4	54,9	53,7
Sweden				
Individual and collective dismissals (regular contracts)	2,80	2,65	2,61	2,61
Temporary contracts	1,77	1,44	1,44	0,81
Collective dismissals (additional restrictions)	2,50	2,50	2,50	2,50
Union Density, percent	83,1	79,1	76,5	68,2
United States				
Individual and collective dismissals (regular contracts)	0,26	0,26	0,26	0,26
Temporary contracts	0,25	0,25	0,25	0,25
Collective dismissals (additional restrictions)	2,88	2,88	2,88	2,88
Union Density, percent	14,3	12,9	12	11,4

Data extracted on 02 Dec 2014 05:40 UTC (GMT) from OECD.Stat
Note: The OECD indicators of employment protection legislation measure the procedures and costs involved in dismissing individuals or groups of workers and the procedures involved in hiring workers on fixed-term or temporary work agency contracts. It is important to note that employment protection refers to only one dimension of the complex set of factors that influence labour market flexibility.
Trade union density corresponds to the ratio of wage and salary earners that are trade union members, divided by the total number of wage and salary earners

6.1.3 Unemployment benefits

Differences with respect to rights and levels of unemployment benefits between the respective countries are also likely to cause differences in worker mobility. In particular, studies from both the United States and multiple OECD countries suggest a positive relationship between the level of unemployment benefits and the duration of unemployment. In line with general economic theory, higher unemployment benefits seem to deteriorate incentives with respect to finding a new job once unemployed, although the robustness of some of these results can be questioned (Atkinson and Micklewright, 1991, pp. 1706–1715; Burtless, 1990, pp. 72–75). Another common empirical finding in public finance and labor economics is the "spike" in the exit rate from unemployment that tends to occur around the expiration of unemployment benefits (see e.g., Katz and Meyer, 1990a, 1990b; Meyer, 1990; Moffitt, 1985). The sharp peak in the hazard rate is often interpreted as evidence that recipients of unemployment benefits wait until their benefits run out before they choose to return to work. Meyer (1990, pp. 771-781) finds a negative relationship between the years of achieved education and the unemployment hazard rate in the United States,

which suggests that low-skill workers tend to "exploit" benefits for longer time-periods. In line with neo-classic economic theory, this is presumably because the relative difference between the market wages these workers potentially could receive and benefits they do receive is smaller than for high-skilled workers. Unemployment benefits are generally perceived as more generous in the two Scandinavian countries than in the United States, which underpins the notion that the average degree of worker mobility is higher among American workers (Economist, 2013; Woosley, 2008)

6.1.4 The housing market

Another factor that is likely to affect mobility are policies and laws that affect the characteristics of the respective countries housing markets. First, the ease at which homes can be bought and sold is important. The procedure of buying and selling property in the United States is relatively fast and less complicated than in other developed countries. It is also a lower threshold with respect to the requirements of obtaining a mortgage loan, especially for foreigners. In addition to reducing the perceived cost of buying and selling property, an easier and quicker procedure is likely to increase mobility because it enables workers to relocate faster and thereby exploit any cross-regional differences in wages and housing costs that occur over time (World Bank, 2014). Secondly, the homeownership rate is likely to affect average mobility because homeowners incorporate price trends in the housing market into their migration decision. In 2001, the homeownership rate in the United States was approximately 68 percent (Callis and Kresin, 2014, p. 5). This is relatively high compared to Sweden (57 percent), but low compared to Norway where the homeownership rate was 76 percent the same year.

Due to industrialization, both of the Scandinavian countries have experienced increased urbanization over the latter decades, but to somewhat different degrees. One reason for this is grounded in quite different perceptions regarding whether the phenomenon should be viewed as a problem or something beneficial. In Sweden, public debate has focused on economic benefits, such as spillover effects and agglomeration economies. As a consequence, policies that aim to counteract urbanization have been relatively absent (Aalbu et al., 2007). In effect, 84 percent of the Swedish population was resident in either major cities or in urban areas in 2005, and rural areas, especially in the north, have experienced a significant depopulation trend over the latter decades. The Norwegian state, on the other hand, has to a greater extent implemented policies that seek to make rural areas more attractive to live in. The official reasoning for implementing these policies has been based on both moral and economic arguments. Moral arguments have been

grounded in the idea that people should have the opportunity to choose freely where they want to live, and that a sufficient degree of job opportunities and access to local amenities that satisfies a minimum standard is a necessity to be able do so. Economic arguments include broad utilization of the countries natural resources and to avoid structural unemployment by enhancing labor mobility between economic regions. To achieve this, Norwegian governments have, to somewhat different extent, aimed to make rural areas more attractive to both private enterprises and workers by improving amenities and giving subsidies and tax cuts to both persons and firms that choose to locate in regions characterized by low population density and few job possibilities (Røste, 2008, pp. 156–170). Whether these measures have been successful is an open question, but if Sweden is to be considered as a valid counterfactual, the policies seem to have counteracted urbanization (Langøren, 2007). The difference in homeownership rates between the two Scandinavian countries can therefore in part be explained by different policy approaches with respect to urbanization, which in turn have caused somewhat different developments in real housing costs in the urban areas of the two countries. In addition, its been the aim of Norwegian policy to promote home ownership since the end of the Second World War, and the Norwegian tax regime tends to benefit home ownership (St.meld. nr 23, 2003).

6.1.5 The demographic composition of the labor force and immigration

The demographic age composition of the labor force is important with respect to labor mobility because the average propensity to migrate is higher among younger workers (Borjas, 2013, p. 322; Stambøl et al. 1999, p. 20). Over the latter decades, the combination of lower fertility rates and higher average life expectancy has led to an increase in the proportion of elderly in the population of most western countries (United Nations, 2002, p. 5). Table 6 provides information regarding the share of the population within working age, the share of elderly and immigrants in the population, and employment rates among natives and foreigners in the respective countries. The table suggests that the age composition of the American labor force is likely to benefit mobility. The relatively high share of individuals within working age can partially be explained by historically high immigration rates. Immigration directly contributed one-third of the population growth in the United States between 1990 and 2010, and, with the U.S. born children and grandchildren of immigrants, immigration contributed half of the population growth in the United States (Martin and Midgley, 2005, p. 5). In addition, as the foreign-born population has grown as share of the total U.S. population over the latter decades, they have grown disproportionately as a share of the labor force. In 1970, foreign-born amounted to five percent of

both the total population and the labor force. By 2010, 16 percent of the labor force consisted of immigrants, although immigrants only accounted for 13 percent of the total population (Singer, 2012.)

Table 6 Demographic composition and employment rates by country, percentage

Year	1995	2000	2005	2010
Norway				
Working Age (20-64) per Pension Age (+65)	3,66	3,89	4,03	3,98
Age 15-64 of total population	64,60	64,80	65,60	66,20
Share (80+) of total population	4,01	4,31	4,64	4,51
Foreign-born population	4,40	6,80	8,20	11,60
Foreign population	3,70	4,10	4,80	7,60
Native-born, employment rate	.	80,00	79,00	78,00
Foreign-born, employment rate	.	75,00	71,00	75,00
Sweden				
Working Age (20-64) per Pension Age (+65)	3,32	3,39	3,40	3,20
Age 15-64 of total population	63,70	64,30	65,30	65,10
Share (80+) of total population	4,66	5,01	5,37	5,29
Foreign-born population	10,60	11,30	12,50	14,80
Foreign population	6,00	5,30	5,10	6,80
Native-born, employment rate	.	79,00	80,00	81,00
Foreign-born, employment rate	.	69,00	71,00	73,00
United States				
Working Age (20-64) per Pension Age (+65)	4,62	4,75	4,83	4,59
Age 15-64 of total population	65,40	66,20	67,10	67,10
Share (80+) of total population	3,08	3,28	3,49	3,65
Foreign-born population	11,70	10,70	12,10	12,90
Foreign population	.	6,30	7,20	6,90
Native-born, employment rate	.	76,00	74,00	72,00
Foreign-born, employment rate	.	74,00	74,00	75,00

Data extracted on 02 Dec 2014 05:40 UTC (GMT) from OECD.Stat
Statistics on foreign-born population from 2000-2010 obtained from OECD: Immigration Outlook 2013 p. 283, 299 and 307.
Numbers from 1995 obtained from OECD: Immigration Outlook 2000 p. 233, 256 and 275.
Note: Foreign-born refers to individuals who were born in a different country than the country they currently resident.
The foreign population refers to individual who still have the nationality of their birth country.

The two Nordic countries have experienced a profound increase in immigration in the course of the latter decades. For instance, foreign-born immigrants accounted for only 1,7 percent of the Norwegian population in the 1960. At the end of the decade, labor migration from countries such as Pakistan and Turkey accelerated, and by 2010 the share of foreign-born accounted for roughly twelve percent of the population (Lofthus, 2002, p. 10; NUPI, 2010). In comparison, the share of foreign-born increased from approximately seven to twelve percent in Sweden between 1970 and 2000 (Store Norske Leksikon, 2014). It is worth highlighting that the composition of foreign-born with respect to countries of origin has changed. In the 1960s, the vast majority of foreign-born in

Norway and Sweden came from other Nordic countries. Today, the composition is more complex, and foreign-born migrate primarily from Poland, Lithuania, Somalia, Pakistan and Vietnam in addition to Nordic countries (Statistics Norway, 2014d)[5].

The share of immigrants within working age should affect average mobility. Indeed, one can argue that immigration injects the economy with persons who are very responsive to wage differences across regions. In a study of internal mobility in the United States, Borjas (2001) finds that new immigrant arrivals are much more likely to be clustered in those states that offer the highest wages for those skills they possess, as compared to native workers. Immigrant flows into the United States thus seem to speed up the rate of wage convergence across economic regions, thereby improving labor market efficiency. This "greasing the wheels" effect is also found among immigrants in Norway. Røed and Schøne (2012) study three stages in the regional mobility of immigrants and refugees that arrived in Norway between 1995 and 2004. The three stages include the settlement pattern of newly arrived immigrants, their subsequent mobility across economic regions and eventual emigration from Norway. The main finding is that immigrants indeed "grease the wheels" of the local labor markets in the Norway, in all three stages of mobility. Immigrants are hence significantly sensitive to adverse regional economic opportunities, opposed to native workers, for whom the authors find no significant effect.

6.2 Historical trends in mobility

6.2.1 Mobility in Norway and Sweden

Stambøl et al. (1999, p. 20) have estimated and compared regional labor market mobility in Norway and Sweden during both economic down- and upturns. More specifically, they study the effects on internal migration and employment during the economic downward business cycle in 1988-1989 in Sweden and 1992-1993 in Norway, and the upward business cycle that occurred in

[5] Labor migration declined in both countries during the oil crisis in the beginning of the 1970s, due to restrictions related to in-migration from non-Nordic countries. After the oil crisis, in-migration related to labor and family-reunion increased, in particular from Pakistan and Turkey. Since the expansion of the European Union in 2004, eastern European workers constitute the majority of labor migrants. Refugees seeking protection from war and persecution also constitute a significant proportion of the in-migration that has taken place after the oil crisis. The majority of the refugees have fled from countries such as Chile, Vietnam, Iran, former Yugoslavia, Iraq and Somalia (Statistics Norway, 2013).

1994-1995 in both countries. A number of their findings are of interest and hold for both countries. First, the propensity to relocate between economic regions is higher among the unemployed than the employed. Second, the probability of finding a job within a year is significantly higher for unemployed persons who relocate between economic regions, compared to unemployed persons with similar characteristics that do not relocate within the given year. To be clear, the latter finding is obtained by controlling for selection effects, so the comparative groups of unemployed persons who relocate do not move because they already have a job offer in another region. Arguably, this implies that workers with higher degrees of mobility are less likely to suffer from long-term unemployment, all else equal. The finding is especially clear among workers with higher educational degrees. Their results also suggests a positive relationship between the proportion of unemployed with higher degrees of worker mobility and educational level, which, in the terminology of this paper, implies that high-skilled unemployed individuals on average are more mobile than low-skilled unemployed. With respect to job-to-job mobility, they find that workers who change jobs between economic regions on average have higher income growth, compared to workers with similar characteristics who switch jobs within an economic region. The average difference in income growth is greater among high-skilled workers than low-skilled workers. Combined, these findings suggest that the skill-specific multiplier should be larger than the general employment multiplier.

Some notable differences between the countries are worth highlighting. Both countries experienced somewhat similar trends in aggregate regional employment during both the up- and downturn, but there was a clear difference with respect to how much of the developments in employment that could be attributed to migration between regions. The degree of total regional labor market mobility, defined as both in- and out-migration to employment between economic regions, was significantly greater in Norway than in Sweden during both the economic down- and upturn (Heikkilia et al., 1999, p. 11). In particular, recruitment to regional employment during the upturn was relatively weak in Sweden compared to Norway, but some of the difference can be explained by difference in magnitudes with respect to the economic cycles. It was only in Norway that migration caused total employment to rise during the economic upturn. In Sweden, on the other hand, in- and out-migration to and from employment were of equal magnitudes. Hence the migration process did not contribute to growth in aggregate employment (ibid, p. 16).

6.2.2 Mobility in the United States

To my current knowledge, there exists no study that compares internal mobility among workers in the United States and the two Scandinavian countries, but mobility tends to be much higher in the United States than in the majority of other developed countries. In 2010, 12,5 percent of the American population moved[6], and approximately 70 percent of these migrants moved within country bounds. During the same year, one of ten Americans moved to a different state, and these numbers were even higher before the financial crisis of 2008-09. The Bureau of Labor Statistics has estimated that individuals born between 1957 and 1964 will hold 11 jobs on average during his or her lifetime, which by coincidence is the same number of times the average American moves in the course of his lifetime. In essence, there is a great deal of mobility in the American labor market. For instance, four percent of workers in their early twenties switch jobs every month, and nearly 1,4 million legal and illegal immigrants enter the country annually (Borjas, 2013, p. 318).

Arguably, a high degree of mobility has been embedded in the American society from the early beginnings. In 1778, the Articles of Confederation explicitly granted all citizens the right to migrate freely across states (Kalen, 1983, p. 329). A little over a century later, a sizable and steady flow of African-American workers migrated from the rural south to the industrialized cities in the north (see e.g., Jasper, 2000; Lemann, 1992). Between 1940 and 1970, four million blacks moved north, and the average black-white earnings ratio increased from 43- to 64 percent within the same period. Although it is clearly misleading to claim that this migration wave was exclusively driven by differences in wage and employment opportunities in the north and south, it obviously persuaded many African-Americans to move (Bover et al., 2002, pp. 2–3). During much of the postwar period, California´s booming economy attracted many workers from other states. However, within a three-year period during the beginning of the 1990s the state downsized its defense industry. This can at partially explain why nearly 750.000 jobs were lost and why the migration flow between California and the rest of the country took a U-turn within the same period (Bodvarsson and Berg, 2013, p. 61).

The American workforce seems to be relatively sensitive to income differences between destination and origin. Indeed, Naskoteen and Zimmer (1980, p. 855) and (Kennan and Walker, 2011, pp. 245–246) have estimated that a ten-percentage-point increase in the wage differential

[6] Moving in this context refers to changing primary housing unit.

between the state of destination and origin increases the probability of migration with approximately seven percentage points. Their estimates also suggest a positive association between employment conditions and the probability of migration. On average, a ten-percentage-point increase in the rate of employment growth in the state of origin reduces the probability of migration with about two percentage points. In spite of this, the volume of internal migration is not sufficient to completely equalize wages across regions. Barro and Sala-i-Martin (1991, pp. 115-116) and Blanchard & Katz (1992, pp. 47-48) have estimated that only about half of the wage gap between regions disappears after 30 years.

One could argue that the historically high rates of internal migration in the United States alone partially explain why the American workforce is so mobile today. More specifically, it seems likely that mobility is a self-reinforcing mechanism. If, for example, a person moved a lot during his upbringing, he is probably more inclined to move when he gets older. For instance, Kodrzycki (2001, pp. 19-21) finds that students who went to college outside the state in which they went to high school are 54 percent more likely to move again during the next five years, all else equal. She also finds that students who moved with their family between birth and high school are 17 percent more likely to move to another state than similar students who had lived their whole life in the same state. An additional interesting finding in the study is that 40 percent of the migration that took place within the time period could not be explained by state differences in employment opportunities, wages, amenities or housing prices. She argues that the latter finding implies individual heterogeneity with respect to emotional preferences for location among the graduates (ibid, p.30).

In light of the conceptual framework, the relatively high average degree of labor mobility among American workers could, arguably, partially be caused by American workers being relatively less emotionally attached to any given location compared to workers in other countries with lower historical migration trends. It is worth noticing that this time-reinforcing mechanism also is likely to have an indirect affect on labor mobility across individuals at any given point in time. If, for example, friends or family relocate due to differences in real wages or amenities between local labor markets, the emotionally related reasons for "staying behind" decline. From this perspective, a high degree of mobility seems to be embedded in the history and social norms of the American society.

On the whole, the descriptive statistics and previous research results presented in this chapter indicates that American workers are more mobile than workers in the two Scandinavian countries. Average worker mobility in Norway has previously been found to be higher in Norway than in Sweden, and skilled workers tend to be more mobile than unskilled workers in all the respective countries. In addition, the net income distribution is more compressed in the Scandinavian countries, which when viewed in isolation suggests that the difference between the skill-specific multiplier and the general multiplier should be greater in the United States. However, country differences with respect to factors such as relative preferences for non-tradable goods, the degree of labor intensity in non-tradable industries, relative differences in mobility between skilled and unskilled workers and characteristics of the housing markets should also affect the relative difference between the multipliers across the countries.

7 Estimates

7.1 Results from the baseline model

The country-specific empirical estimates of the general and skill-specific long run employment multipliers are reported in table 7[7]. Robust standard errors clustered by local labor markets are shown in parenthesis behind the estimates. The estimates for Sweden and the United States are derived from Moretti and Thulin (2013, p. 354). The instrumental variable estimates reported in the second column of the table are the estimates of interest. The estimate of the average general multiplier for Norway suggests that an additional job in the local traded sector on average causes employment in the local non-traded sector to increase with 0,75 in the long run. In comparison, the estimate of the skill-specific multiplier for Norway is over three times larger. The estimate suggests that an additional job in the traded sector that requires tertiary education generates 2,46 jobs in the non-traded sector on average in the long run. Both estimates are significant on the one percent level.

Table 7 Local multiplier, by country and skill

Multiplier for	OLS	IV	N
Norway			
Overall tradable employment	0.61*** (0.14)	0.75*** (0.17)	90
Skilled tradable employment	2.15*** (0.33)	2.46*** (0.49)	90
Sweden			
Overall tradable employment	0.22 (0.25)	0.48* (0.28)	100
Skilled tradable employment	1.42 (1.20)	2.97*** (0.61)	100
United States			
Overall tradable employment	1.99*** (0.39)	1.59*** (0.26)	77
Skilled tradable employment	0.28*** (0.04)	2.52* (1.54)	77

Robust standard errors clustered by local labor market in parenthesis
*,** and *** denote at the 10, 5 an 1 percentage level, respectively
Estimates for the United States and Sweden obtained from Moretti and Thulin (2013, p. 348 and 354)
Number of observations (N) forUnited States obtained from Moretti (2010)

[7] First stage regression results for all of the Norwegian estimates shown is this chapter is provided in table A4 in appendix 1. First stage regression results for the United States and Sweden are not reported in neither Moretti (2010) or Moretti and Thulin (2013).

The difference in magnitude between the Norwegian general and skill-specific multiplier is significant and consistent with both the conceptual framework presented in chapter two and with the descriptive statistics provided in chapter five. Recall that the average net wage of skilled workers in the traded sector was higher than that of unskilled workers within the given time period, that high income households on average spend nominally more on non-traded goods than low income households and that skilled workers tend to be more mobile than unskilled workers. Hence, it seems reasonable to assume that the difference between the estimates is driven by average net income differences between skilled and unskilled workers in the local traded sector and, in turn, that aggregate local demand for non-traded goods increase more when a local economy generates a new job in the local traded sector that requires higher levels of human capital.

The difference in magnitude between the two multipliers is important for development policies intended to increase local aggregate employment, and suggests that Norwegian policymakers should aim at generating local jobs that require higher levels of human capital. Arguably, it is important to emphasize that the multiplier should not be considered as a market failure, but rather as a pecuniary externality that increases demand for local goods and services. Hence, the presence of large multipliers does not in itself justify government intervention. Local unemployment, on the other hand, can justify government intervention, and understanding the mechanism of the employment multiplier and having reasonable expectations with respect to its magnitude is arguably crucial for implementing cost-efficient policies.

The estimated multipliers in Table 7 reveal some interesting differences between the respective countries. First, the largest general multiplier is found in the United States. It is approximately to and three times larger than the comparative estimated multipliers for Norway and Sweden, respectively. Arguably, the relative difference between the general multipliers is consistent with, but does not necessarily imply, that American workers on average are more mobile than workers in the two Scandinavian countries. In such a case, the offsetting equilibrium effects should be smaller in the United States and hence the multiplier larger. Other possible explanations include more labor-intensive non-traded industries in the United States, stronger average relative preferences for non-traded goods among American consumers or that the average supply of local housing is less constrained in the United States compared to the to Scandinavian countries. Some combination of these factors seems likely, both in light of the conceptual framework and empirically. The descriptive data presented in chapter five and six suggests that the Scandinavian

countries are the two countries that are most similar across the dimensions that are likely to affect the multipliers magnitude. This is arguably also reflected in the magnitude of the general multipliers, where the greatest difference in estimated magnitudes is found between the two Scandinavian countries on the one hand, and the United States on the other. Hence, the relative country differences with respect to the estimated general multipliers seem to be consistent with both theory and empirical data.

Comparing the difference between the skill-specific and the general multiplier within each country suggests that the required skill level corresponding to the initial jobs generated in the traded sector is of greater importance for the multipliers magnitude in the two Scandinavian countries than in the United States. For instance, the estimated skill-specific multiplier for Norway is more than three times as large as the estimate of the general multiplier. In comparison, the estimate of the skill-specific multiplier for the United States is less than twice the size of the estimate of the general multiplier. This can seem somewhat counterintuitive if one only considers the average wage difference between skilled and unskilled workers in the respective countries, which is greater in the Unites States than in Norway and Sweden. However, country differences with respect to the relative mobility of skilled and unskilled workers, labor market policies, consumer preferences and features in the housing market may explain the empirical results. That the relative difference between the skill-specific and general multiplier in Sweden and Norway are of relatively similar magnitudes compared to the United States underpins this, but with the data at hand, I cannot isolate the effects of individual factors on the magnitude of the multipliers. Hence, it is not possible to make a robust conclusion with respect to the driving force behind the relative difference in the countries multipliers.

7.2 County and local labor market estimates

Separate regressions were undertaken to check the robustness of the Norwegian estimates with respect to how local labor markets were defined. In the alternative specification, I used Norway´s 19 counties as the basis for local labor markets. As with the baseline model, Oslo is excluded from this model. An alternative robustness check, which is not undertaken in this paper, could be to use the *Standard for Economic Regions* as the basis for local labor markets. Country estimates of the multipliers are shown in table 8, together with the Norwegian estimates from the baseline model. As the table shows, the point estimates do not change much, and the general tendency of the estimates are the same as for the baseline model.

Table 8 Local multipliers for Norway, by specification

Multiplier based on:	OLS	IV	N
Local labor markets (Bhuller 2009)			
Overall tradable employment	0.606*** (0.141)	0.749*** (0.172)	90
Skilled tradable employment	2.147*** (0.333)	2.463*** (0.491)	90
Counties			
Overall tradable employment	0.519* (0.249)	0.852* (0.439)	36
Skilled tradable employment	2.252*** (0.363)	2.401*** (0.607)	36

Robust standard errors clustered by local labor market in parenthesis
*,** and *** denote at the 10, 5 an 1 percentage level, respectively

The skill-specific multiplier is significantly larger than the general multiplier, although the relative difference between the two multipliers is smaller compared to the baseline model. The county IV estimate of the general multiplier is approximately 0.85, which is slightly larger than the corresponding baseline estimate. The county estimate, however, is only significant on the 10 percent level. The county estimate of the skill-specific estimate is significant on the one percent level, and marginally smaller than the corresponding estimate from the baseline model.

All of the county estimates are less efficient than the corresponding estimates yielding from the baseline model, which seems reasonable. First, the county estimates are based on fewer observations, which in itself implies larger standard errors. In addition, it seams reasonable that there is a larger variation in local multiplier across counties compared to local labor markets, partially because counties on average are geographically larger than the local markets. In essence, the average variations within counties in factors that affect the magnitude of the multipliers are presumably larger across countries than local labor markets, which in turn imply greater variation in local multipliers.

The relative small difference in point estimates between the county and baseline estimates suggests that the estimates of the multipliers are quite insensitive with respect to how local labor markets are classified and defined. In turn, this advocates robustness of the baseline estimates, and underpins the notion of presence of empirically significant employment multipliers in Norway within the given time period.

7.3 Estimates from models including Oslo and Stockholm

As argued in chapter 4, the instrumental variable strategy is best suited when there are many small local labor markets that by themselves have little impact on nation wide trends in labor demand in the tradable sector. Due to its relative size, it seemed impossible to find nation wide trends in employment in the traded sector that did not reflect local employment trends in Oslo, and Oslo was hence excluded from the baseline model. Moretti and Thulin (2013) found it necessary to exclude Stockholm from their baseline model for the same reason. Table 9 provides estimates of multipliers yielding from models where Oslo and Stockholm are included. I have undertaken regressions using both the baseline model definition and counties as the basis for local labor markets. The Swedish estimates[8] are taken from Moretti and Thulin (ibid).

Table 9 Local multipliers for Norway and Sweden, by specification, Oslo and Stockholm included

Multiplier based on:	OLS	IV	N
Norway			
Local labor markets (Bhuller 2009)			
Overall tradable employment	2.432*** (0.436)	2.757*** (0.229)	92
Skilled tradable employment	11.026* (5.752)	12.433*** (1.844)	92
Counties			
Overall tradable employment	2.888** (1.029)	5.762*** (2.204)	38
Skilled tradable employment	10.891* (3.399)	21.879*** (5.939)	38
Sweden			
Local labor markets			
Overall tradable employment	2.33 (1.45)	3.85***(1.50)	102
Skilled tradable employment	11.20***(4.22)	15.90***(1.64)	102

Robust standard errors clustered by region in parenthesis
*,** and *** denote significanse at the 10, 5 and 1 percentage level, respectively
Estimates from Sweden are obtained from Moretti & Thulin (2013)

All of the estimates reported in the table are both considerably larger and less efficient than the corresponding estimates from the models that excluded Oslo and Stockholm. For instance, the local labor market IV estimate of the general multiplier for Norway jumps from 0,75 to 2,76, an increase of roughly 270 percent. The corresponding Swedish estimate increases from 0,5 to 3,85. The increase in the skill-specific estimates is even more profound. These estimates are roughly six and seven times larger when Oslo and Stockholm are included, respectively. The Norwegian estimates based on counties as local labor markets are not reliable. Following the rule of thumb

[8] These estimates are reported in the appendix.

postulated by Stock and Yogo, the absolute value of the t-statistic corresponding to the first stage regression should be larger than 3,16, which is not he case (Hill et al., 2012, pp. 414–415). In total, the absolute magnitude of the estimates in general, and the relative difference in the estimates in particular, suggests that the estimates from the models that include Oslo and Stockholm are upward biased due to reversed causality. The validity of the estimates reported in table 9 are in other words highly questionable.

8 Conclusions

The national economy can be divided into a number of local economies. These consist of industries with firms that produce goods and services that are either tradable or non-tradable on the national or international market. Employment levels in the local traded and non-traded sector are interconnected through the employment multiplier. Changes in employment in the local traded sector affects local demand for non-tradable goods and services which, in turn, affect employment in the local non-traded sector. The magnitude of the employment multiplier depends on a number of factors, including consumers relative preferences for non-tradable goods, the degree of labor intensity in non-traded industries, the type of jobs initially created or lost in the local traded sector, worker mobility and local housing supply. Policies and labor market institutions affect these factors, and hence also the size of the multiplier.

In this paper I estimate the average long run employment multipliers for local economies in Norway. The time period of interest reaches from 1996 to 2010. I then compare the estimates with corresponding estimates for Sweden and the United States obtained by Moretti and Thulin (2013). Closely following their methodological approach, I estimate both a general and a skill-specific multiplier. The former based on changes in employment in the traded sector as a whole, the latter based on changes in employment in the traded sector among workers with tertiary education. The estimates of the general and skill-specific multipliers are expected to differ, primarily due to average wage differences between the respective groups of workers.

Comparing estimates between Norway, Sweden and the United States is interesting because the countries differ with respect to factors that affect the size of the employment multiplier. For instance, relatively compact income distributions, generous welfare systems, strict employment protection laws, strong labor unions and lower geographical mobility characterize the two Scandinavian countries. Although the differences across these dimensions are smaller between the Scandinavian countries, the two countries have undergone different degrees of urbanization and developments in house ownership rates during the latter decades. It therefor seems reasonable to expect the estimates of the multipliers to differ across all of the respective countries.

I find empirical evidence of sizable and statistical significant long run employment multipliers for Norway within the time period of interest. Results from the baseline model suggest that an

additional job in the local traded sector generates 0,75 jobs in the local non-traded sector on average in the long run. The estimate for the skill-specific multiplier is significantly larger. An additional job in the traded sector that requires tertiary education is estimated to generate approximately 2,5 jobs in the local non-traded sector in the long run. Both estimates are significant on the one percent level. Separate regressions were undertaken to check the sensitivity of the estimates with respect to how local labor markets are defined. The estimates from the alternative specification are similar to those yielding from the baseline model, which suggests that the baseline estimates are robust and underpins the presence of significant employment multiplier effects within the given time period.

The estimated general multiplier for Norway is somewhat larger than the corresponding estimate for Sweden, while the estimated skill-specific multiplier is smaller. Among the respective countries, the largest general multiplier is found in the United States, while the largest skill-specific multiplier is found in Sweden. The skill-specific multipliers are quite similar in magnitude across the respective countries. An interesting finding is therefore that the relative difference between the skill-specific and general multiplier within each country is greater in the two Scandinavian countries than in the United States. This suggests that the required skill level corresponding to the initial jobs generated in the traded sector is of greater importance for the multipliers magnitude in Norway and Sweden than in the United States. This can seem somewhat counterintuitive if one only considers the average wage difference between skilled and unskilled workers in the respective countries. However, country differences with respect to the relative mobility of skilled and unskilled workers, labor market policies, consumer preferences and features in the housing market may explain the empirical results. Further research on local employment multipliers is needed to identify the relative importance of these factors.

It is in the interest of both the national and local governments in Norway to limit unemployment and promote economic growth in local economies. The estimates of the long run employment multiplier obtained for Norway should therefore be of interest to policymakers who seek to increase aggregate employment in local economics, in particular in areas characterized by relatively high unemployment. Taking measures to reduce local unemployment generally require substantial use of financial resources. The estimates of the multipliers can help policymakers to choose measures that are likely to be cost effective and have the greatest effect. In this respect, the significant difference between the general and specific employment multiplier arguably suggests

that Norwegian policymakers should aim at creating jobs in the local traded sector that requires high levels of human capital.

References

Aalbu, H., Bøhme, K., Hanell, T., Uhlin, Å., Gløersen, E., 2007. Sentraliseringens pris - delprosjekt 1.3: Norge i en internasjonal sammenlikning. Stockholm.

Atkinson, A.B., Micklewright, J., 1991. Unemployment Compensation and Labor Market Transitions: A Critical Review. Journal of Economic Literature 29(4), 1679–1727.

Barro, R.J., Sala-i-Martin, X., 1992. Convergence across States and Regions. Brookings Papers on Economic Activity 107–158.

Black, D., McKinnish, T., Sanders, S., 2005. The Economic Impact of Coal Boom and Bust. The Economic Journal 115 (503), 449–476.

Blanchard, O., 2010. Macroeconomics: a European perspective. Prentice Hall, Harlow, England ; New York.

Blanchard, O.J., Katz, L.F., 1992. Regional Evolutions. Brookings Papers on Economic Activity 1–61.

Bodvarsson, Ö.B., Berg, H.V. den, 2013. The Economics of Immigration: Theory and Policy. Springer Science & Business Media.

Borjas, G.J., 2001. Does immigration grease the wheels of the labor market. Brookings Papers on Economic Activity 69–133.

Borjas, G.J., 2013. Labor economics. McGraw-Hill, New York.

Bouston, L.P., 2009. Competition in the Promised Land: Black Migration and Racial Wage Convergence in the North, 1940-1970. Journal of Economic History 69. 755–782.

Bover, O., Arellano, M., Bentolila, S., 2002. Unemployment Duration, Benefit Duration And The Buisness Cycle. The Economic Journal. 112, 223–265.

Bureau of Labor Statistics, 2014. Earnings and unemployment rates by educational attainment.

Burtless, G., 1990. The Economist's Lament: Public Assistance in America. The Journal of Economic Perspectives. 4.

Callis, R., Kresin, M., 2014. Residental Vacancies and Homeownership In The Third Quater 2014.

Carrington, W.J., 1996. The Alaskan Labour Market during the Pipeline Era. Journal of Political Economy 186–218.

DiNardo, J., Lee, D.S., 2004. Economic impacts of new unionization on private sector employers: 1984-2001. The Quartely Journal of Economics.

The Economist, 2013. More for less [WWW Document]. URL http://www.economist.com/news/special-report/21570831-generous-welfare-state-does-not-cost-earth-more-less (accessed 12.18.14).

Faggio, G., Overman, H., 2014. The effect of public sector employment on local labour markets. Journal of Urban Economics 79, 91–107.

Farbrot, A., 2010. Advarer mot hollandsk syke [WWW Document]. Handelshøyskolen BI. URL http://forskning.no/penger-okonomi-samfunnsokonomi-velferdsstat/2010/03/advarer-mot-hollandsk-syke (accessed 12.2.14).

Hansen, S., Skoglund, T., 2008. Utvikling i sysselsetting og lønn etter 1930. Økonomisk analyser.

Heikkilia, E., Johansson, M., Persson, L.O., Stambøl, L.S., 1999. Interregional Labour Market Mobility Through Regional Vacancy Chains: A Comparative International Approach.

Hill, R.C., Griffiths, W.E., Lim, G.C., 2012. Principles of econometrics. John Wiley & Sons, Hoboken, N.J.

Jasper, J.M., 2000. Restless Nation: Starting Over in America. University of Chicago Press: Chicago.

Jofre-Monseny, J., Silva, J., Vazquez-Grenno, J., 2014. Local multipliers of public employment: Long-run evidence from the late development of the Spanish public sector. Preliminary Draft.

Johansson, O.N., Mats, 1999. Regional arbeidsmarkedsmobilitet i land. Nordic Council of Ministers.

Kalen, S., 1983. Durational Residency Requirments and the Equal Protection Clause: Zobel v. Williams. Urban Law Annual ; Journal of Urban and Contemporary Law 25, 329–359.

Katz, L., 1985. Layoffs, Recalls, and the Duration of Unemployment. National Bureau of Economic Research (Cambridge, MA) Working Paper No. 1825.

Katz, L., Meyer, B.D., 1990b. The Impact of the Potential Duration of Unemployment Benefits on the Duration of Unemployment. Journal of Public Economics 45–72.

Katz, L., Meyer, B.D., 1990a. Unemployment Insurance, Recall Expectations, and Unemployment. The Quartely Journal of Economics 973–1002.

Kennan, J., Walker, J., 2011. The Effect of Extected income On Individual Migration Decisions. Econometrica 79, 211–251.

Kirkebøen, L.J., 2010. Høyt utdannede tjener mer over livsløpet. Økonomisk analyser.

Kodrzycki, Y.K., 2001. Migration of Recent College Graduates. New England Economic Review 13–34.

Langøren, A., 2007. Sentralisering - årsaker, virkninger og politikk [WWW Document]. URL http://www.ssb.no/offentlig-sektor/artikler-og-publikasjoner/sentralisering-aarsaker-virkninger-og-politikk (accessed 12.2.14).

Lemann, N., 1992. The promised land: the great Black migration and how it changed America, 1st Vintage Books ed. ed. Vintage Books, New York.

Lofthus, E., 2002. Immigrants in Norway: a summary of findings. Statistisk Sentralbyrå, Oslo.
Martin, P., Midgley, E., 2010. Immigration In America 2010.

Meyer, B.D., 1990. Unemployment Insurance and Unemployment Spells. Econometrica 58, 757–782.

Moffitt, R., 1985. Unemployment Insurance and the Distribution of Unemployment Spells. Journal of Econometrics 28, 85–101.

Moretti, E., 2010. Local Multipliers. American Economic Review 100, 373–377.

Moretti, E., 2011. Local Labor Markets, in: Handbook of Labor Economics. Elsevier, pp. 1237–1313.

Moretti, E., Thulin, P., 2013. Local multipliers and human capital in the United States and Sweden. Ind Corp Change 22, 339–362.

Naskoteen, R.A., Zimmer, M., 1980. Migration and Income: The Question of Self-Selection. Southern Economic Journal 46, 840–851.

NOU 2009:10 [WWW Document], n.d. URL http://www.regjeringen.no/nb/dep/fin/dok/nouer/2009/nou-2009-10/11.html?id=568384 (accessed 12.2.14).

NUPI, 2010. Diasporaer i Norge. DEL 6: 1960-2010: Forvandlingen av Norge [WWW Document]. URL http://hvorhenderdet.nupi.no/Artikler/2010-2011/Diasporaer-i-Norge/%28part%29/6 (accessed 12.26.14).

OECD, 2012. Education at a Glance: OECD Indicators.

Organization For Economic Cooperation And Development., 2014. Education at a glance 2014: OECD indicators. OECD, [S.l.].

Røed, M., Schøne, P., 2012. Does Immigration Increase Labour Market Flexibility? Labour Economics 19, 527–540.
Røste, O.B., 2008. Politikk og økonomi - for statsvitere, 1st ed. Gyldendal Norsk Forlag AS, Oslo.

Singer, A., 2012. Immigrant Workers in the United States Labor Force [WWW Document]. The Brookings Institution. URL http://www.brookings.edu/research/papers/2012/03/15-immigrant-workers-singer (accessed 12.17.14).

Singh Bhuller, M., 2009. Inndeling av Norge i arbeidsmarkedsregioner.

Stambøl, L.S., Heikkilä, E., Johansson, M., Nygren, O., Persson, L.O., Nordisk Ministerråd, 1999. Regional arbeidsmarkedsmobilitet i land: bruttostrømsanalyser og etterspørselsbetraktninger i de regionale arbeidsmarkedene. Nordisk Ministerråd, København.

Statistics Norway, 2014a. Indikatorer for bærekraftig utvikling, 2014 Utvikling i inntektsulikhet [WWW Document]. URL http://www.ssb.no/natur-og-miljo/barekraft/utvikling-i-inntektsulikhet (accessed 1.12.14).

Statistics Norway, 2014b. Gjennomstrømning i høyere utdanning, 2012/2013 [WWW Document]. URL http://www.ssb.no/utdanning/statistikker/hugjen/aar/2014-06-26 (accessed 12.2.14).

Statistics Norway, 2014c. Antall offentlige årsverk nesten tredoblet siden 1970 - SSB [WWW Document]. URL http://www.ssb.no/offentlig-sektor/artikler-og-publikasjoner/offentlig-forvaltning-storrelse (accessed 12.2.14).

Statistics Norway, 2014d. Nøkkeltall for innvandring og innvandrere [WWW Document]. URL http://www.ssb.no/innvandring-og-innvandrere/nokkeltall (accessed 12.26.14).

Statistics Norway, 2013. Skandinavisk komparativ statistikk om integrering. Innvanderere i Norge, Svergie og Danmark [WWW Document]. URL http://www.ssb.no/befolkning/artikler-og-publikasjoner/innvandrere-i-norge-sverige-og-danmark (accessed 12.26.14).

St.meld. nr 23 [WWW Document], 2003. URL http://www.regjeringen.no/nb/dep/kmd/dok/regpubl/stmeld/20032004/stmeld-nr-23-2003-2004-/2.html?id=197932 (accessed 4.12.14).

St.meld nr. 58 [WWW Document], 1996. URL http://www.regjeringen.no/nb/dep/kld/dok/regpubl/stmeld/19961997/st-meld-nr-58_1996-97/2.html?id=191319 (accessed 12.2.14).

Store Norske Leksikon, 2014. Sveriges befolkning. Store norske leksikon.

United Nations, 2002. World population ageing, 1950-2050. United Nations, New York.

Woosley, M., 2008. World's Best Places For Unemployment Pay [WWW Document]. URL http://www.forbes.com/2008/06/27/unemployment-benefits-world-forbeslife-cx_mw_0627worldunemployment.html (accessed 4.6.14).

World Bank, 2014. Internal mobility [WWW Document]. URL http://siteresources.worldbank.org/ECAEXT/Resources/258598-1284061150155/7383639-1323888814015/8319788-1324485944855/10_us.pdf (accessed 2.11.14).

Appendix 1

Table A1 Employment statistics for 46 local labor markets, 1996, 2003 and 2010

Variable	Statistic	1996	2003	2010
Employment, total	Sum	1.769.449	1.890.564	2.098.967
	Mean	38.466	41.099	45.629
	Standard deviation	86.662	95.690	106.170
	Minimum	6335	6581	6822
	Maximum	577.104	635.784	701.352
Employment, non-traded sector	Sum	1.428.757	1.597.275	1.807.965
	Mean	31.059	34.723	39.303
	Standard deviation	74.771	85.608	97.360
	Minimum	4635	5134	5405
	Maximum	501.312	572.680	649.156
Employment, non-traded sector, skilled	Sum	425.459	542.655	705.206
	Mean	9249	11.797	15.330
	Standard deviation	25.490	32.826	42.756
	Minimum	1118	1333	1608
	Maximum	171.701	220.170	286.044
Employment, non-traded sector, unskilled	Sum	1.003.298	1.054.620	1.102.759
	Mean	21.810	22.927	23.973
	Standard deviation	49.329	52.828	54.675
	Minimum	3510	3740	3734
	Maximum	329.611	352.510	363.112
Employment, traded sector	Sum	340.692	293.289	291.002
	Mean	7406	6375	6326
	Standard deviation	12.458	10.752	10.013
	Minimum	969	676	718
	Maximum	75.792	63.104	52.196
Employment, traded, skilled	Sum	49.002	53.690	67.971
	Mean	1065	1167	1477
	Standard deviation	2609	2810	3132
	Minimum	73	61	74
	Maximum	16.341	16.981	16.429
Employment, traded, unskilled	Sum	291.690	239.599	223.031
	Mean	6341	5209	4848
	Standard deviation	9897	7999	6938
	Minimum	870	615	644
	Maximum	59.451	46.123	35.767

Table A2 Employment rates, 46 local labor markets, 1996, 2003 and 2010

Variable	Statistic	1996	2003	2010
Employed	Mean	83	80	78
	Standard deviation	1.9	3.3	1.7
	Minimum	78	69	74
	Maximum	86	87	82
Employed and skilled	Mean	23	27	31
	Standard deviation	3.5	4.1	4.5
	Minimum	17	18	23
	Maximum	33	37	43
Non-traded	Mean	78	82	83
	Standard deviation	7.5	6.6	6.2
	Minimum	62	67	63
	Maximum	91	92	93
Non-traded, skilled	Mean	26	29	34
	Standard deviation	3	3.7	4.0
	Minimum	20	22	26
	Maximum	34	38	44
Traded	Mean	22	18	17
	Standard deviation	7.5	6.6	6.2
	Minimum	9	7	6
	Maximum	38	32	37
Traded, skilled	Mean	10	13	17
	Standard deviation	4.7	6.2	7.3
	Minimum	5	6	8
	Maximum	32	41	47

Note: Rate for employed calculated as share of employed over total sample
Rates for traded and non-traded calculated as share of total employed
Rates for skilled and unskilled calculated as share of employed in given sector

Table A3 Correlation matrix, 46 local labor markets, 1996 - 2003 and 2003 - 2010

Id	Variable	1	2	3	4	5
1	Difference in employment, non-traded sector	1				
2	Difference in employment, traded sector	− 0.27	1			
3	Difference in skilled employment, traded sector	0.83	0.07	1		
4	Instrument for difference in employment	− 0.32	0.74	− 0.17	1	
5	Instrument for difference in skilled employment	0.91	− 0.03	0.77	− 0.01	1

Table A4 First stage regressions

	OLS	t	F	N
Dependent variable: Employment in traded sector				
Independent variable				
Instrument based on local labor markets	0,76 (0,13)	5,85	34,22	90
Instrument based on local labor markets*	0,89 (0,17)	5,27	27,87	92
Instrument based on counties	0,93 (0,21)	4,44	19,74	36
Instrument based on countires*	3,98 (1,32)	3,02	9,12	38
Dependent variable: Skilled employment in traded sector				
Independent variable				
Skilled instrument based on local labor markets	0,93 (0,24)	3,91	15,32	90
Skilled instrument based on local labor markets*	0,97 (0,28)	3,47	12,05	92
Skilled instrument based on counties	0,94 (0,26)	3,63	13,18	36
Skilled instrument based on countires*	4,70 (1,74)	2,70	7,33	38

Note: * denotes models where Oslo is included

Table A5 Difference in employment and instruments for 46 local labor markets, 1996 - 2003 and 2003 - 2010

Variable	Statistic	1996 - 2003	2003 - 2010
Difference in employment, non-traded sector	Mean	3663	4580
	Standard deviation	10895	11903
	Minimum	-1500	-3837
	Maximum	71368	76476
Difference in employment, traded sector	Mean	-1030	81
	Standard deviation	1871	810
	Minimum	-12688	-2884
	Maximum	286	3761
Difference in skilled employment, traded sector	Mean	102	313
	Standard deviation	299	731
	Minimum	-116	-552
	Maximum	1549	4095
Difference in instrument	Mean	-652	13
	Standard deviation	1225	820
	Minimum	-7449	-1170
	Maximum	3	3806
Difference in instrument, skilled	Mean	278	253
	Standard deviation	1057	340
	Minimum	2	3
	Maximum	6994	1357

Table A6 Average wages, 46 local labor markets, 1996, 2003 and 2010

Variable	Statistic	1996	2003	2010
Total	Mean	164 418	236 236	326 365
	Standard deviation	12 844	18 138	28 111
	Minimum	132 976	200 880	277 008
	Maximum	196 026	287 694	414 579
Non-traded	Mean	159 977	228 822	312 440
	Standard deviation	10 131	14 335	20 980
	Minimum	138 909	203 390	276 542
	Maximum	191 791	283 030	391 687
Non-traded, skilled	Mean	203 821	289 260	380 308
	Standard deviation	10 077	15 559	23 738
	Minimum	184 069	260 510	337 346
	Maximum	230 858	346 529	4 729 741
Non-traded, unskilled	Mean	144 525	203 133	276 988
	Standard deviation	9 353	11 406	16 017
	Minimum	126 923	185 000	253 760
	Maximum	171 440	243 369	327 653
Traded	Mean	174 980	261 511	384 794
	Standard deviation	31 892	45 147	64 311
	Minimum	101 509	178 955	280 968
	Maximum	248 575	402 239	591 236
Traded, skilled	Mean	239 891	360 727	510 819
	Standard deviation	55 935	78 797	97 148
	Minimum	123 637	203 958	310 711
	Maximum	379 681	565 300	826 313
Traded, unskilled	Mean	166 486	244 363	354 659
	Standard deviation	26 351	32 444	44 950
	Minimum	98 332	176 475	277 550
	Maximum	223 433	324 344	482 746

Table A7 Expenditure in Norway on selected non-tradable goods, by decile

Year		2007	2008	2009	2012
06 Health	Decile 1	4942	4896	5686	7070
	Decile 2 +3	7609	8666	8455	10618
	Decile 8 + 9	12118	12093	12025	12181
	Decile 10	17620	14646	15421	15267
07 Transport	Decile 1	16630	16358	17405	14092
	Decile 2 +3	31493	32217	27254	52387
	Decile 8 + 9	102195	98034	102717	119240
	Decile 10	131356	137459	137716	168349
09 Recreation and culture	Decile 1	16636	20880	23586	23942
	Decile 2 +3	22804	24823	28529	25120
	Decile 8 + 9	66891	68025	69611	58960
	Decile 10	83660	91196	96208	88429
11 Restaurants and hotels	Decile 1	9063	9195	9969	6761
	Decile 2 +3	7612	7795	8295	9829
	Decile 8 + 9	17324	16879	17452	22764
	Decile 10	28158	27945	29298	31195

Scource: Statistics Norway.

Extracted 25.11.2014 from:
https://www.ssb.no/statistikkbanken/selectvarval/saveselections.asp

Table A8 Expenditure in Norway on selected non-tradable goods, by decile, Percent of total expenditure.

Year		2007	2008	2009	2012
06 Health	Decile 1	2,9	2,7	3	3,6
	Decile 2 +3	3,4	3,7	3,4	3,6
	Decile 8 + 9	2,4	2,3	2,2	2,1
	Decile 10	2,7	2,1	2,1	1,9
07 Transport	Decile 1	9,8	9	9,1	7,2
	Decile 2 +3	14,2	13,8	11	18
	Decile 8 + 9	20,2	19	19,1	20,7
	Decile 10	20	19,8	18,9	20,8
09 Recreation and culture	Decile 1	9,8	11,5	12,4	12,3
	Decile 2 +3	10,3	10,6	11,5	8,6
	Decile 8 + 9	13,2	13,2	13	10,2
	Decile 10	12,7	13,1	13,2	10,9
11 Restaurants and hotels	Decile 1	5,3	5,1	5,2	3,5
	Decile 2 +3	3,4	3,3	3,4	3,4
	Decile 8 + 9	3,4	3,3	3,2	3,9
	Decile 10	4,3	4	4	3,9

Scource: Statistics Norway

from:
https://www.ssb.no/statistikkbanken/selectvarval/saveselections.asp

Appendix 2

The following sections present a mathematical version of the simple theoretical framework presented in chapter two. The main point of the model is to highlight how offsetting equilibrium effects affect the equilibrium allocation of workers following an increase in labor demand. The framework is based on Moretti (2011) and Moretti & Thulin (2013). The long run spatial equilibrium model is presented in subsection A2.1. In subsection A2.2 I use the model to analyze the consequence of an increase in local labor demand on local wages, housing prices and the allocation of workers between local economies.

A2.1 Spatial equilibrium with heterogeneous labor

For the sake of the argument, assume that the national economy consists of two competitive local economies, *a* and *b.* Within each local economy, firms produce a single tradable and homogenous good that is assumed sold on the international market. Hence its price is the same everywhere and set equal to one. Workers are either skilled or unskilled and differ in terms of productivity. For simplicity, I assume that workers with different levels of skill work in different firms. In other words, I assume away the possibility of imperfect substitution of labor. The latter assumption is not crucial with respect to the main conclusions derived from the model. Assumptions imposed on the production function of firms imply that the zero-profit condition holds. As a consequence, firms are indifferent between utilizing skilled and unskilled labor in the production process.

Workers

All workers provide one unit of labor, consume one unit of housing and settle in the local economy that maximizes their utility. Their indirect utility increases with local wages net of housing cost (real wages), amenities and they have idiosyncratic preferences for location. Skilled and unskilled workers have access to the same local amenities, but need not value these amenities equally. Idiosyncratic preferences for location capture the degree of taste or emotional attachment to a given local economy. Mathematically, the indirect utility function of worker *i* at time *t* can be modeled as

$$V_{lict} = w_{lct} - r_{ct} + A_{lc} + e_{lic} \quad , \quad l = S,U \quad i = 1,N \quad t = 1,T \qquad (1)$$

Where *l* denotes the worker´*s* level of skill, *S* and *U* denotes skilled and unskilled respectively, (*w – r)* is log wages net of housing costs in local labor market *c, A* is amenities which are assumed constant over time, and the random error term *e* represents the worker´*s* idiosyncratic preferences for local labor market *c*. A larger *e* implies that workers are more emotionally attached to a given local labor market, and these individual tastes for location can vary by skill group. The latter assumption is important because within this model, idiosyncratic preferences for location implicitly measure the degree of mobility. Hence mobility can differ between unskilled and skilled workers. For example, assume that worker *i´*s relative preferences for local economy *a* over *b* is

$$e_{lia} - e_{lib} \sim U\left[-\beta_l, \beta_l\right] \qquad (2)$$

The parameter in equation (2) then captures the degree of mobility, which can vary by skill group. Individual tastes for location is important for the respective group of workers if the parameter is large. In such a case, workers are less willing to relocate to arbitrage away differences in real wages and amenities between local economies. Within this framework, the degree of worker mobility exclusively determines the elasticity of local labor supply. If workers have strong tastes for location, they are relatively emotionally attached to a given local economy and therefore less mobile. In such a case the elasticity of local labor supply is small. In the opposite case, where workers are less emotionally attached to a local economy, workers are more mobile and hence the elasticity is larger. Assuming that workers have some degree of taste for location implies that local labor supply increases with local wages. Hence the theory suggests that a given worker strictly prefers local economy a to local economy b if

$$w_{lat} - r_{at} + A_{la} + e_{lia} > w_{lbt} - r_{bt} + A_{lb} + e_{lib} \qquad (3)$$

In equilibrium, the marginal worker must be indifferent between the two labor markets, which implies the following equilibrium condition

$$w_{lbt} = w_{lat} + \left(r_{bt} - r_{at}\right) + \left(A_{la} - A_{lb}\right) + \beta_S\left(\frac{N_{lbt} - N_{lat}}{N}\right), \quad N = N_{Sa} + N_{Sb} + N_{Ua} + N_{Ub} \qquad (4)$$

Firms

In the long run, firms are assumed to settle in the local economy that maximizes their profits. A producer of a tradable good can therefore relocate from one local economy to another if for example local wages or rents become too high. Standard long-run assumptions are made with respect to their production functions, which is assumed to be Cobb-Douglas; labor and capital are used as inputs in the production process and the law of diminishing marginal returns is assumed to hold. A firm´s production function can thus be formulated mathematically as

$$\ln y_{lct} = X_{lct} + hN_{lct} + (1-h)K_{lc} \quad , \quad 0 < h < 1 \tag{5}$$

Where X is a local labor market and skill-specific productivity shifter, and K and N is the log of capital and number of workers respectively. For simplicity, I assume that capital inputs are sold on the international market, so the price on capital inputs are considered fixed from firms point of view. Labor is assumed to be perfectly mobile within local economies. The latter assumption implies that local wages are equalized with the value of the marginal product of labor within local economies. In essence, local wages reflect local workers productivity. Mathematically,

$$w_{lct} = X_{lct} - (1-h)N_{lct} + (1-h)K_{lc} + \ln h \tag{6}$$

The housing market

Since workers are assumed to consume one unit of housing, the inverse of local demand for housing is just a rearrangement of the equilibrium condition formulated in equation (3):

$$r_b = (w_{Sb} - w_{Sa}) + r_a + (A_{Sb} - A_{Sa}) - \beta_S \left(\frac{N_{Sb} - N_{Sa}}{N} \right) \tag{7}$$

Assume that the elasticity of local housing supply is determined exogenously by local land law regulations and geographical conditions. The elasticity of housing supply will therefore be smaller in local economies where these factors make it more difficult to produce new housing units. If local housing supply is neither perfectly inelastic nor perfectly elastic, local housing supply can be modeled as

$$r_c = z + \rho_c N_c \qquad , 0 < \rho_c < \infty \tag{8}$$

Where ρ_c characterizes the elasticity of local housing supply in local economy *c*. A larger ρ_c implies that the elasticity of housing supply is smaller.

Equilibrium

Equilibrium in the labor market is found by equating (4) and (6), while equilibrium in the housing market is found by equating (7) and (8):

$$N^*_{Sck} = \Gamma N\left[N\left(\rho_a + \rho_b\right)\left(X_{Sck} - X_{Sdk} + X_{Udk} - X_{Uck} + A_S - A_U\right) + 2\beta_U\left(X_{Sck} - X_{Sdk} + A_S\right)\right], \qquad \text{c = a , b} \quad \text{d = a , b} \quad \text{c} \neq \text{d}$$

$$N^*_{Uck} = \Gamma N\left[N\left(\rho_a + \rho_b\right)\left(X_{Uck} - X_{Udk} + X_{Sdk} - X_{Sck} + A_U - A_S\right) + 2\beta_S\left(X_{Uck} - X_{Udk} + A_U\right)\right]$$

$$r^*_{ck} = z + \rho_c\left(N^*_{Uck} + N^*_{Sck}\right)$$

$$\Gamma := \frac{1}{2h\left[N\left(\rho_a + \rho_b\right)\left(\beta_U + \beta_S\right) + 2\beta_U\beta_S\right]}$$

A2.2 The effects of an increase in local labor demand

Consider a case where local demand for skilled workers increase. Specifically, assume that there are two periods and that the productivity of skilled workers increases in local economy *b* in the second period. The productivity of all other workers remains constant. Mathematically, the productivity increase can be modeled as an increase in the local labor market and skill specific productivity shifter*:*

$$X_{Sb2} = X_{Sb1} + \Delta, \qquad \Delta > 0 \qquad (9)$$

Due to the increase in productivity, firms in local economy *b* increase their demand for skilled labor and local wages of skilled workers rise. Since the wage of skilled workers is higher in local economy *b* than *a,* some skilled workers choose to migrate in the second period. Taking differences between the equilibrium solutions for the second and first period yields:

$$N^*_{Sb2} - N^*_{Sb1} = \frac{N\left[N(\rho_a + \rho_b) + 2\beta_U\right]}{2h\left[N(\rho_a + \rho_b)(\beta_U + \beta_S) + 2\beta_U\beta_S\right]}\Delta > 0 \quad (10)$$

$$N^*_{Ub2} - N^*_{Ub1} = -\frac{N^2(\rho_a + \rho_b)}{h\left[N(\rho_a + \rho_b)(\beta_U + \beta_S) + 2\beta_U\beta_S\right]}\Delta < 0 \quad (11)$$

$$r^*_{b2} - r^*_{b1} = \frac{N\beta_U\rho_b}{h\left[N(\rho_a + \rho_b)(\beta_U + \beta_S) + 2\beta_U\beta_S\right]}\Delta > 0 \quad (12)$$

$$\left(w^*_{Sb2} - w^*_{Sb1}\right) - \left(r^*_{b2} - r^*_{b1}\right) = \frac{N\beta_S(\rho_a + \rho_b) + \rho_a N\beta_U + 2\beta_U\beta_S}{h\left[N(\rho_a + \rho_b)(\beta_U + \beta_S) + 2\beta_U\beta_S\right]}\Delta > 0 \quad (13)$$

$$\left(w^*_{Ub2} - w^*_{Ub1}\right) - \left(r^*_{b2} - r^*_{b1}\right) = -\frac{\beta_U N\rho_b}{h\left[N(\rho_a + \rho_b)(\beta_U + \beta_S) + 2\beta_U\beta_S\right]}\Delta < 0 \quad (14)$$

A couple of things are worth noticing in equation (10) – (14). First, in-migration of skilled workers to local economy *b* is increasing in the elasticity of local labor supply of unskilled and skilled workers. These elasticity´s are high when the respective groups of workers have weaker preferences for location and hence are more mobile (small *β)*. Second, the initial migration of skilled workers from local economy *a* to *b* increases demand for housing in local economy *b* and decreases demand for housing in local economy *a.* In effect, housing prices increases in the former economy and decreases in the latter. Since the nominal wages of unskilled workers in unaffected, the development in housing prices imply that wages net of housing costs are higher for unskilled workers in local economy *a.* As a consequence, some unskilled workers choose to out-migrate from local economy *b.* Thus, the increase in demand for skilled labor causes a "brain-gain" in economy *b* and a "brain-drain" in economy *a*.

Third, in-migration of skilled workers is higher when the elasticity of local housing supply in local economy *b* is high (small ρ), or, when the supply of housing is less constrained. In such a case, housing prices will not rise as much in response to in-migration, real wages of skilled workers will be higher and a greater amount of skilled workers will choose to migrate. Finally, unskilled workers who remain in local economy *b* experience a decline in real wages, while all other workers experience an increase in real wages. The increase in real wages in local economy *a* is caused by a decline in housing costs in the local economy.

It can be shown that the in-migration of skilled workers to local economy *b* is greater than the out-migration of unskilled workers, which means that aggregate employment in the local economy increases. Although the ultimate effect on local employment following the increase in local labor demand is positive, it is important to notice that the effect is somewhat dampened by offsetting equilibrium effects. Within the framework presented, the offsetting equilibrium effects are increased production costs due to an increase in local wages, and a partial decline in real wages of skilled workers du to increased housing prices. The magnitude of these offsetting effects depends crucially on labor mobility and the elasticity of local housing supply.