Migration, Wage Inequality, and the Urban Hierarchy

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Migration, Wage Inequality, and the Urban Hierarchy

Empirical Studies in International and Domestic Population Movements, Wage Dispersion and Income: Sweden, 1993-2003

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EFI THE ECONOMIC RESEARCH INSTITUTE

Dissertation for the Degree of Doctor of Philosophy, Ph.D, Economic History, Stockholm School of Economics 2009.

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Preface

This report is a result of a research project carried out at the Institute for Economic and Business History Research at the Economic Research Institute at the Stockholm School of Economics.

This volume is submitted as a doctor's thesis at the Stockholm School of Economics. As usual at the Economic Research Institute, the author has been entirely free to conduct and present her research in her own ways as an expression of her own ideas.

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Stockholm, November 9, 2009

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Stockholm, November 2009

Martin Korpi

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Introduction, background and summary of the thesis

1. Introduction

In Western countries that were the first to go through industrialization and subsequent modernization, the development of income inequality appears to have followed similar long-term trends. These trends have been described as having an inverse U-shape, where inequality rose during the first stages of economic development but decreased substantially during its later stages (Kuznets, 1955). Although the timing of the developments has varied between countries and its causes are still debated, the similarities have dominated the picture, especially with respect to the descending phase of inequality during the first half of the 20th century (Nielsen and Alderson, 1997; Alderson and Nielsen, 2002; Mahler, 2004; Williamson, 1965).

Since the 1970s however, many countries have witnessed a reversal of this trend, inspiring substantial research efforts within the social sciences as to the potential causes of this change. Main factors driving this development are often assumed to have been changing institutions such as lower levels of unionization, deindustrialization and changing technology, increasing international capital flows and heightened competition between developed and developing countries. In addition to these factors, the role of increasing international migration has also figured in the debates, especially among economists in the United States (Gustafsson and Johansson, 1999; Checchi and García-Peñalosa, 2008; see also Atkinson, 2008).

This study, on the one hand, takes inspiration and many of its questions from the strand of inequality research focused on the role of international migration. An important scholar within this research has been George Borjas with his colleagues. In studies of the effects of immigration on jobs and wages for those potentially competing with immigrant workers, most studies find very small negative and even some positive effects of increasing immigration. These studies typically compare increasing shares of migrants within a geographical area (local labour markets, or equivalents) and outcomes in terms of wages for workers potentially competing with immigrants for jobs and wages (for summaries see e.g. Friedberg and Hunt, 1995; Smith and Edmonston, 1997; Ekberg, 1998; Dustmann and Glitz, 2005). The main argument of Borjas and his colleagues, however, has been that these studies tend a hide a wider truth. Since migrants, both domestic and international, can be assumed to move to places where wages are the highest and therefore react to any type of negative wage

pressure in areas where immigrants settle (disproportionately, in the US as elsewhere, in the larger metropolitan areas), any negative wage pressure will in effect disseminate over the nation as a whole. Therefore, the effects of immigration should predominantly be estimated by general equilibrium modelling for the whole economy, the results of which suggests immigration as having had sizable effects on the increasing US wage inequality since the middle of the 1970s (Borjas, 1994; Borjas, Freeman, Katz, DiNardo and Abowd, 1997; Borjas, 2003).

This equilibrium modelling approach, however, is based on assumptions of constant returns to scale and largely precludes the possibility of different types of scale effects resulting from a net inflow of migrants into local labour markets. Within traditional economic geography, on the other hand, different types of scale effects – including indivisibilities – are the basic working assumptions governing the location and spread of cities and different industries. Increasing returns to scale is also the basis for the field of geographical economics, now increasingly becoming part of the mainstream of economics by the recognition of researchers such as Paul Krugman. Within migration research, however, both within the field of economic history as well as economics and geography, there is still a relative lack of research being done on the basis of this theoretical perspective. In an empirical study of migration flows into and between local labour markets in Sweden, the present study combines theoretical perspectives from neoclassical economics with those from traditional economic geography and geographical economics. It focuses on, and basically asks, what the possible outcomes of both domestic and international migration could be if we modify neoclassical assumptions with alternatives considering different types of scale effects potentially associated with migration.

2. Background and time-period of this study

The subject and time-frame of the study is Sweden, 1993-2003. Immigration to Sweden after 1945 can be characterized as having gone through two broadly defined phases. One period, from the Second World War up until the late 1970s, was dominated by labour migration predominantly from Finland and other European countries such as former Yugoslavia, and also by substantial refugee migration from Eastern Europe. During this time, particularly during the late 1950s and for most of the following decade, Sweden experienced labour shortages and labour migrants as well as refugees readily found employment, many of them within the booming manufacturing sector. Indeed, for many years up until the middle of the 1970s, employment rates for foreign born workers were actually slightly higher than for the Swedish born (Ekberg and Gustafsson, 1995; Lundh and Ohlsson, 1999). During the second phase, from the 1980s and onwards, labour migration declined as a share of total immigration, and migration to Sweden subsequently came to be dominated by refugees and family reunification. At the same time, the composition of immigrants in terms of countries of origin changed as well. In the 1970s, refugees from Latin America, especially Chile, made up the largest share of the newly arrived immigrant population. During the 1980s, especially towards the end of the decade, immigrants were largely refugees from the Middle East. During most of the 1990s, people escaping the wars in former Yugoslavia came to dominate the immigrant flows. During this second phase, in general, immigrants also came to face a much tougher labour market than previously. Especially after the financial crises at the beginning of the 1990s, the general unemployment rate both among the native and foreign born population has been much higher than at any time since the Second World War, and unemployment failed to fall back to levels typically taken for granted prior to the crises. Unemployment among the foreign born in particular, even though it varies between groups, has also been substantially higher than among the Swedish born population (Scott, 1999; Bevelander and Scott, 1996; Edin and Åslund, 2001; Bevelander, 2004).

In interpretations as to the causes of the difference in outcome between the above two phases as concerns immigrant employment, several factors have been stressed. Many underline that this is mainly to do with a shift in labour demand towards a job market demanding less unskilled labour, and which to a larger extent requires language skills as well as different types of tacit knowledge. The comparatively non-hierarchical organization of Swedish working life has also

been seen as increasing immigrants disadvantage (Bengtsson, Lundh and Scott, 2005; Lundh and Ohlsson, 1999). Research also suggest the prevalence of ethninc discrimination as an important factor (e.g. Carlsson and Rooth, 2007; Edin and Lagerström, 2006). Regardless of the exact causes, for our purposes, these differences in the outcome of immigrants on the Swedish labour market obviously suggests caution in drawing conclusions for other historical time-periods based on the research at hand. My purpose here is however not to compare outcomes of migration between different historical phases, or different types of migration, and it is a matter debate as to what extent the drawn conclusions apply to different time-periods. As concerns the shift in the motives for migration to Sweden (from a large share of labour migrants to more of refugee migration and family reunification), it is however important to note that both refugees as well as those admitted on the grounds of family ties over time come to constitute part of the labour supply. As has been noted by others, the fact the previous refugee migrants came to have very similar employment rates and outcomes as the native born population (such as those arriving after 1945 and well into the 1960s, mainly from Eastern Europe), suggests that the changing labour market outcome for immigrants during this second phase need not necessarily have to do with the specific motives for immigration to Sweden (for a discussion, see Bengtsson et al., 2005).

The motivation for the chosen time-periods and the focus on Swedish labour markets is as follows. Firstly, 1993-2003 is well suited for the purposes of the questions at hand, since the character of immigration does by and large not change over this period. All through the 1990s and the following decade, those admitted on the grounds of employment make up around ten percent of total immigration. Therefore we do not see a major shift along these lines or any type of major political reform possibly affecting the outcomes. Second, we do not find any major changes in terms of relevant economic policy during this time. 1993 marks the bottom of a severe recession with employment picking up quite slowly until the end of the decade and subsequent downturn at the beginning of the new millennium. In terms of economic policy however, the guiding principle that Sweden followed preparing for and after entering the European Union in 1994 can by and large be characterized by a monetary policy of maintaining a stable inflation rate (of around two percent a year) and large restrictions on stimulating the economy by way of fiscal policy. The time-period does nonetheless encompass a rather thorough restructuring of the Swedish economy; a net loss of employment of around 300 000 jobs, a relative move away from

public to private sector service employment and a net loss of manufacturing jobs (see e.g. Thakur, 2003; Jonung, Kiander and Vartia, 2009). Even though the main part of this restructuring is accomplished during the first half of decade, and in article two and three the issue is addressed in different ways, we must nevertheless keep this in mind when interpreting outcomes in this research. Third, In Sweden we have exceptionally good relevant data starting from 1990 and onwards. In the study, all four papers are based on individual full population data, highly detailed both regarding information pertaining to individuals as well as to their residence, with 10 000 square meter housing coordinates for almost everybody included in the data base. This allows for very accurate calculations both of variables related to local labour markets, in papers one and two, as well as the individual level variables used in the subsequent papers.

Are the research questions on the role of migration for income inequality relevant in the Swedish context? Mainly in papers two and three, in different ways this study seeks to contrast possible scale effects with the possibility of negative labour supply side effects, due to positive net inflows both from domestic and international migration. As wages in Sweden are largely set by collective bargaining, the possibility of direct wage competition – i.e. by workers actually offering to work for less than set wages – is of course limited (cf. Lundh, 2002). Few would however argue that a labour shortage combined with increasing demand would not tend to push wages upwards, and we can therefore think of a negative supply side effect as the opposite of a shortage of different types of labour. Further, even under collective bargaining, the presence of many unemployed within certain sectors can of course limit workers in demanding a raise. Given the large inflows of migrants to Sweden during this time, it is therefore still an empirical question whether or not effects like these can be seen.

3. Theoretical background and previous studies

As noted above, a neoclassic economic framework has been the main theoretical approach in analysis of effects of international and domestic migration on wages and wage inequality. Within this school of thought, assuming constant returns scale, the skill composition and educational background of immigrants is critical in terms of outcomes. The basic reasoning corresponds to standard supply and demand theory. If migrants consist predominantly of lower educated workers, or only find work requiring limited schooling, positive net migration should augment inequality because lower educated workers are losing out due to negative supply side effects. Therefore average wages for lower educated categories of workers should be lower in places experiencing positive net migration, and inequality correspondingly higher. If the flow of migrants predominantly consists of higher educated persons however, all else equal, we can expect that net increases in migration should decrease levels of inequality as a result of top wages being suppressed.[1]

In Swedish studies direct linkages between migration and income disparities have received little attention, and studies on effects on wages and relative factor prices are also sparse. In a study on immigration and effects on the relative price of capital (the ratio between returns to capital and average wages), Ekberg (1977) finds immigration to have had a slightly increasing tendency on this ratio, thus implying minor negative consequences for the wage income of the native population, but with this tiny effect further shrinking over time. In a more detailed approach (Ekberg, 1983), calculating effects both on relative wages and employment for different types of labour, very small negative effects and very small positive effects are found for wages of the low and the highly educated workers, respectively.

These results are also largely in accord with what has been found in US studies and in other European countries. For the United States, typically, comparing labour markets with regard to increasing shares of foreign born and income developments for different groups of native workers, studies find elasticities of around -.01 to -.02, thus implying a reduction in wages for low educated workers at around minus 0.2 percent following a 10 percent increase in the

[1] Of course, as part of this reasoning, complementarity between these factors of production also affects the outcome; increasing demand and wages for higher (lower) educated when the migrant labour predominantly consists of lower (higher) educated.

foreign born population (Friedberg and Hunt, 1995; Borjas, 1994). In Europe, where fewer studies have been made, Zimmerman (1994) finds immigration to have had very slight negative effects on the relative wages of low income workers and a corresponding slight positive effect on the income of the highly educated. In a study simulating relative wage effects of immigration for several European countries (Gang and Rivera-Batiz, 1994), also very minor effects are found. Similar estimates of small effects appear in later European studies (Dustmann, Fabbri and Preston, 2005; Frank, 2007; Carrasco, Jimeno and Ortega, 2008).

The overall estimates from this literature would thus imply that immigration tends to have an increasing – but very small – effect on wage income disparities of the native population. As mentioned, the approach taken in these studies – the so-called area approach – has been criticized by some scholars arguing that comparisons between local labour markets tend to mask the larger picture. Since both workers and firms can respond to negative supply side effects (attracting firms while simultaneously discouraging potential migrant workers), any negative effects on relative wages are spread out between local labour markets and are thus not traceable by comparative methodology. These scholars argue that the effects of immigration should instead be understood as taking place on the national level, through general equilibrium effects on income disparities between low and high educated workers. In contrast to studies using an area approach, these authors find immigration to have had considerable negative effects on the wages of the lower educated and therefore strongly contributing to increasing inequality in the US since the middle of the 1970s (Borjas, 2003; Borjas et al., 1997).

As noted above, the purpose of the present study has been to compare this previous research – both approaches constituting different variants of the neoclassical perspective – with assumptions of different types of positive scale affects at the level of the local labour market. A point of departure has been traditional economic geography, and specifically the early writings on Central Place theory (Christaller, 1933, 1966; Lösch, 1954), as well as – though to a lesser extent – Gunnar Myrdal (1957) and Allen Pred (1966). As these writers have contributed to the intellectual foundations for the later work of Paul Krugman, and the implications as regarding possible migration outcomes are similar, I will also briefly comment on his work.

In the economics of Christaller's original theory, the main rationale for the geographic spread of different industries and services is the varying levels of fixed set-up costs relative to the local demand needed to cover these fixed costs. Assuming evenly spread levels of per capita income across regions, businesses or establishments that need a large local population to cover these fixed costs locate in central places of so-called higher order (in relatively larger cities or only in the largest), whereas establishments that require lower levels of fixed costs relative to local demand can be set up in every city, regardless of size. From this we have a link between urban scale and the degree of specialization of the local business structure, or occupational structure. If we think in terms of a cross-section, for each 'step' upwards in the urban hierarchy an additional industry or professional branch is added to the local business structure. The larger the local labour market, the more diversified is the local business structure in terms of the number of occupational branches represented locally.[2]

For our purposes, Central Place theory is relevant for understanding regional differences in income inequality, and by extension for potential effects of migration, in two ways. First, as mentioned above, since it to a significant degree explains geographical variation in occupational structure, if some jobs and some industries are associated with higher average incomes, Central Place theory is also relevant in understanding regional differences in wage inequality. Second, as a corollary (as first proposed by Haworth, Long and Rasmussen, 1977, 1978), if we have a link between size of local population and the number of industries represented in a given locality, we also have some link between the size of local population and the local market structure. If we again think in terms of moving up the urban hierarchy, until there has been a sufficient increase in either local population or level of local demand, the 'added' industry or professional branch will, in effect, be able to exercise some degree of local monopoly power. And, to the extent that business specialization also requires specialized labour, the characterization of the local market for certain goods and services as monopolistic also applies to the local labour market, i.e. to capital as well as to labour. This characteristic of local market structure is something we

[2] By way of simplification, this account of Central Place theory assumes some given fixed level of transport costs. In the original theory, the number of industries represented in a given locality is also a function of transport costs. Lower transport cost increase the effective size of the local labour market (more people from surrounding smaller cities can access the jobs, goods, and services offered in the central place), thus enabling an increase in the degree of specialization of the local business structure, whereas the opposite is true for an increase in transport costs. For a summary of Central Place theory, see e.g. King (1984). For a more critical assessment, see Beavon (1977).

could expect to be reflected in the local wage level of that particular 'added' industry.[3]

As noted in the introduction, the fundamentals of Central Place theory are also much in accordance with the new geographical economics literature where all agglomeration is seen as a result of a basic trade-off between economies of scale on the one hand and transportation costs on the other; sometimes referred to as the so-called Folk-theorem of geographical economics (cf. Fujita, Krugman and Venables, 1999; Fujita and Thisse, 2002).[4]

For example, Krugman's Core-Periphery model (Krugman, 1991a) sets about to explain the logic of 'centrifugal' and 'centripetal' economic forces, in effect, the causes of agglomeration and dispersion of economic activities. This is done from a very limited set of basic assumptions. In contrast to Central Place theory which deals with dispersion between many places, the Core-Periphery model deals with only two. Also, while the discussion in Christaller's original work evolves around what he calls the production of central goods, and no clear distinction is made between goods and services, Krugman explicitly focuses on goods. But the core themes are however very similar. In effect, in both approaches, different types of fixed set up costs related to market size determine the amount of dispersion of economic activities.[5]

The Core-Periphery model assumes two production locations differing in size, and two economic characteristics, firstly the existence of transportation costs and secondly that some but not all of the goods produced in the two locations

[3] This local monopoly-, or oligopoly, power is also a function of transport costs, in the sense that it would disappear if people, services and goods could be moved at no cost.

[4] The reasoning behind this theorem goes like this; if production of goods and services were characterized by constant returns to scale and transport costs were at impedingly high levels, we would see "backyard capitalism" – a situation where everything can be produced where people live and we need not agglomerate. If, on the contrary, production of goods and services are all characterized by increasing returns to scale and transport costs are non-existing, everything would be produced in one locality. Because of this, agglomeration is said to be a product of a basic trade off between these two forces (cf. Fujita and Thisse, 2002 pp. 25-28).

[5] The account of Central Place theory in this thesis focuses heavily on Christaller's original work, but it is worthy to point out that Lösch later developed the original framework explicitly for the production of goods, and how falling costs per unit – increasing returns – could offset the costs of transporting goods between local markets, something which enabled specialisation of production within the urban hierarchy. In this regard, too, the reasoning is very similar to Krugman.

are subject to increasing returns to scale at the plant level (Krugman, 1991b). Furthermore some of the inputs to production are assumed to be immobile (e.g. agriculture or existing production plants) while others (workers) are mobile. The model then suggests a basic tension between centrifugal and centripetal economic forces. Increasing returns – different types of fixed set up costs and indivisibilities – at the plant level would at an initial stage lead to concentration of production for those goods subject to increasing returns, in one of the two localities. The existence of increasing returns implies that production costs per unit decrease with the scale of production (i.e. economic efficiency is increased with plant size), thus profits increase if production is concentrated. Transport costs, on the other hand, are reduced to a minimum – all things equal – if production is located where there is a market, that is, if it is located in both localities. In other words, the geographical distribution of production between the two places depends on a trade-off between transport costs and the fixed costs associated with investment in production capacity.

Sufficiently high transport costs, then, offset the gains from producing in only one of the two localities. Depending on the magnitude of the forces involved, firms have an incentive to concentrate production where the market is the largest. Adding migration to the model, mobile workers will tend to move to where firms locate, but the market will be largest where the workers locate, suggesting the existence of self-reinforcing cumulative processes. However, as long as not all resources (including workers) are mobile, transport costs are substantial and some production is not subject to increasing returns to scale, there will be a countervailing tendency of dispersion, locating production where resources and markets are located. The outcome, whether the relation between the two localities will be stable or if development will 'tip' in the direction of increasing concentration, will depend on the strength of these centripetal and centrifugal forces respectively (for additional discussion and more critical assessments, see also Baldwin, 2001; Brakman and Garretsen, 2003).

Central Place theory, and by extension the works of Krugman and others, are relevant in developing an alternative hypothesis as regarding migration (whether domestic or international) and possible effects on wage dispersion for two main reasons. Firstly, as noted above, if we have some link between the size of local population and the local market structure for different types of industries, migration can theoretically affect levels of local demand, while at the same time not affecting market structure (the level of competition) for these industries. On

the basis of Central Place theory and this basic reasoning, economists Haworth, Long and Rasmussen (1977, 1978) develop what they call a "monopoly hypothesis". Increasing city size due to positive net migration, they argue, effectively increases demand for local goods and services while at same time, due to existence of industry specific indivisibilities and entry barriers, different industries are to a varying degree protected from increasing local competition following the concomitant increase in demand for goods and services.[6] With this logic, increasing city size gives rise to 'monopoly rents' for groups that to some degree are insulated from competition, an effect of positive net migration thus being increasing inequality 'from the top', or, because upper income levels tend to increase at a faster rate than the income of workers in the middle or lower segments of the local income distribution. Comparing developments between 1960 and 1970 for 79 US SMSAs, using simple OLS methods, they find migration (population change) as having significantly positive effects on estimates of the local Gini coefficient, controlling for competing explanations such as educational disparities and change in the local occupational structure as (Haworth et al., 1978).

Secondly, as also discussed in Haworth et al., given a link between industrial diversification and size of local population, we can expect change in local population size over time to be associated with changes in industrial diversification. In other words, assuming that migrant populations exert some level of demand for local goods and services, we can expect a net positive increase in migration, regardless of their educational status, to result in more specialized industries being added on to the local business structure of the destination where these migrants settle. If specialization of industries and specialized labour can be associated with higher average wages, this increase in the number of specialized industries should over time contribute to increasing disparities of local wage structures. Given this, changes in the size of local population due to net changes in migration levels should affect the whole business structure of destination communities and not just the industries where the migrant population finds work.[7]

[6] The authors illustrate by comparing the relatively high entry barriers in the local newspaper industry to the much lower equivalent in gas stations, fast food restaurants and similar enterprises.

[7] The articles of Haworth et al. stirred some debate at the time; see Walker, 1979, 1981; Haworth et al., 1979, 1981; Hirsch, 1982. Other authors that have explored similar issues are discussed in article number one, below.

The Core-Periphery model is also relevant here in that it opens up for the discussion of cumulative causation as fundamental in regional economic growth processes. Primarily in papers three and four, I also mention works of Gunnar Myrdal (1957) and Allen Pred (1966, 1977). Briefly summarized, the main contribution of Myrdal to economic geography and development theory (sometimes referred to as 'high development theory', cf. Krugman, 1997), is the idea of circular and cumulative processes in regional development. The essential argument is that regional economic development in most cases is characterized by circular processes where different dynamic factors tend to "lock into" one another, giving a cumulative development in either a positive or negative direction. In this context market forces – here defined as migration, capital movements and trade – tend to strengthen regional disparities in development rather than working to equilibrate them. In Myrdal's thinking, the movement of people – internal migration – is an essential part of both negative and positive local development, and economically expansive areas tend to attract migration. This has a direct positive effect on demand for goods, services, and investment in housing, roads and public amenities in the regions and cities to which the flows of migration are directed. By the same token, migration has a negative effect in regions experiencing net negative flows.

Thus, migration and capital movements together often give rise to a kind of positive or negative "momentum". In the positive case we see that continued demand for capital, and new rounds of investment permit increasing levels of income and savings which paves the way for further investment. In contrast, regions that lack this positive momentum experience lower demand for investment, lower levels of income and lower levels of saving. In the longer run these differing migration flows also lead to changes in the local age structure, with stark regional disparities regarding dependency ratios and the share of the population being of working age. This further tends to exacerbate initial positive and negative development (Myrdal, 1957, pp. 24-25). In addition to migration, capital flows and trade, Myrdal also dwells upon different types of positive and negative externalities, as part of these self-reinforcing developments. [8]

[8] In the search for higher levels of capital turnover, capital markets also tend to increase these regional disparities rather than to curb them, transferring savings from areas with low levels of investment to those experiencing economic expansion, and thereby adding to regional polarization. As regarding regional trade, through increasing returns to scale, agglomeration of production capacity in industrial centres permits comparative advantages and relatively

In comparison with Krugman's model, Myrdal is not specific about the effects of the size of the local market in understanding the direction of the cumulative process (although he does, in more general terms, compare attractiveness of the larger vis-à-vis the smaller market in regard to labour market diversity and the market for consumer goods). Instead, positive and negative development is mainly a product of previous success and failure. In Krugman's model, on the other hand, the difference in size of the market is crucial for understanding the cumulative process.[9]

The importance of city size, or size of the local market, is however later introduced by Allen Pred (1966), who develops a framework for understanding city growth and regional development along very same similar lines as Myrdal. Like Myrdal before him, Pred also focuses on the role of migration but puts relatively more emphasis on regional trade while adding elements of Keynesian multiplier effects, common in the economic discourse at the time. Also, in contrast to Myrdal, Pred introduces the concept of thresholds, a term borrowed from Central Place theory, as an important element of understanding regional economic development. That is, the increase in local population through positive net migration flows subsequently allows for the establishment of businesses for which the local population, or the local income level, hitherto had not been sufficiently large. Like Myrdal before him, Pred also describes the "cumulative loop"; growth leads to further growth if successive thresholds for various businesses are overcome.[10]

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lower unit costs, which in turn means heightened competition for relatively small scale production outside of these industrial centres. The expansion of markets and increases in trade can thereby in itself be argued as having a regionally polarizing effect (1957, pp. 29-31).

[9] Other differences are of course that the Core-Periphery model leaves out the whole discussion of negative or positive external effects, which Myrdal sees as part of the concept of a cumulative process, and that Myrdal, by and large, leaves out the question of different transport costs and how these can change the regional outcomes. Also, though both Krugman and Myrdal aim at describing centripetal and centrifugal forces, Myrdal largely leaves out the possibility of stability in the trade off between the two, at least in the long term, while Krugman's model allows the strength of the forces involved to determine the outcome.

[10] Pred (1966) discusses two non-formal models – that is, not mathematically formalized models – corresponding to different periods in American history: One where city growth primarily is driven by commercial expansion (1800-1840) and another where industrial expansion has a larger influence (1860-1914). These do not differ in any principal way but merely underline different aspects of the same mechanisms.

In this thesis, mainly in papers number three and four, I refer to writers such as Myrdal and Pred and their concepts of cumulative causation as an underlying developmental force, as an alternative explanation to neoclassic interpretations of different migration outcomes. In paper number three, it motivates why we do not necessarily need to expect wage competition to define the outcome for low-income native born workers. In paper number four, it is used as a motivation for why migration within an urban system must not necessarily gravitate towards an equilibrium, a notion which is sometimes invoked by scholars (see discussion, paper number four). In other words, I do not provide any type "test" for existence of cumulative causation, something which would be very hard to do. We should however note that different notions of cumulative causation, as opposed to equilibrium economics, pose significant challenges for the analysis of migration outcomes. In neoclassical economics, or equilibrium economics, we implicitly or explicitly assume that we are moving from one equilibrium to another, and that we thereby can isolate cause and effect as regarding population movements. Under cumulative causation, on the other hand, migration fits into different feedback loops and causality is much harder to define. This is more of a problem for equilibrium economic analysis than from the perspective of economic history, where notions of path dependency in historical development are a common feature (cf. Ottosson and Magnusson, 1997; David, 2001; Arthur, 1994; see also Toner, 1999 for an overview of cumulative causation concepts).[11]

4. Description and summary of articles

The dissertation consists of four separate articles, all addressing different questions related to domestic and international migration, wage income and wage inequality for Sweden during the time-period of this study. A brief description of how these papers are interrelated is as follows. Paper number one, as a point of departure for the thesis, uses cross-sectional analysis to investigate the relationship between size of local population and wage inequality, and tests for different types of explanations – related to urban scale – for the patterns that are found. In paper number two, I attempt to test how these explanations hold up in a dynamic setting (with immigration and domestic migration). More specifically, I explore the hypothesis developed by Haworth, Long and

[11] This is of course something which most are well aware of, therefore the heightened focus on the use of different types of instruments and natural experiments in many types of empirical work.

Rasmussen, discussed above, and relate this to potential neoclassic interpretations. Paper number three specifically addresses potential effects from increasing shares of foreign born within the local labour market on the wage income of low income native born workers, and explores more in detail whether increasing inequality also may emanate from the bottom of the income structure. Finally, as discussed below, since the economic motives and incentives behind domestic migration (of both native and foreign born) are also central in the discussion of potential effects of immigration, paper number four explores this theme.

The first article, *Does Size of Local Labour Markets Affect Wage Inequality? A Rank Size Rule of Income Distribution*, describes and tests for possible explanations of the cross-sectional geographic variation of wage income disparities. Using data for 1995, the paper shows how wage inequality systematically increases with labour market size, i.e. the number of people residing within each local labour market. It also pinpoints the basic cross-sectional structure of these disparities, where upper level income increases with population size at a faster rate than mid- or lower level incomes.

Turning to possible explanations of the above patterns, I discuss two different theoretical approaches; one based on ordinary Human Capital theory and another related to traditional geographic Central Place theory. Controlling for factors such as age structure and different types of labour market fixed effects, wage inequality is significantly and positively related to both increasing shares of higher educated as well as greater degrees of diversification, i.e. a greater number of industries represented within the local labour market. Thus, the results are in accordance with both these theoretical approaches. Results suggest that Human Capital theory does not fully explain the variation in income disparities that are related to size of local population and that increasing business diversification captures an additional factor, a factor that – at least statistically – has similar importance. Although we cannot directly test our hypotheses related to Central Place theory, we cannot reject the hypotheses given in this methodological approach.

The paper thus points to something that I regard as worthy of further work. If the approach related to Central Place theory has some merit, it suggests that differences in market structure (i.e. the degree of competition) between different types of industries are of potential relevance as for income disparities between

workers within these industries. In that regard, Central Place theory suggests a complementary – though not mutually exclusive – approach to Human Capital theory in understanding wage disparities and inequality.

The results also raise the question of how to include these types of urban scale effects, related to diversification, as part of our understanding of income effects of migration. The question is thus to what extent possible effects of migration on inequality and income disparities can be understood as effects related to changes in business diversification rather than, or in addition to, supply-side effects on the educational composition of the labour force.

The second paper, *Migration and Wage Inequality – Economic Effects of Migration to and Within Sweden, 1993-2003*, looks at the relationship between local population size and wage inequality in a dynamic setting. In the paper, I attempt to compare neoclassic interpretations (i.e. wage competition) with an alternative hypothesis, related to Central Place theory and indivisibilities at the level of the local labour market (the so-called monopoly hypothesis developed by Haworth, Long and Rasmussen, discussed above).

In a descriptive sense, firstly, the paper shows how changes in total migration are related to changes in wage inequality, and also how these changes are mainly emanating from relatively larger increases in the upper half of the income distribution. Second, to explore the possible alternative interpretations of the found empirical patterns, I estimate an OLS model using the ten year percent changes of all included variables. In this fashion, different categories of net migration – the main variables of interest – are regressed on levels of wage inequality, while controlling for factors such as change in business diversification and educational composition of the local labour market. The model is tested using a range of inequality measures sensitive to change in inequality in the upper half of the income distribution. In addition, I also test for change in the lower percentile levels, as to get a sense of migration's possible effects on the bottom-half of the income distribution.

The results indicate that the link between total migration and changing inequality boils down to domestic migration of the Swedish born population, and none of our groups of foreign born are significantly related to changing inequality. On the basis of this, it seems safe to assume that the increase of foreign born migrants in Sweden during the 1990s has not been an substantive

factor in the overall increase in wage inequality during the studied time-period, at least not in terms of potential negative effects through wage competition. The finding that migration of the Swedish born – the main migrant category – is positively related to changes in inequality, however, lends support to the alternative monopoly hypothesis. The results suggest that positive net migration can affect income dispersion regardless of the possibility of wage competition.

In the third article, *Does Immigration Hurt Low Income Workers? Immigration and Real Wage Income below the 50th Percentile, Sweden 1993-2003*, our aim is to analyse the relationship between earnings for low income native born workers and increasing shares of foreign born within the local labour market. The main question concerns weather any negative supply side effects on income of native born workers can be traced in the Swedish case. The paper uses individual longitudinal data for two time-periods, 1993-1999 and 1997-2003. To examine the above question, two different statistical models for each of these two periods are estimated. One controls for regional fixed effects such as differences in industry structure, levels of unionization among workers etc, and the other for individual fixed effects – factors such as attitudes, tradition and individual level attributes often described as being "in the air" within the different local labour markets used in the study. The two models are tested for the low and intermediate level educated as well as by using different percentile levels below median wage income as population cut-off points.

The results point towards a mostly positive but not very strong relationship between shares of foreign born population and wage income for the native born, results in line with those obtained in similar studies for other European countries and the US. In comparison to those studies, the article also tries to separate between variation at the level of the local labour market and variation among individuals living within these local labour markets. This methodological approach has been suggested by some scholars (cf. Longhi, Nijkamp and Poot, 2005, pp. 473-474) but to our knowledge not yet explored. We find that very little of the explained variation can be ascribed to differences between labour markets, for example as regarding shares of foreign born population. Therefore, the results suggest that not only are coefficient estimates in these types of studies usually small (either positive of negative); at least in case of Sweden very little of the explained variation between low income workers can be ascribed to potential competition from foreign born workers.

In the fourth article, *The Urban Hierarchy and Domestic Migration: The Interaction of Internal Migration, Disposable Income and the Cost of Living, Sweden 1993-2002,* we look at migration and economic outcomes from the viewpoint of the individual migrant household. Focus here is not, as previously, on wage income and wage disparities but rather on the motivating factors in internal migration. The paper gauges household gains in disposable income related to internal migration and compares differences in outcome along two dimensions. The first one examines the relevance of taking housing costs into account, and second, the direction of the move in terms of the urban hierarchy; upwards versus downwards within the urban hierarchy (to larger or to smaller labour markets), and into versus out from population growth regions. In short, we find relatively higher increases in disposable income for households moving up the urban hierarchy and into population growth regions. Taking housing expenditure into account, the pattern is however reversed; the largest gains are made by moving from larger to smaller labour markets and out of population growth regions, a much smaller share of total domestic migration.

The paper is related to the general theme of the thesis in the following ways. In the methodological debate over how to estimate the economic effects of immigration, an influential argument has been that these effects cannot be traced by comparing local labour markets for shares of foreign born workers on the one hand, and the economic outcomes for those potentially competing with immigrant labour on the other (the so-called area approach). This, so the argument goes, is because both international and domestic migrants are assumed to react to any downward pressure on wages by moving out of growth areas experiencing positive net inflows, something which at least in theory would nullify wage disparities between regions. Therefore, we should not compare outcomes between different labour markets if we want to gauge the effects of immigration, but rather estimate general equilibrium models that look at changes in different factors of production summarized for the nation as a whole. By showing that potential gains from moving down the hierarchy (and out of population growth regions) are very substantial compared to the gains from moving up (and in), the results in our paper highlight substantial economic incentives for movements out of population growth regions. The paper thus suggests that migratory outflows from growth regions can to some extent be responses to local costs of living, instead of assumed responses to downward wage pressure which are difficult to trace empirically.

5. Conclusions

In summary, this work suggests that using only a neoclassic approach for interpreting changes in wage inequality related to migration is problematic. We cannot completely rule out wage competition as a factor in these dynamics, but the results in these studies and the modelling approaches used here, suggest that the domestic and international effects on income structure and wage dispersion are related mainly to changes emanating from the top of the income distribution. Also, it is possible that part of this dynamic has to do with indivisibilities and some type of monopoly rents in local labour markets experiencing positive net migration. In other words, we cannot falsify the alternative hypothesis explored in paper number two that increasing wage inequality emanating from the top are related to the factors suggested in that alternative approach. Although, with our modelling approach, we do not specifically find significant effects of the foreign born migrants on wage inequality, these results suggest an additional, or alternative, interpretation of income effects related to migration that is potentially important, definitely less explored, and which motivates further research along these lines. The study, in paper four, also suggests that assumptions of domestic migration as a reaction to negative wage pressure, as is a common assumption in general equilibrium modelling of immigration's effects on inequality, are problematic. Domestic population movements out from population growth regions can also reflect potential gains in disposable income, with decreasing housing costs and costs of living as a strong motivating factor.

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Paper 1

Does Size of Local Labour Markets Affect Wage Inequality? - A Rank-size Rule of Income Distribution

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Abstract

The question addressed in this paper is twofold: (*i*) does wage inequality increase with local population size, and if so, (*ii*) what are possible factors behind this increase? In a cross-section analysis of Swedish local labour markets using unique full population data, the paper shows that urban scale, i.e. size of local population, has significant positive effects on wage inequality. Testing for potential explanations, labour market diversification, human capital, migration, age structure and employment are shown to be significantly associated with inequality. Given these effects, the paper raises the question of how to understand and incorporate scale effects into models of long-term change in wage inequality.

Keywords: Wage inequality, local labour markets, urban size, business diversification
JEL-codes: R12, J31, D63, J40.

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1. Introduction

Within the social sciences, the question of income inequality is traditionally analyzed within either sociology (norms and power structures) or economics (human capital and factor supply analysis). In line with what has been argued in earlier scholarship (detailed later), this paper shows that inequality has a clear geographical dimension as well. The main questions addressed are, one, in a cross-section analysis, does wage inequality increase or decrease with urban scale – the size of local labour market population –, and two, what are the correlates of inequality? The empirical evidence provided suggests that local population size has significant positive effects on wage inequality. Also, size of population is shown to affect all wage levels, but top level income to a relatively larger degree than median or lower wage income. Thus, the evidence at hand also suggests that the effect on inequality stems from relatively larger increases in top wage levels as size of local population increases.

These results are important for two reasons. First, across the globe continued urbanization is a recurrent feature of regional development. For example in Sweden, which constitutes the basis for this analysis, this trend has been reinforced during the past fifteen years with the three largest areas showing absolute growth of around 300 000 individuals during the same time span (2004), the equivalent of about 3.3 percent of total population. In the case of Sweden, these patterns are also projected to continue in the foreseeable future, partly because of domestic and international migration and partly because of population growth inherent in regional age-structure disparities (for Swedish readers, see Korpi, 2004). These findings thus provide an alternative partial explanation to past increases in inequality and point to increasing wage inequality as something to expect from future demographic change alone. Second, the findings have potential importance for how we think about long term changes in inequality. For example, in studying effects of immigration on inequality and relative wages over time, an influential argument has been that these effects can safely be traced through general equilibrium analysis. In these analyses however, by using linear homogenous production functions, constant returns to scale are assumed and potential scale effects are disregarded. Consequently, increasing inequality is seen as reflecting the fact that immigration has affected the relative supply of low educated workers in the economy (Borjas, 2003; Borjas and Freeman, 1992; Borjas, Freeman, Katz, DiNardo and Abowd, 1997; Reed, 2001). By contrast, for Swedish data, this

paper shows clear scale effects at the level of the local labour market, that go beyond the relative distribution of educational and occupational groups. The findings therefore suggest a measure of caution in the type of general equilibrium modelling mentioned above, and hint at the need for a complementary approach.

What follows in section 2 and 3 is a theoretical outline and a discussion of previous studies that puts the study in proper perspective. Section 4 describes data and method, while section 5, 6 and 7 provide descriptive figures, model results, summary and concluding remarks.[2]

2. Theory

With few exceptions, the issue of income inequality has largely been absent within modern Economic geography literature, and to the extent that it is raised within Geographical economics, focus has mainly been on potential effects of density of local population and not of labour market size or urban scale. For example, Glaeser (1999) suggests a negative link between population density and income inequality because productivity might be unevenly distributed among workers as a result of differences in learning. The argument postulates the common theoretical notion that local productivity and learning is enhanced by the amount of personal contacts between people/workers. The ability of low skill workers, however, is assumed to be more affected by this person-to-person learning than is the case of high skill workers. Since there is a theoretical link between levels of productivity and wage levels, this phenomenon is assumed to have the effect of compressing the income structure. Thus, the higher the population density the more compressed the income structure and the lower the levels of wage inequality.[3]

[2] It should be noted that this paper is part of an ongoing research project on questions of regional income inequality. The paper at hand addresses the static structure of inequality across the urban hierarchy. Another question to be explored in future research is how, in a dynamic setting, inequality changes with changes in the urban hierarchy, i.e. with changes in size and educational composition of the local population and the local business structure.

[3] This theoretical link is also explored in a recent paper by Wheeler (2004). Using county level data from 1970 to 1990, Wheeler finds a robust negative link between population density and different measures of wage inequality, and argues that decreasing population density at county and city level during this period might help explain the persistent rise in income inequality during this same time span.

Aside from density and the approach taken by Glaeser and Wheeler, what reason do we have to believe that local labour market size could affect top incomes to a larger extent than lower incomes, that is, could we expect *increasing* wage inequality with increasing labour market size? As I will argue, a case for this can be made building upon two separate, but not mutually exclusive, theoretical approaches. On the one hand, regular Human Capital theory, focusing on individual characteristics of workers, in this case on workers within the local labour market. On the other – much overlooked and seldom considered – Central Place theory, focusing on local business structure, or on 'the job' rather than the individual.[4]

Within the field of economics, Human Capital theory (Becker, 1964) is easily the most frequently used approach for explaining earnings differences, both among individuals and within society at large. Principally, it regards wage income differences among individuals as a consequence of individual differences in the market rate of return to investments in education and training, but also to other personal characteristics like ambition, talent, intelligence and experience.

The manner in which the theory is applicable to geographic variation in inequality is, at least at the onset, straightforward. If higher educated are relatively more productive and this is reflected in their wages, we would expect inequality to vary with the local distribution of education. That is, up to a certain brake point, the larger the share of highly educated the higher the local levels of inequality. Since a higher educated labour force is usually a more common feature of larger labour markets relative to smaller ones, we can hypothesize that increasing inequality should be positively correlated with labour market size.

Barring assumptions of some kind of long run demand externalities, it is however obvious that this can only be a theory valid in the short run. In the long run, differences due to regional variations in labour supply should disappear, either because of downward pressure on the wages of the group of workers in relative larger supply or because workers are assumed to move where the rate of return to their specific human capital is the highest, both of which would tend to equalize wages and inequality across regions. If, on the other hand, we see long

[4] "Labor market size", "size of local population" and "urban scale" are used alternately throughout the text, meaning total labor market population.

run differences regarding these features, we have to assume the existence of some kind of permanent external economies, however defined.

Turning to the field of geography and Central Place theory (Christaller, 1966; Lösch, 1954), as mentioned above, the focus is instead on local business structure. In the economics of Christaller's original theory, the main rationale for the geographic spread of different industry branches and services is the varying levels of fixed set-up costs relative to the local demand needed to cover these fixed costs. Assuming evenly spread levels of per capita income across regions, businesses or establishments that need a large local population to cover these fixed costs locate in central places of so-called 'higher order' (in relatively larger cities or only in the largest), whereas establishments that require lower levels of fixed costs relative to local demand can be set up in every city, regardless of size. From this we have a link between urban scale and the degree of specialization of the local business structure, or occupational structure. If we think in terms of a cross-section, for each 'step' upwards in the urban hierarchy an additional industry or professional branch is added to the local business structure. The larger the local labour market, the more diversified the local business structure (the number of occupational branches represented locally).[5]

Although there's been a long hiatus in central place related research, roughly during the past thirty years, this theoretical approach can still be said to be highly relevant. For example, using Swedish data, the number of industry branches represented within the local labour market can be shown to be a log-linear function of the size of local population, with an R^2-value of 0.96 (Strömquist, 1998). In another study, using a somewhat different approach, 75 percent of all industry branches are shown to be significantly correlated with the size of local population (Malmberg and Korpi, 2000).[6]

[5] By way of simplification, this account of Central Place theory assumes some given fixed level of transport costs. In the original theory, the number of industry branches represented in a given locality is also a function of transport costs. Lower transport cost increase the effective size of the local labour market (more people from surrounding smaller cities can access the jobs, goods, and services offered in the central place), thus enabling an increase in the degree of specialization of the local business structure, whereas the opposite is true for an increase in transport costs. For a summary of Central Place theory, see e.g. King (1984) or, for Swedish readers, Malmberg and Korpi (2000).

[6] As an aside, Christaller can in this respect be seen as providing a 'city specific'-version of Adam Smith's classical statement that "the division of labour is limited by the extent of the market". In other words, to the extent that markets are local and depend on local population size we would expect Smith's statement to hold not only on a global, national or regional level, but also for cities and local labour markets.

The fundamentals of Central Place theory are also much in accordance with the new 'Geographical economics' literature where all agglomeration is seen as a result of a basic trade-off between economies of scale on the one hand and transportation costs on the other; the so-called "Folk-theorem" of Geographical economics (cf. Fujita, Krugman and Venables, 1999; Fujita and Thisse, 2002).[7]

Returning to the question at hand, Central Place theory is relevant for understanding regional inequality in two ways. First, as mentioned above, since it to a significant degree explains geographical variance in occupational structure, if some jobs and some industry branches are associated with higher average incomes, Central Place theory is also key to understanding regional differences in wage inequality. Second, as a corollary (first proposed by Haworth, Long and Rasmussen, 1978), if we have a link between size of local population and the number of industry branches represented in a given locality, logically we also have some link between the size of local population and the local market structure. If we again think in terms of moving up the urban hierarchy, until there's been a sufficient increase in either local population or level of local demand, the 'added' industry or professional branch will, in effect, be able to exercise some degree of local monopoly power. And, to the extent that business specialization also requires specialized labour, the characterization of the local market for certain goods and services as monopolistic also applies to the local labour market, i.e. both to capital as well as to labour. This characteristic of local market structure is something we could expect to be reflected in the local wage level of that particular 'added' industry branch.[8]

So, to sum up, a case can readily be made for increasing inequality with labour market size, building upon economic as well as geographical theory. This increasing inequality should also stem from relatively higher increases in top wages, broadly defined, as size of local labour markets increases. However, the

[7] The reasoning behind this theorem goes like this; if production of goods and services were characterized by constant returns to scale and transport costs were at impedingly high levels, we would see "backyard capitalism" – a situation where everything can be produced where people live and we need not agglomerate. If, on the contrary, production of goods and services are all characterized by increasing returns to scale and transport costs are non-existing, everything would be produced in one locality. Because of this, agglomeration is said to be a product of a basic trade off between these two forces (cf. Fujita and Thisse, 2002 pp. 25-28).

[8] This local monopoly-, or oligopoly, power is also a function of transport costs, in the sense that it would disappear if people, services and goods could be moved at no cost.

aforementioned approach taken by Glaeser et al., complicate matters somewhat. The focus of this paper is not on density, and indeed, one of its underlying assumptions is that density is a function of the urban hierarchy (or increasing returns at either plant or city level) and that therefore size of local population is the more relevant variable. However, since for Swedish data, size of local population and population density are highly correlated the study does have additional input relevant for that debate as well.[9] That is, if we allow ourselves to use size of local population as a proxy for density, Glaeser et al's approach can also be extended to a local labour market setting, and, if their proposition is true, declining inequality should go hand in hand with a larger local population. This diminishing inequality should also stem from relatively higher bottom wages as size of local labour markets increases.

Thus, the main question here is twofold. 1) Does inequality increase with urban scale – the size of population in the local labour market –, and, if so, what part of the income distribution is affected, and 2) what are the possible factors behind this increase? The paper tests for size effects on local levels of inequality and controls for the major implications of the above mentioned theories; human capital levels, i.e. the share of higher educated, and levels of industry diversity within each local labour market. In addition, controls for other factors such as age structure, employment levels and migration are also made.

3. Previous Studies

Surveying the literature, one obvious conclusion is that research findings on the effects of city and labour market size on income inequality have been mixed (Richardson, 1973; Burns, 1975; Danziger, 1976; Farbman, 1975; Haworth et al., 1978, 1977; Garofalo and Fogarty, 1979; Chakravorty, 1996). Broadly speaking, earlier empirical and theoretical work tended towards the conclusion that inequality diminished with city size and size of local population. Later on, this belief was by and large replaced by the opposite view; the larger the city the higher the level of inequality, and this latter conclusion has also been

[9] The correlation coefficient for density and size of local (working age) population for Swedish data is around 0.70. Population density is however calculated using municipalities and large areas, mostly in the north of the country, can more accurately be described as relatively small agglomerations in largely uninhabited space. Taking this into account, the correlation would most likely be even higher.

strengthened by some empirical work of the past few years using state level data.

Examples of early studies include Richardson (1973). Building upon Duncan and Reiss (1956), who in their statistical survey of the USA found the Gini-coefficient of personal income in 1950 to be decreasing with size of urban population, Richardson likewise found larger size of urban population to be associated with decreasing inequality. This, in turn, was associated with increasing average income levels and city size. The explanation offered was very much inspired by Kuznets (1955), who famously argued that inequality and economic development follows an inverse U-shaped pattern, with rising inequality in initial stages of development followed by lower levels with the subsequent spread of technology and rising levels of education. As urbanization was regarded as a form of economic development and as American cities were regarded as being well beyond the initial stages of economic development, Kuznets' hypothesis could be seen as an indirect 'explanation' for the pattern observed.

Both these studies however used rather imprecise measures of income inequality and Richardson explicitly acknowledged that larger cities could provide possibilities for higher incomes, although he could not find any such patterns in his data. Other studies finding a negative or insignificant relationship between city size and inequality include Frech and Burns (1971), Burns (1975), Soroka (1984), and Danziger (1976).

Starting with the theoretical work of Thompson (1968), the predominant view subsequently came to be that city size and inequality were positively correlated. Using a standardized regression model and a sample of 160 US cities divided into eight city-size classes, Betz (1972), found the Gini coefficient for each separate city class to be increasing with size. Using US SMSA data and similar methodological approaches, this conclusion later came to be strengthened by Farbman (1975), Haworth, Long and Rasmussen (1978, 1977), Garofalo and Fogarty (1979), Nord (1980) and most recently Chakravorty (1996). However, only one of these studies include data for cities not part of any larger SMSA and with populations smaller than 50 000 inhabitants. For these smaller cities, Nord (1980) finds income inequality to be decreasing with city size, thus suggesting a U-shaped relationship between city size and income inequality, with inequality decreasing up until a break point of cities with around 50 000 inhabitants, but

increasing beyond that (for the SMSA's with populations larger than 50 000, his findings are in line with the aforementioned authors).

With few exceptions, increasing levels of inequality are here associated with changes in occupational mix (a larger share of white collar, and less manufacturing as a share of total employment), a larger share of non-white population, and increases in the median or average wage level. Education, or some measure of labour force "quality", is also commonly controlled for, but here results are less clear. Some authors (Burns, 1975; Garofalo and Fogarty, 1979; Danziger, 1976; Chakravorty, 1996) find a positive relationship between different measures of education inequality and income inequality, while others find increases in median years of schooling as reducing levels of income inequality, hypothesizing that this effect is due to lower returns to education (Farbman, 1975; and Nord, 1980). Since changes in the median do not necessarily imply anything specific about changes in the distribution of education, or education inequality, these results are somewhat hard to compare. However, if an increase in median years of schooling means less inequality in education, the results are commensurate with one another, if not, they are contradictory.

Some of these studies have also taken a dynamic approach, including population growth as a potential source of inequality (Burns, 1975; Garofalo and Fogarty, 1979; Nord, 1980; Haworth et al., 1978). The results here have been somewhat mixed, some showing significant positive effects (Garofalo and Fogarty, 1979; Haworth et al., 1978), others negative (Chakravorty, 1996) or more ambiguous results (Burns, 1975; Nord, 1980).

In more recent papers on the causes of post 1970 rising US inequality, there has been an increasing focus on using US state level data rather than often used in-between country data, and on doing longitudinal analysis instead of the more common cross-sectional analyses. The main focus in these papers, however, is not city level income inequality per se, but rather increasing US income inequality in general, and the practice of using state or local labour market data seems to stem largely from a desire to avoid the various methodological problems involved with cross country analyses. Accordingly, perhaps, local population size and broad regional dummy variables (to control for unmeasured regional effects) are used with only very rudimentary theoretical background

provided as to why city or local population size at all should be included in matters of income distribution and inequality.

For example, Partridge, Rickman & Levernier (1996) recall Kuznets' above mentioned argument, that since "…urbanization is a measure of economic development, a greater metropolitan share should reduce income inequality" (p. 22). However, since service producing industries often show a bimodal wage structure and since such industries are often concentrated in urban areas, the authors argue that the inverse might actually be what to expect. Using panel data from 1960 to 1990 for the 48 contingent US states, they find that both the percentage of population living within metropolitan areas and local immigration levels have significant positive effects on (state) levels of inequality. Morill (2000), using US state level data comparing two points in time with two cross-sectional regressions, one for 1970 and one for 1990, argues along a somewhat similar line. The supposed link between city size and income inequality is negative, but recent urban economic growth might be associated with increasing income inequality due to changes in labour market structure. Morill finds rising inequality associated with high median income growth, immigration and percentage living within metropolitan areas (however, the latter variable being significant only for 1990). Similarly, McCall (2000), in an important study of within-group wage inequality in US local labour markets where she uses the residual standard deviation as a measure of inequality, includes size of local population to "control for the tendency of wages to be higher in large cities".[10] As with Morill, no explicit reference is made to any earlier literature suggesting that city and labour market size *per se* might have some independent effect on inequality. Nevertheless, she too finds size of local population and different regional fixed effects to be significant factors, together explaining as much as 36 percent of within group variation among the wages of male workers.

To sum up, we find disparities in both results and theoretical approach. However, the empirical results have been more in favour of a positive relationship between city size/size of local population and levels of income inequality, rather than the opposite. This conclusion is also strengthened by later findings. When it comes to theory, there was never, and still isn't, any real consensus as to the causes of the found pattern. There is however a common notion in most of these approaches. That is that increasing income disparities

[10] In other words, she uses the standard deviation of what is *not* explained by her control variables (i.e. the residuals) as a measure of inequality.

with city or local population size stem from changes in local skill or occupational composition, sometimes associated with in-migration, sometimes treated more as a given external factor. These differences are commonly measured using different measures of educational inequality, and, for occupational composition, controlling for share of blue/white collar jobs.

One potential problem with many of the earlier studies from the 1960s and 1970s is the often singular use of the Gini coefficient as a measure of inequality. As is well known, the Gini coefficient is most sensitive to changes and variation around the middle of the income distribution. If the theoretical outline presented above has some merit, however, city or labour market size should mainly affect upper (or bottom) income levels. In addition to the Gini coefficient we therefore present three different measures of inequality, differing both in definition and type as well as in regards to the part of the total income distribution on which they focus. Also, in contrast to many recent papers, we use data on local labour markets rather than broad regional level data (as in Partridge et al and Morill, discussed above).

4. Data and methods.

The study utilizes a database consisting of longitudinal full population data covering all individuals living in Sweden some time between the years 1990-2002. The database (*Place*) has been compiled in cooperation between Statistics Sweden (SCB), The Department of Social and Economic Geography and the Institute for Housing and Urban Research (IBF), both at Uppsala University. Unprecedented in scope and geographical level of detail, the database provides a series of individual level data, including place of residence and work, occupational status, education, source and level of income.

For this study, as it concentrates on income inequality in one cross-section, we use data for one year only (1995). From this data, in turn, all persons with a yearly wage income above three million and below 30 000 Swedish crowns are excluded, the equivalent of around 420 000 and 4200 US dollars, respectively (in 1995 exchange rates). The first measure rids the data of a small number of individuals – 137 in total, almost all of which live in the bigger metropolitan areas. This hardly affects inequality estimates of the larger labour markets but serves to avoid an outcome where top level inequality in a few small labour

market are disproportionately driven by one or two individuals.[11] As regarding the second measure, this in turn follows common practice in studies of income distribution and its objective is to confine the data only to workers with a reasonably strong attachment to the labour market.[12] In addition to this, we also exclude all individuals under the age of 25, this with basically the same motivation as the last measure. Under the age of around 25 a very large share the today's cohorts are not yet fully established on the labour market, either because of unemployment or because they are still in education. Also, given major differences in personal income over a life cycle, and the fact that the regional age structure differs mainly in the share of people under 25-30 years of age, the purpose of the measure is to as far as possible rid the results of a potential bias coming from these regional differences. What are left are all men and women between the ages 25 to 64, a population of around 3.5 million people.

As a second step, the individual data are linked to municipalities and municipalities to local labour markets. Because of changes in the size and age structure of local and regional population, and improvements in infrastructure and communication over time, the definition of local labour markets change over time. This paper uses a 1998 definition of local Swedish labour markets by Statistics Sweden. From this definition, Sweden can be divided into 100 local labour markets, made up of some 289 municipalities. The main separation criteria is here the share of working age population commuting out of the municipality on a daily basis, the rule being that if more than 20 percent commute from municipality *a* to municipality *b*, municipality *a* is registered as belonging to the local labour market of municipality *b*, and so on. From the individual level data, in turn, the different measures characterising each local labour market are calculated separately for each local labour market. Thus, by way of clarification, the final data set used in the analysis contains information pertaining to the 100 local labour markets but no individual level data.

What is tested with this data, using simple OLS regressions, is the effect of labour market size as measured by the logarithm of the local population, on four

[11] The measure is also motivated since weights are not assigned to our observations and a labour market comprising 3000-4000 individuals has the same statistical importance as one containing half a million or more. It should be noted that this measure in effect only influences the outcome of one labour market significantly (Filipstad), which otherwise has top level income inequality on par with Stockholm.

[12] By comparison, studies in the US usually only include workers who had a salary income for more than 13 weeks of the last year, (cf. Wheeler, 2004).

different inequality measures: the local Gini-coefficient, Theil's index, GE(2) and the 99/50 percentile ratio. From this selection, we thereby have three commensurate statistics giving an assessment of inequality across the whole income distribution, and another focusing on variance in absolute top level income. The Gini-coefficient is chosen partly because of its familiarity, both in work on inequality in general and in studies with results pertaining to the issue at hand, and partly because we need a measure focusing on variation around mean, or median income. The Theil index and GE(2), in turn, represent an entirely different class of inequality measures (the family of generalised entropy measures) and therefore provide an alternative take on inequality. Out of the different entropy measures, the Theil and GE(2) are chosen since they to the largest degree focus on upper level income. Given the theoretical background outlined above they therefore fit our purposes nicely. The 99/50 percentile ratio is straightforward and needs no further introduction. Finally, in addition to these measures, the 50/10 ratio is included by way of description in section five below.[13]

To test for potential explanations of the found pattern, the following independent variables are introduced: The relative size of male population, employment, age structure of the working age population, educational attainment, the level of diversification of the local business structure, population size and net migration rates of the foreign and Swedish born population, all of which provide information pertaining to each separate local labour market.

[13] For background theory and formal definitions of these measures, see for example Cowell (1995) or Jenkins (1995). In my research I have also computed a range of additional inequality measures (Mean Logarithmic Deviation, the 90/50, the 90/10 and 50/10 ratio). These tables are available from the author but cannot be included here.

The estimated model is as follows:

$$INEQ_{i,\,1\text{-}4} = \alpha + \beta_1 LMDIV_i + \beta_2 EDUC_i + \beta_3 AGE_i + \beta EMPLOYMENT_{4i} + \beta_5 MALE_i + \beta_6 SWEBRNMGRNTS_i + \beta_7 FRGNBRNMGRNTS_i + \beta_8 POPULATIONRSDL + \varepsilon_i \quad (1)$$

where:

INEQ = inequality measures 1-4 (the 99/50 ratio, GE2, Theil's index and Gini-coefficient)

LMDIV = labour market diversity

EDUC = percent higher educated within the labour force

AGE = age structure

EMPLOYMENT = employment rate, share employed ages 20-64

MALE = percentage men within the employed labour force

SWEBRNMGRNTS=share of Swedish born migrants, having arrived 91-95, as compared with population size 1990

FRGNBRNMGRNTS=share of foreign born migrants, having arrived 91-95, either migrating within the country or immigrating from abroad, as compared with population size 1990.

POPULATIONRSDL=Population residual, a substitute variable for population size, defined as the remaining heterogeneity when regressing population size, ages 25-64, on labour market diversity (LMDIV) (see discussion below).

i = local labour market

ε = error term

α = intercept

In addition to these variables we also in a separate analysis include controls for region specific effects.

As control for levels of human capital (EDUC), one of our two main variables of interest, the share of higher educated is used. Higher educated is defined as anyone having achieved at least three years of post secondary education, i.e. fifteen or more years of schooling. Level of business diversification (LMDIV), in turn, is intended as a variable to test our hypothesis related to Central Place theory. As we move up the urban hierarchy and additional industries are added to the local business structure, labour markets successively become more diversified. If our theoretical outline in section two is justified, this increase in diversification should be associated with increases in top income levels. The variable is straightforward and defined as the share of the aggregate total number of industries (in Sweden) represented in each local labour market.[14] As with shares of higher educated, this variable is expected to be positively related to inequality.

Our additional independent controls are motivated and further defined as follows. The relative size of male population (MALE) is controlled for since local labour markets differ in this aspect and men tend to have higher wages than women (defined as working age male / total working age population). Thus, the variable is assumed to have a positive effect on measures of income inequality. Controlling for differences in employment/unemployment levels, in turn, is standard procedure in studies on inequality, aimed at capturing potential labour supply-side effects. Since the rate of unemployment is the less reliable measure of the two – subject to political influence that varies over time and region – the employment rate is used here. Since higher shares of employed among the workforce should entail less downward pressure on wages, EMPLOYMENT is expected to be negatively associated with inequality. Our variable for age structure (AGE), calculated as the ratio between age groups (25-29 + 60-64) / (30-59), is intended to pick up the spread of the local age structure. If either group in the numerator is large relative to the middle-aged workforce, we would expect higher levels of inequality, and vice versa. The variable is thereby expected to be positively related to inequality.

Migration of Swedish and foreign born population (SWEBRNMGRNTS and FRGNBRNMGRNTS) is included to control for possible worker supply-side effects. In analysis of wage- and wage inequality effects of international and

[14] For the assignment of workers to different industry categories, industry classifications by Statistics Sweden is used (SNI92). The classifications basically correspond to United Nations activity classifications, ISIC. The total number of Swedish industries in 1995 is 742.

domestic migration, economic outcomes of migration is often assumed as dependent on who the migrants are, more specifically what their educational background is. If they're predominantly lower educated, or only find work requiring limited schooling, positive net migration should augment inequality because lower educated workers are losing out due to negative supply side effects. Therefore average wages for less educated groups should be lower in places experiencing positive net migration, and inequality correspondingly higher. If the flow of migrants predominantly consists of higher educated however, all else equal, lower levels of inequality should follow net increases in migration due to top wages being suppressed. To complicate matters, however, positive externalities associated with the migrant population are often assumed. In this way, a potential negative effect on wages and inequality of a influx of higher educated may fail to materialize because the migrants – often in an ad hoc manner – are assumed as being more productive, gifted or ambitious, nullifying a possible negative supply side effect. Which effect, i.e. what sign, to expect on inequality from different rates of migration is thus a somewhat open question. However, in a neoclassical setting and without assumptions of externalities, since Swedish born migrants are relatively well educated (calculations by the author), higher shares of Swedish born migrants should be associated with lower levels of inequality, all else equal. Foreign born migrants on the other hand, since they frequently have to compete for jobs demanding only average or lower educational background (even though they're often highly educated), are expected to be associated with higher levels of inequality.

Finally, local population size is included to pick up on any variation in inequality associated with labour market size that is not captured by our other controls. Since size of population and labour market diversity are almost completely co-linear – with a correlation coefficient of .98, see Table A2 (appendix 1), and Figure 5 – it is problematic to use both these variables simultaneously within the regressions. However, as we're interested in information not captured by our other controls, we define the population variable (POPULATIONRSDL) as the remaining heterogeneity, i.e. the residuals, when regressing the log of population size on labour market diversity (LMDIV). As with labour market diversity, we expect this variable to be positively associated with wage inequality.

Since our measure of labour market diversification does not specify industry type – only their number – adding controls for region specific characteristics is

also motivated. In addition to our basic model we therefore test our results using dummy variables for labour markets largely similar as regarding population size, age structure and educational characteristics, but differing along lines of main industry; public sector (health care, education) or private manufacturing (small to middle sized companies within manufacturing). In large areas in the north and northwest of Sweden, population expansion was historically based on the exploitation of natural resources (mainly dairy farming and forestry). Following structural changes and some 50 years of depopulation, employment in many of these areas is today however disproportionately dominated by health care and services geared towards the elderly. Since Swedish health care is organized through the public sector, this implies local and regional government as the main employer. Both on the grounds of market structure (a single employer thus reducing competition for labour) and a general pattern of public sector employment lagging private sector in terms of wages, we can therefore expect a more compressed local wage structure within these areas than elsewhere in the country. Our first regional dummy, SERVICEREGION, is therefore expected to be negative. In contrast, mostly within the south east and south west of the country, we also have labour markets with employment dominated by small and middle sized firms involved in different types of manufacturing. Here however, potential effects on inequality are not altogether straightforward. Along the lines of market structure (private sector), a relatively more dispersed wage structure is what to expect. Conversely, because these firms also employ industrial workers where unionization has traditionally been high, this feature might result in higher wages for the relatively lower educated and a more compressed wage structure, all else equal. Expectations as regarding our second regional dummy, INDUSTRIALREGION, is therefore indeterminate and can be either or, positive or negative.[15]

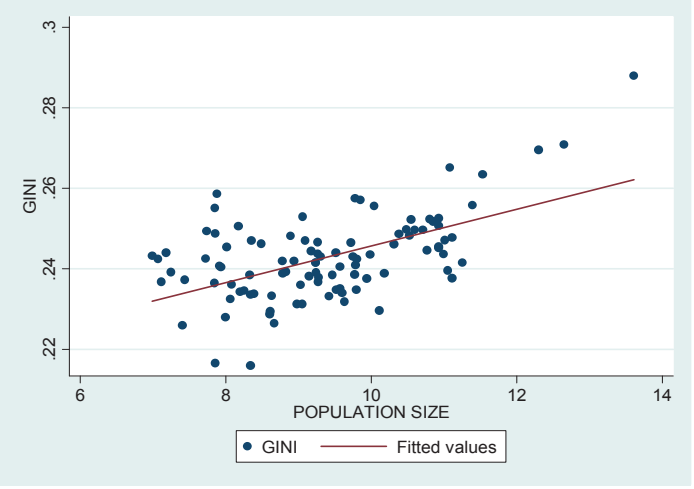
[15] The definitions of these two variables are taken from NUTEK, a Swedish business development agency (NUTEK, 1997). Industrial- and service regions, constituting 55 out of our 100 local labour markets, are defined as labour markets with a population of 1000-20 000 (ages 16-64) and with more than / less than 30 percent of employment within different types of commodity production, respectively.

5. The Swedish case: Descriptive statistics and figures

To provide a basic picture of the data, Figures 1 and 2 plot simple bivariate regression results between labour market size, the Gini, GE(2) and Theil's index, respectively. These plots show labour market size (i.e. log of local population) as clearly positively related to levels of income inequality. Furthermore, it also seems like this increasing inequality is due to larger increases in top income levels as population size increases, in other words there's some merit to our hypotheses presented in section 2. As noted above, different inequality measures focus on variance in different parts, or different brackets, of the total income distribution. The GE(2) places a larger emphasis on variance in higher income brackets as compared with Theil's index. Because of this, we would expect local labour market size to have a larger effect on the former than the latter. This is also the result we get (see Figure 2). Here, size of local population seems to have a larger positive effect on upper income levels, that is, the bivariate regression line for the GE(2) is steeper than the equivalent line for Theil's index.[16] (For more detailed descriptive statistics, see Table A1, appendix 1).

[16] Since we are using the logarithm of population size the slope coefficient can be interpreted as an ordinary elasticity using the Gini-coefficient, a 10 percent population increase leading to a 0.4 percent rise in the Gini. As Theil's index, GE2 and the 99/50 ratio are not measures that vary between 0-1, the same reasoning cannot be applied to them.

Figure 1. The Gini-coefficient and log size of local labour market.



GINI= 0.2 + .004 *log* (size local population) + *e*. R^2=0.32

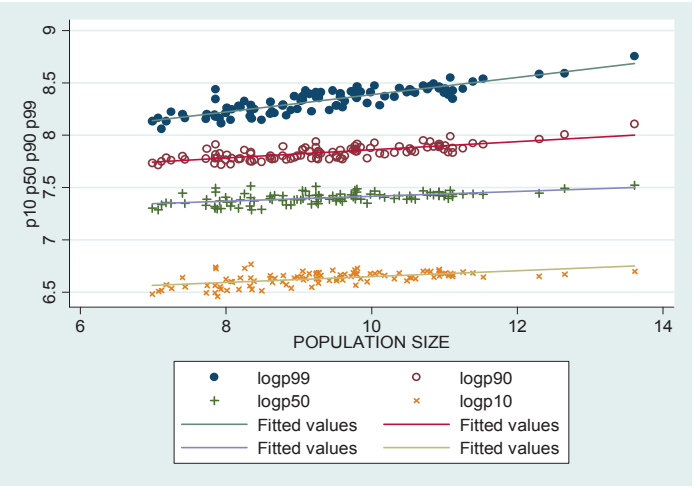
Figure 2. The GE(2) , Theil's index and log size of local labour market.

GE(2)= 0.03 + .008 *log* (size local population) + *e*. R^2=0.52
THEIL= 0.056 + .005 *log* (size local population) + *e*. R^2=0.44

This initial conclusion is strengthened by looking at the relationship between labour market size and the level of income, as measured by the different income percentiles calculated for each local labour market. Figure 3 plots the log of four different income percentiles and the simple bivariate regression line, against log of labour market size. The steeper slope of the coefficient for the higher income percentiles (mainly the 99th) likewise indicate that the effect of local labour market size on income inequality is due to higher upper income levels in larger labour markets, rather than for example lower bottom income levels. In fact, Figure 3 also points to variance in the structure of wage inequality in labour markets of different size. The larger the population of the local labour market, the more dispersed is income above median income levels, while wage structure below median income remains largely constant, or is even slightly more compressed (see Figure 4, showing the 99/50 and the 50/10 percentile ratios).[17] In other words, as size of local population increases different parts of the income distribution are affected differently. Still, the larger picture is one where wage inequality increases with labour market size. With this in mind we now turn to potential explanations for the found pattern.

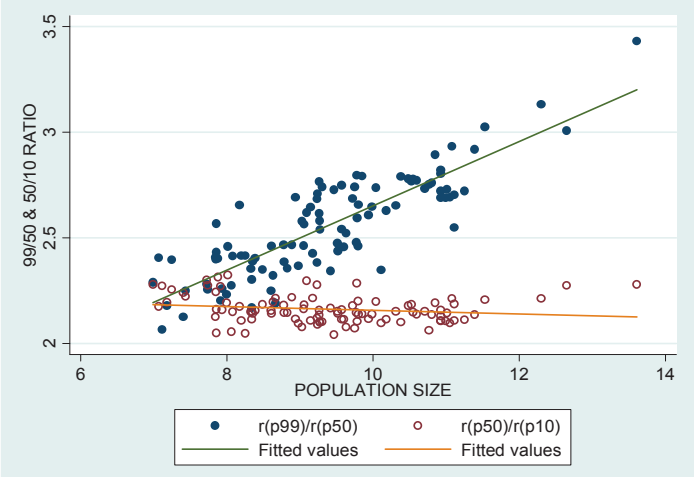
[17] If we accept population size as a substitute for population density (see discussion p. 7), Figure 4 is also of interest for the debate on density and inequality. The slightly declining 5010 percentile ratio lends support to Glaeser's notion that productivity and wages of less educated increase with density/population size relatively fast. Using our data, however, the bivariate relationship is weak and seems correct only measuring inequality below the 50th percentile, and not for inequality measures accounting for the total income distribution.

Fig. 3. Size of local labour market population and income levels (percentiles). Log values.



Logp99= 7.6 + .078 *log* (size local population) + *e*. Adjusted R^2= 0.74
Logp90= 7.5 + .037 *log* (size local population) + *e*. Adjusted R^2= 0.54
Logp50= 7.2 + .022 *log* (size local population) + *e*. Adjusted R^2= 0.30
Logp10= 6.4 + .030 *log* (size local population) + *e*. Adjusted R^2= 0.31

Figure 4. The 99/50 ratio, 50/10 ratio and log size of local labour market.



Ratio9950 = 1.13 + .15(POP) + *e*. Adj R-squared = 0.7207
Ratio5010 = 2.24 -.009(POP) + *e*. Adj R-squared = 0.0224

6. Size effects with controls

A general conclusion emerging from Table 1, showing results of our model tested with different inequality measures as dependent variables, is that labour market diversity, education, age structure, employment, migration and population size all have significant effects on levels of inequality. Out of these variables, education (EDUC) is highly significant using all our inequality measures, and labour market diversity (LMDIV) using Theil's index, GE2 and the 99/50 ratio as dependent variable. As we will see below, education together with labour market diversity also has the largest separate effect on explained variation. As a rule, these two variables increase in explanative power focusing on variation in inequality in the upper part of the income distribution, using Theil's index, GE2 or the 99/50 ratio, as opposed to using the Gini-coefficient. Our remaining controls vary in significance depending on which inequality measure we use as dependent variable, and thus which part of the income distribution we choose to focus on.

Employment levels (EMPLOYMENT) is significant for two of our measures (the Gini and Theil's index) while age structure (AGE) only using the GE2. As the signs of coefficients for these variables are as expected these results can be easily interpreted along the arguments outlined in section four. The coefficient for percentage men (MALE), in turn, also has the expected (positive) sign in all regressions but one (the 99/50 ratio). As the estimates are far from significant, however, this factor does not seem to be an important contributor to levels of inequality.

Table 1. OLS regression estimates. Gini, Theil's index, GE(2) and the 9950 ratio as dependent variables. P-values in parenthesis.

Independent variable	1. GINI	2. THEIL	3. GE(2)	4. The 9950 ratio
LMDIV	.011	.015**	.028*	0.684*
	(0.142)	(0.017)	(0.003)	(0.000)
EDUC	.153*	.129*	.174**	2.44*
	(0.009)	(0.008)	(0.018)	(0.006)
AGE	.10	.097	.170**	-.340
	(0.094)	(0.053)	(0.025)	(0.705)
EMPLOYMENT	-.063**	-.050**	-.055	.443
	(0.042)	(0.050)	(0.159)	(0.340)
MALE	-.025	-.025	-.065	-1.271
	(0.764)	(0.714)	(0.537)	(0.312)
SWEBRNMGRNTS	.154*	.0930	.079	-.071
	(0.010)	(0.059)	(0.289)	(0.936)
FRGNBRNMGRNTS	.128	.113	.188	3.025**
	(0.149)	(0.125)	(0.095)	(0.026)
POPULATIONRSDL	.006	.008*	.012*	.061
	(0.057)	(0.006)	(0.003)	(0.219)
Constant	.255*	.105*	.109	2.351*
	(0.000)	(0.006)	(0.061)	(0.001)
N	100	100	100	100
Adj. R^2	.49	.56	.59	.76

P>|t| in parenthesis. * significant at 1%; ** significant at 5%

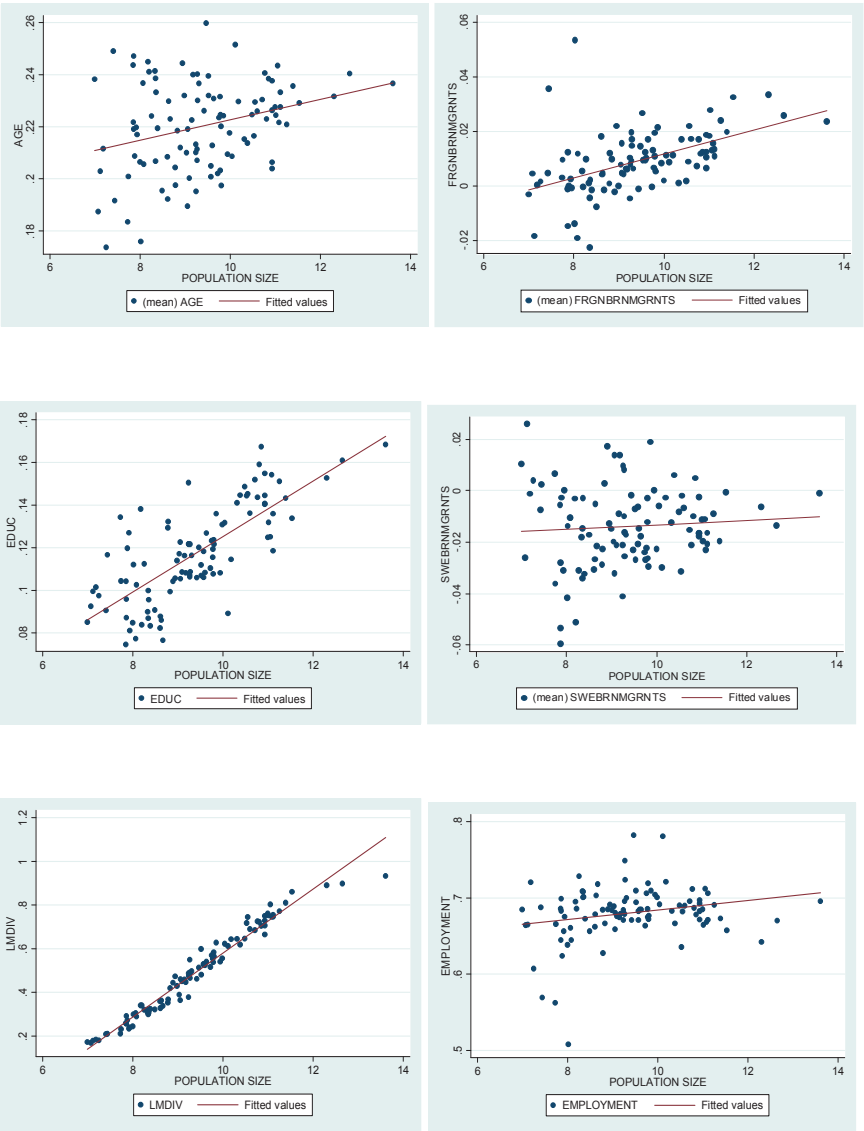
Somewhat more ambiguous are the results concerning changes in levels of migration of the Swedish and foreign born population. Contrary to what we expected, migration of the Swedish born (SWEBRNMGRNTS) is positively associated with inequality as measured by the Gini (while remaining slightly under a 95 percent level of confidence using Theil's index). Thus, as regarding these migrants, we cannot see any negative supply side effects and we either have to assume these migrants as associated with positive externalities of some kind, or simply that demand for higher educated is larger than supply during this period. Our variable for changes in the foreign born population (FRGNBRNMGRNTS), on the other hand, ends up far from conventional levels of significance in all regression but one, the 99/50 ratio. This general result is however not surprising given a pattern of higher unemployment rates among foreign born in Sweden, and that, during this time, the Swedish labour market is only half-way recovered from a very sharp downturn following the housing- and financial market crises in the beginning of the decade (see for example Ekberg and Gustafsson, 1995; Bevelander, 2004). Therefore, higher shares of foreign born may not affect outcomes as would perhaps otherwise be expected. In this

respect our result regarding top level income inequality (the 99/50 ratio) is somewhat puzzling. Rather than reflecting a causal mechanism, however, a possible interpretation is that this is a consequence of the differing migration pattern of the foreign born (see Figure 5), who during this period to a larger degree move to bigger metropolitan areas, where also top level income inequality is higher.

Finally, population size (POPULATIONRSDL) is significant using both the Theil index and GE2 (and significant at 6 percent using the Gini). In other words labour market diversity does not fully capture all regional variation in inequality associated with population size, and our variable containing the additional variation is significant, or close to significant, in most of our regressions. As we will see below, however, this remaining heterogeneity only accounts for a very small share of explained total variation.

Turning to the question of statistical importance, Tables A3 and A4 (see appendix 1) showing the effect on explained variation of introducing the independent variables sequentially, together suggest that business diversity and education have relatively higher explanatory power than the rest of our controls. Using these two variables alone results in values of adjusted R-squared of between 0.40 (using the Gini) to around 0.70 (using the 99/50 ratio). Adding other controls increases explained variation but to a more limited extent, in numbers of around 10 percentage points maximum. This feature is salient in all of the regressions, however to a larger degree using inequality measures focusing on upper parts of the income distribution. We should also note that this is not an effect of our controls being co-linear and merely capturing the same variation. Introducing the variables in reversed order (Table A4), also reveals education and labour market diversity as having a tandem effect on R-squared of around 10 to 30 percentage points, up from around 35-40 percent captured by our other controls.

Figure 5. Plots of selected explanatory variables and size of local labour markets.



As for our regional dummy variables (Table 2), industrial regions (INDUSTRIALREGION) is negatively associated with inequality, while SERVICEREGION, our second variable, is unexpectedly positive. Since the estimated coefficients are far from conventional levels of confidence this result is not dwelled into further. We can note however that including these dummies reduces significance of our estimate for share of higher educated (mostly because of negative correlation between service- and industrial regions and shares of higher educated, see Table A2, appendix 1), and increases significance for labour market diversity (LMDIV).

Table 2. OLS regression estimates. Gini, Theil's index, GE(2) and the 9950 ratio as dependent variables, including regional fixed effects. P-values in parenthesis.

Independent variable	1. GINI	2. THEIL	3. GE(2)	4. The 9950 ratio
LMDIV	.018**	.018**	.031*	.591*
	(0.033)	(0.011)	(0.006)	(0.000)
EDUC	.105	.095	.130	2.60*
	(0.081)	(0.061)	(0.092)	(0.006)
AGE	.108	.100**	.173**	-.436
	(0.066)	(0.042)	(0.023)	(0.629)
EMPLOYMENT	-.061**	-.049	-.054	.416
	(0.043)	(0.052)	(0.163)	(0.371)
MALE	.053	.026	-.005	-1.74
	(0.541)	(0.726)	(0.961)	(0.196)
SWEBRNMGRNTS	.135**	.082	.067	.084
	(0.021)	(0.094)	(0.367)	(0.925)
FRGNBRNMGRNTS	.124	.111	.185	3.06**
	(0.154)	(0.129)	(0.098)	(0.024)
INDUSTRIALREGION	-.003	-.003	-.004	-.012
	(0.170)	(0.148)	(0.156)	(0.752)
SERVICEREGION	.003	.001	.000	-.055
	(0.227)	(0.566)	(0.896)	(0.197)
POPULATIONRSDL	.007**	.009*	.014*	.066
	(0.028)	(0.003)	(0.001)	(0.196)
Constant	.212*	.080	.081	2.687*
	(0.000)	(0.051)	(0.189)	(0.000)
N	100	100	100	100
Adj. R^2	0.51	0.57	0.60	0.76

P>|t| in parenthesis. * significant at 1%; ** significant at 5%

To summarize, both our theoretical approaches outlined above seem to find support in the data. As for the human capital approach, the share of higher educated is statistically significant using all our measures of inequality. This of course is something we would expect given that jobs with higher incomes are

usually dominated by people with higher education, and these jobs tend to be relatively numerous in larger cities or larger labour markets. We should note however that Human Capital theory, since it does not give any account as to how and why higher educated are spread out over geographical space, is a somewhat limited approach in explaining geographical variation in inequality. As for our alternative approach, Central Place theory is of importance as well. Firstly, as seen in section five and figures 1-4, it correctly predicts our observed patterns, i.e., that inequality should increase with population size due to increases in top wage levels. Secondly, our chosen variable to test this hypothesis, labour market diversification (LMDIV), is statistically significant in determining inequality as measured by Theil's index, GE2 as well as the 9950 ratio. Also, rather than the other way around, in comparing the strengths of these two theoretical approaches we should keep in mind that the share of higher educated is most likely a function (however defined) of the urban, or occupational, hierarchy.[18]

Is endogeneity a problem? Given that workers act on incentives – economic or other – and move between local labour markets, this constitutes a potential bias in our model. In particular, given persistent positive externalities of some kind, for example associated with the higher educated, the results presented might to some extent be a function of the local wage distribution at an earlier point in time, inducing highly educated workers to move to labour markets where wages at the time were the highest. This movement of workers, in turn, would then affect our dependent as well as our main explanatory variables, i.e. labour market diversity and the share of higher educated.

Returning for a moment to our previous results, the fact that migration of the Swedish born is positive and significant, or close to significant (using the Gini and Theil's index respectively), suggests that this is a potential but perhaps not major cause for concern. If our results were to a large extent a reflection of past regional wage discrepancies and population movements, controlling for migration would leave our other main explanatory variables insignificant, or make up a large part of explained variation. As is now though, including or leaving out our two migration variables neither affects levels of significance of

[18] We can note that these results regarding labour market diversification are fairly robust, for example leaving out tertiary activities, or even commodity industries, from our definition of the variable does not significantly affect the results (not shown).

our other explanatory variables nor explained variation to any larger degree (not shown).

The case may however be that five years is not sufficient amount of time for previous changes – whether structural or as regarding individual incentives – to really take effect. To gain some clarity in this, we can test the robustness of our results by introducing instrument variables into our model. Given near perfect correlation between business diversification and population size in our cross-section (see Table A2, appendix 1), using the regional population distribution at an earlier point in time as instrument for current business diversification might indicate if the patterns presented are stable or more ephemeral in character. Since a requirement is that instruments should have no direct causal effect on the dependent variable, i.e. our different measures of inequality, path-dependency and slow changes within the urban and occupational hierarchy over time might in this respect be a problem, at least when using lagged variables from more recent years as instruments. Given a longer time span however, we can argue that whatever direct effect our lagged variable might have, it is sufficiently small for it to be used tentatively as an instrument in IV-regressions. In Table 3 we therefore present results from using the 1968 regional population distribution (the earliest year for which relevant population data are readily available) as instrument for 1995 local business diversification, one of our suspected endogenous variables. The fact that labour market diversity – as well as most of our other explanatory variables – remains highly significant, clearly ads weight to our previous results and suggest that these patterns are rather stable over time.[19] Any endogeneity bias in the original regressions is thus not likely important enough to comprise the results.

[19] As an alternative to IV-specification we have also estimated OLS models using lagged (1990) instead of current values for the diversification and education variable (not presented here). Since these variables are highly correlated over time, this is not a very reliable alternative but nevertheless we checked it for completeness. For the education variable this yields results very similar to those presented in Table 1. Labour market diversification (LMDIV), however, looses its significant effect on one of our inequality measures (the Thiel index) when the lag is used. A further difficulty with this test is that in some places diversification in 1990 may not provide a good indicator for the future level of diversity, given the massive restructuring of Swedish industry that took place during the deep 1991-1993 recession (see for example Thakur, 2003). These tables are available from author but cannot be included here.

Table 3. IV-regression estimates. Gini, Theil's index, GE(2) and the 9950 ratio as dependent variables. P-values in parenthesis.[20]

Independent variable	1. GINI	2. THEIL	3. GE(2)	4. The 9950 ratio
LMDIV	.016**	.021*	.039*	.730*
	(0.049)	(0.002)	(0.000)	(0.000)
EDUC	.142**	.113**	.144	2.349*
	(0.020)	(0.029)	(0.067)	(0.010)
AGE	.087	.079	.142	-.470
	(0.154)	(0.126)	(0.075)	(0.602)
EMPLOYMENT	-.072**	-.062**	-.075	.359
	(0.023)	(0.022)	(0.070)	(0.444)
MALE	-.040	-.044	-.096	-1.421
	(0.630)	(0.536)	(0.384)	(0.258)
SWEBRNMGRNTS	.130**	.064	.031	-.305
	(0.028)	(0.201)	(0.679)	(0.726)
FRGNBRNMGRNTS	.069	.039	.063	2.461
	(0.443)	(0.612)	(0.589)	(0.066)
Constant	.271*	.126*	.144**	2.506*
	(0.000)	(0.002)	(0.019)	(0.000)
N	100	100	100	100
Adj. R^2	0.47	0.53	0.55	0.76

P>|t| in parenthesis. * significant at 1%; ** significant at 5%
Instrumented: LMDIV
Instruments: EDUC AGE EMPLOYMENT MALE SWEBRNMGRNTS FRGNBRNMGRNTS logPOP1968

[20] Since keeping our population residual (POPULATIONRSDL) within the first stage of the two stage IV-regressions introduces problems with co-linearity – with T-values around 65 for our instrument (see Table A5) – this variable is left out of the regressions and therefore not included in Table 3.

7. Concluding remarks

The results in this paper indicate that labour market size has significant effects on total wage inequality. The effect is larger when we use inequality estimators that focus on variance in top or mid upper level income, rather than estimators focusing on variance around mean or median income, for example the Gini coefficient. Thus, as we would expect given the theoretical outline presented by way of introduction, the positive link between wage inequality and labour market size is due to increasing upper income levels as labour market size increases. This broad result also motivates the subtitle of this paper; there is a systematic link between labour market size, or rank, and levels of wage inequality (disregarding that the two are not fully equal substitutes).

Out of the two broad theories outlined, we find support for both in the data. To be sure, a large part of the positive effect stems from variation in education levels at the level of the local labour market. However, part of the explanation is also linked to industrial diversification, or the occupational composition of the local labour market. Specifically, as population size increases, labour markets become more diversified which in turn is related to increasing inequality. This result is interesting, since, if wage inequality is also a function of the occupational hierarchy, it is then possibly linked to urbanization, market structure and transportation costs. This suggests a less explored complimentary approach in analysis of wage dispersion that goes beyond more commonly analyzed factors, i.e. educational composition of the labour force, institutions, changing technology, etc.

Of course, none of the approaches discussed provide us with an ultimate explanation. In comparing the merits of the two, we should however keep in mind that Human Capital theory is somewhat limited in this context, since it gives no account as to how and why the higher educated are spread over geographical space. And as noted, in all likelihood the share of higher educated is some function of the occupational hierarchy and not vice versa.

As we have seen, in a cross-sectional analysis as this one, increases in size of local population are associated with increasing inequality because, although all wages increase with population size, top wages increase the most. Also, the analysis suggests that these patterns are rather stable over time. A question for further research, and returning to our introductory discussion on modelling

effects of migration, given these effects of local population size, how can these scale effects be incorporated into a migration framework?

8. Appendix

Table A1. Labor market size and income distribution in Swedish local labour markets, (abbreviated). Rank based on number of labor-force participants aged 25-64 years.

Rank	Labor market region	Population (thousands)	Gini coefficient	Theil's index	Ratio 99th to 50th percentile
1	Stockholm	2067	28.8	14.9	3.4
2	Göteborg	836	27.1	12.8	3.0
3	Malmö	615	27.0	12.8	3.1
4	Helsingborg	292	26.3	12.3	3.0
5	Linköping	243	25.6	11.4	2.9
6	Örebro	210	24.2	10.1	2.7
7	Skövde	183	23.8	9.8	2.5
8	Trollhättan	186	24.8	10.6	2.7
9	Västerås	173	26.5	12.2	2.9
10	Borås	173	24.0	10.0	2.7
11	Norrköping	169	24.7	10.4	2.7
12	Kristianstad	168	24.4	10.2	2.7
13	Falun-Borlänge	153	25.3	11.0	2.8
14	Jönköping	152	25.1	10.9	2.8
15	Luleå	142	24.6	10.4	2.7
16	Gävle	145	24.5	10.4	2.7
17	Umeå	135	25.2	10.9	2.9
18	Karlstad	128	25.2	10.8	2.8
19	Växjö	126	24.5	10.3	2.8
20	Sundsvall	113	25.0	10.6	2.7
23	Eskilstuna	107	24.8	10.7	2.8
27	Lidköping	73	23.9	9.8	2.6
33	Karlskoga	49	24.2	10.1	2.7
43	Västervik	40	23.5	9.6	2.8
47	Arvika	36	23.3	9.3	2.3
48	Säffle	31	24.3	10.2	2.7
49	Älmhult	30	23.8	9.8	2.5
50	Ljungby	28	23.7	9.7	2.6
59	Lysekil	25	25.3	10.5	2.6
60	Gällivare	22	23.1	9.3	2.5
63	Tranås	22	24.2	10.0	2.7
66	Kalix	19	23.9	9.8	2.4
75	Hofors	11	21.6	8.1	2.2
81	Älvsbyn	9	23.6	9.2	2.4
82	Årjäng	10	23.2	9.1	2.3
89	Laxå	7	21.7	8.4	2.4
90	Storuman	7	25.5	10.8	2.4
91	Vansbro	8	23.6	9.3	2.4
92	Jokkmokk	7	24.9	10.2	2.3

Table A2. Correlation matrix, independent variables and population size (POP).

	POP	LMDIV	EDUC	AGE	EMPLOY~T	MALE	SWEBRN~S	FRGNBR~S	INDUST~N	SERVIC~N	POP~RSDL
POP	1										
LMDIV	0.9815	1									
EDUC	0.7551	0.7455	1								
AGE	0.2966	0.3274	0.0544	1							
EMPLOYMENT	0.2270	0.2459	-0.0561	0.6296	1						
MALE	-0.2742	-0.2731	-0.4316	0.1536	0.2633	1					
SWEBRNMGRNTS	0.0736	0.1099	0.1549	-0.0491	-0.1024	-0.5000	1				
FRGNBRNMGR~S	0.4992	0.5381	0.4679	0.0796	-0.1695	-0.3461	0.1743	1			
INDUSTRIAL~N	-0.2290	-0.2605	-0.4649	0.0862	0.1728	0.5209	-0.3312	-0.2886	1		
SERVICEREG~N	-0.5097	-0.5279	-0.1789	-0.3935	-0.3893	-0.2837	0.2271	-0.1628	-0.3793	1	
POP~RSDL	0.1917	0.0000	0.1221	-0.1291	-0.0750	-0.0323	-0.1787	-0.1511	0.1391	0.0441	1

Table A3. Adjusted R-squared and sequentially introduced independent variables

	LMDIV	+EDUC	+AGE	+EMPLOYMENT	+MALE	+SWEBRNMGRNTS	+FRGNBRNMGRNTS	+POPULATIONRSDL
GINI	0.30	0.40	0.39	0.43	0.45	0.47	0.47	0.49
THEIL	0.41	0.49	0.49	0.52	0.53	0.53	0.53	0.56
GE2	0.48	0.54	0.54	0.56	0.56	0.56	0.56	0.59
99/50 ratio	0.72	0.76	0.75	0.75	0.75	0.75	0.76	0.76

Table A4. Adjusted R-squared and sequentially introduced independent variables, reversed order

	POPULATIONRSDL	+FRGNBRNMGRNTS	+SWEBRNMGRNTS	+MALE	+EMPLOYMENT	+AGE	+EDUC	+LMDIV
GINI	0.01	0.32	0.32	0.33	0.33	0.34	0.45	0.49
THEIL	0.02	0.34	0.34	0.35	0.35	0.37	0.53	0.56
GE2	0.03	0.32	0.32	0.34	0.36	0.39	0.57	0.59
99/50 ratio	0.00	0.33	0.33	0.34	0.43	0.42	0.74	0.76

Table A5. IV-regression with GE2 as dependent variable and the log of local population size in 1968 as instrument for business diversification. Absolute values of T-statistics in parenthesis.

First-stage regression

	LMDIV
EDUC	.431*
	(3.66)
AGE	.154
	(1.22)
EMPLOYMENT	.316*
	(4.97)
MALE	-.021
	(-0.12)
SWEBRNMGRNTS	.036
	(0.29)
FRGNBRNMGRNTS	.833*
	(4.55)
POPULATIONRSDL	-.152*
	(-20.90)
logPOP1968	.156*
	(63.83)
Constant	-1.35*
	(-14.36)
Observations	100
Adjusted R-squared	0.99

Instrumental variables (2SLS) regression

	GE2
LMDIV	.03*
	(3.20)
EDUC	.165**
	(2.27)
AGE	.169**
	(2.25)
EMPLOYMENT	-.057
	(-1.48)
MALE	-.065
	(-0.62)
SWEBRNMGRNTS	.079
	(1.07)
FRGNBRNMGRNTS	.180
	(1.61)
POPULATIONRSDL	.012*
	(3.01)
Constant	.111
	(1.94)
Observations	100
Adjusted R-squared	0.59

Absolute value of t-statistics in parentheses
* significant at 1%; ** significant at 5%

Instrumented: LMDIV
Instruments: EDUC AGE EMPLOYMENT MALE SWEBRNMGRNTS FRGNBRNMGRNTS POPRESIDUAL logPOP1968

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Paper 2

Migration and Wage Inequality
- Economic Effects of Migration to and within Sweden, 1993-2003.

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Abstract

In this paper, I explore two different hypotheses as regarding potential effects of domestic and international migration on wage inequality. One related to the possibility of wage competition, and another alternative hypothesis related to fixed set-up costs and indivisibilities for different types of industries within the local labour market. Using full population data for 1993 and 2003 for Swedish local labour markets, an OLS model of percent changes in inequality is estimated. Factors associated with increasing wage inequality are positive net migration of the Swedish born population, changes in labour market diversification, educational inequality and levels of employment. The estimates do not suggest wage competition as a substantive factor in increasing wage inequality during this time. However, the finding that migration of the Swedish born – our main migrant category – is positively related to changes in inequality lends support to the alternative hypothesis. The result suggests that positive net migration may affect income dispersion regardless of possible wage competition.

Keywords: Wage inequality, local labour markets, business diversification, regional migration, international migration.
JEL-codes: R12, J31, D61, J40. F22

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1. Introduction

According to standard neoclassical theory, an inflow of migrant labour can lead to increasing wage inequality if migrants compete with low skilled domestic labour. Both US and European based studies (Borjas, 1994; Smith and Edmonston, 1997; Ekberg, 2003), however, show small or non-existent direct negative effects of immigration (and domestic migration) on wage levels of workers competing with the migrant labour force. These results have been challenged by some researchers, arguing that the true effects of labour migration can only be understood through its effect on the educational composition of the total labour force within a country (Borjas, 2003; Borjas, Freeman, Katz, DiNardo and Abowd, 1997). Using a general equilibrium framework, these studies in turn show immigration as having significant negative effects on some domestic wage earners, and, as a result of this, sizeable positive effects on levels of wage inequality.

A general equilibrium framework, however, entails assumptions of constant returns to scale, precluding possible positive scale effects resulting from migration and changes in the size of local population. By contrast, in a cross sectional study of Swedish local labour markets drawing on theoretical implications of traditional Central Place theory (Korpi, 2008), wage income inequality is shown to be positively correlated with size of local population, the correlation being a function of increasing top wages as size of local population increases. This pattern, in turn, is shown as being partly a function of increasing average educational levels, and partly of increasing industrial diversity as size of local population increases. In a cross sectional setting therefore, we have clear population scale effects on wage inequality that go beyond the educational composition of the workforce within the local labour market.

On the basis of these types of scale effects, economists Haworth, Long and Rasmussen (1977, 1978) have argued that we can expect migration to be related to increasing inequality emanating from the top of the income distribution. Increasing net migration in population growth regions gives rise to increasing local demand for goods and services. However, in the presence of population thresholds and indivisibilities for different types of industries, we have the possibility of a gap in time before this increasing demand gives rise to changes in the local market structure for any particular industry. That is, before demand is sufficiently large for additional local competitors to establish themselves

within that particular industry. This gives rise to what the authors call "monopoly rents", the possibility of higher income due to positive net migration and increasing demand, but without this additional demand necessarily giving rise to increasing competition.

Theoretically, we thus have two possible interpretations of the relationship between positive net migration and increasing inequality. One related to the possibility of wage competition among workers, and another alternative hypothesis related to changing local demand and market structure within the local labour market. In the paper at hand, using full population data for 1993 and 2003 on Swedish local labour markets and simple panel data methods, both these alternative migration-inequality hypotheses are tested. According to the first, the neoclassic approach, we expect migration to have different effects depending on the educational status of the migrants. If they are predominantly lower educated, we expect higher inequality due negative wage pressure in the lower part of the income distribution. If they are predominantly higher educated, we expect lower inequality due to potential wage competition at the upper end of the income spectrum. According to our second hypothesis, related to indivisibilities – the monopoly rents hypothesis – we expect net migration to be positively associated with increasing inequality regardless of educational status of the migrants. Three basic research questions are addressed: *(i)* Does migration (defined as both immigration and domestic migration) over time contribute to changes in wage inequality? If so, *(ii)* which parts of the income distribution are these changes associated with, and (*iii*), controlling for possible competing explanations, does the available data support any of these two competing hypothesis?

What follows below in section 2 is theory and previous studies. Section 3 discusses data and methodology, section 4 our statistical models while section 5 and 6 contain descriptive statistics and results, respectively. Section 7 concludes.

2. Theory and previous studies

As noted above, a neoclassic economic framework has been the main theoretical approach in analysis of wage and wage inequality effects of international and domestic migration. Within this school of thought, effects on wages and wage inequality of positive net migration is dependent on who the migrants are, more specifically what their educational background is. If they are predominantly lower educated, or only find work requiring limited schooling, positive net migration should augment inequality because lower educated workers are losing out due to negative supply side effects. Therefore, average wages for lower educated groups should be lower in places experiencing positive net migration, and inequality correspondingly higher. If however, the flow of migrants predominantly consists of higher educated, all else equal, lower levels of inequality should follow net increases in migration due to top wages being suppressed.[2]

To my knowledge there are no Swedish studies focusing on direct linkages between migration and income disparities, and studies on effects on wages and relative factor prices are also sparse. Ekberg (1977), in a study on immigration and effects on the relative price of capital (the ratio between returns to capital and average wages), finds immigration to have a slight increasing tendency on this ratio, thus implying minor negative consequences for the wage income of the native population, with this already tiny effect further shrinking over time. In a more detailed approach (Ekberg, 1983), calculating effects both on relative wages and employment for different types of labour, very small negative effects and very small positive effects are found for wages of the low and the highly educated workers, respectively.

These results are also largely in accord with what has been found in US studies and for other European countries. For the US, typically, comparing labour markets with regard to increasing shares of foreign born and income developments for different groups of native workers, studies find elasticities of around -.01 to -.02, thus implying a reduction in wages for low educated workers at around minus 0.2 percent following a 10 percent increase in the foreign born population (Friedberg and Hunt, 1995; Borjas, 1994). In Europe,

[2] Of course, as part of this reasoning, complementarity between these factors of production also affects the outcome; increasing demand and wages for higher (lower) educated when the migrant labour predominantly consists of lower (higher) educated.

where in general fewer studies have been made, Zimmerman (1994) finds immigration to have had very slight negative effects on the relative wages of low income workers and a corresponding slight positive effect on the income of the highly educated. Also, in a study simulating relative wage effects of immigration for several European countries (Gang and Rivera-Batiz, 1994), equally very minor effects are found. Similar small estimates are also found in later European studies (Dustmann, Fabbri and Preston, 2005; Frank, 2007; Carrasco, Jimeno and Ortega, 2008).

As concerning wage inequality, all these studies would of course imply immigration as having a positive – but very minor – effect on wage income disparities. As mentioned, however, the approach of these studies has been challenged by authors arguing that comparisons between local labour markets (or, for the US, Standard Metropolitan Statistical Areas), tend to hide a wider truth. Because both workers and firms can respond to negative supply side effects (attracting firms while simultaneously discouraging potential migrant workers), any negative effects on relative wages are automatically spread out over geographical space, and thus not traceable by comparative methodology. These authors argue instead that the effects of immigration can and should be understood as happening on the national level, through general equilibrium effects on income disparities between low and high educated workers. In contrast to the aforementioned studies, these authors find immigration to have had considerable negative effects on the wages of lower educated and therefore strongly contributing to increasing income disparities over time (Borjas, 2003; Borjas et al., 1997).

While this critique is clearly relevant, this paper argues that geographical comparative methodology still has advantages which merit its further use. Firstly, an assumption that the equilibrating response of workers and firms to local downward wage pressure sufficiently offsets any traceable local wage disparities is clearly a matter of debate. For Sweden, as well as for most of Europe and certainly the US, regions experiencing population growth tend to keep on growing over time, with ‘counter migration’ movements – migrants heading out of larger metropolitan growth regions – making up a significantly smaller share of total domestic migration (for data on Sweden, see Korpi, Clark and Malmberg, 2008). As for Sweden, wage levels for all income percentiles tend to increase with local population size, including major population growth areas experiencing positive net migration. This pattern is also likely to be rather

stable over time (Korpi, 2008). So, even though we do not have exact data on the educational composition of these differing migrant flows, just the fact that counter urbanization more or less consistently makes up a smaller share of total migration raises some doubt as to whether counter urban migrants are effectively equilibrating wages over geographical space. [3]

Second, as is argued by Friedberg and Hunt (1995), because of the fact that little by way of downward wage pressure can be traced even from very sudden and large net inflows, like the so-called Mariel Boatlift of Cubans to Miami or the large immigration to France and Portugal at the time of their former colonies' independence (often referred to as natural experiments, see Card, 1990; Hunt, 1992; Carrington and de Lima, 1996), these equilibrating worker and firm movements must by definition happen instantly. In effect, before we can actually observe them happening, something which seems unlikely.

As mentioned by way of introduction, this paper argues that traditional geographic Central Place theory (Christaller, 1966; Lösch, 1954) also provides an alternative take on analyzing economic effects of migration, whether domestic or international. In the economics of Christaller's original theory, the main rationale for the geographic spread of different industries and services is the varying levels of fixed set-up costs relative to the local demand needed to cover these fixed costs. Assuming evenly spread levels of per capita income across regions, businesses or establishments that need a large local population to cover these fixed costs locate in central places of so-called higher order (in relatively larger cities or only in the largest), whereas establishments that require lower levels of fixed costs relative to local demand can be set up in every city, regardless of size. From this we have a link between urban scale (local population size) and the degree of specialization of the local business structure, or occupational structure. If we think in terms of a cross-section, for each 'step' upwards in the urban hierarchy an additional industry or professional branch is added to the local business structure. The larger the local labour market, the more diversified the local business structure (the number of industries represented locally). And as the number of industries within local labour

[3] A possibility could of course be that the counter urban migrants predominantly constitute workers competing with the urban migrants moving into population growth regions.

markets is highly correlated with local population size, the available data does not contradict this argument (Strömquist and Johansson, 1998; Korpi, 2008).[4]

Not much work has been done using this theoretical approach. However, as noted by way of introduction, on the basis of Central Place theory economists Haworth, Long and Rasmussen (1977, 1978) develop what they call a "monopoly hypothesis" as an alternative way to understand effects of urbanization and migration. Increasing city size due to positive net migration, they argue, effectively increases demand for local goods and services, while at the same time, due to existence of industry specific indivisibilities and entry barriers, different industries are to a varying degree insulated from a concomitant increase in local competition.[5] With this logic, increasing city size gives rise to 'monopoly rents' for groups that to some degree are protected from competition; an effect of positive net migration thus being increasing inequality 'from the top', or, because upper income levels tend to increase at a faster rate than the income of workers in the middle or lower segments of the local income distribution. Comparing developments between 1960 and 1970 for 79 US SMSAs, using simple OLS methods, they find migration (population change) as having significantly positive effects on estimates of the local Gini coefficient, controlling for competing explanations such as educational disparities and change in the local occupational structure as (Haworth et al., 1978).

In the present paper, as an alternative hypothesis, we follow Haworth et al (1977, 1978) and use a similar approach to gauging the relationship between levels of migration and changing wage inequality. As is also discussed in Haworth et al (1978), since size of local population is related to specialization among industries, we can also expect that a net positive increase in migration will result in more specialized industries being added on to the local business structure. If specialization among industries is related to higher average wages, we can thus also expect this to have an effect on the local income structure where migrants settle. In our model this possibility is also explored.

[4] Using Swedish data, the number of industries represented within the local labour market can be shown to be a log-linear function of the size of local population, with an R^2-value of 0.96 (Strömquist and Johansson, 1998).

[5] The authors illustrate by comparing the relatively high entry barriers in the local newspaper industry to the much lower equivalent in gas stations, fast food restaurants and similar enterprises.

3. Data

The study utilizes a database consisting of longitudinal data covering all individuals living in Sweden some time between the years 1990-2003. The database (*Place*) has been compiled in cooperation between Statistics Sweden (SCB), the Department of Social and Economic Geography and the Institute for Housing and Urban Research (IBF), both at Uppsala University. The database details place of residence and work and a series of individual level data, including educational and occupational status and source and level of income.

From this data, data on the working age population (20-64) are compared for two points in time, 1993 and 2003 (with each data-set containing around five million individuals). The two years are chosen since we can thereby roughly cover developments over the whole of a business cycle. Both the starting and end year represent two lows in economic activity, with 1993-94 showing high unemployment following the sharp economic downturn of 1991-1992, and 2003-2004 the equivalent point in time following the downturn after the internet related stock market boom at the end of the 1990s.

By choosing these two points in time, we also – perhaps as much as possible – control for changes in economic policy, since this remains largely the same 1993 to 2003. The economic policies that Sweden followed preparing for and after entering the European Union in 1994 can by and large be characterized by a monetary policy of maintaining a stable inflation rate (of around two percent a year) and large restrictions on stimulating the economy by way of fiscal policy (see for example Lindbeck, 1997; Thakur, 2003).

As a first measure, for both 1993 and 2003, the individual data are linked to local labour markets. Because local labour markets are defined on the basis of commuting patterns, the definition of local labour markets can change over time. This paper uses a 1998 definition of local Swedish labour markets by Statistics Sweden. From this definition, Sweden can be divided into 100 local labour markets, made up of some 289 municipalities. The main separation criteria is here the share of working age population commuting out of the municipality on a daily basis, the rule being that if more than 20 percent commute from municipality *a* to municipality *b*, municipality *a* is registered as belonging to the local labour market of municipality *b*, and so on. The individual level data, in turn, is then used to calculate the different measures characterising each local

labour market. Thus, the analysis presented below is based on aggregate measures and contains no individual level data.

To identify net migrant flows of the Swedish and foreign born in and out of local labour markets, we compare the residence of individuals aged 20-64 in 2003 with their residence 1993. People that reside in different labour market regions 1993 and 2003 are counted as domestic migrants. People residing in Sweden 1993 but not in 2003 are counted as international out-migrants, and those residing in Sweden 2003 but not 1993 are counted as international in-migrants. Domestic and international net migration, for both Swedish and foreign born, is then obtained by simply subtracting the number of out-migrants from the number of in-migrants for each local labour market. In the final variable definitions, these domestic and international migrant flows are then summarized into Swedish and foreign born migrants, the latter group also divided according to length of stay in the country (defined in detail below).

To calculate inequality measures and percentile levels (plus other independent variables), we exclude all persons with a yearly wage income below 34 400 and 38 600 SEK for 1993 and 2003 respectively (the equivalent of around 4200 and 4 600 US dollars, in 1993 and 2003 exchange rates). This follows common practice in studies of income distribution and the objective is to confine the data only to workers with a reasonably strong attachment to the labour market.[6]

What is tested with this data, using simple panel methods described below, is the effect of changes in net migration, (total, domestic and international), on four different inequality measures: the local Gini-coefficient, MLD (the mean logarithmic deviation), Theil's index and GE(2). Using these measures we thereby have four commensurate statistics that assesses inequality across the whole income distribution. The Gini-coefficient is chosen partly because of its familiarity, both in work on inequality in general and in studies with results pertaining to the issue at hand, and partly because we need a measure focusing on variation around mean, or median income. The MLD, Theil's index and GE(2), in turn, represent an entirely different class of inequality measures (the family of generalised entropy measures) and therefore provide an alternative take on inequality. As outlined previously, increasing net migration can theoretically affect both the upper – or top – part of the income distribution as

[6] By comparison, studies in the US usually only include workers who had a salary income for more than 13 weeks of the last year, (cf. Wheeler, 2004).

well as the bottom. Our entropy measures are chosen since they, in this listed order, focus on changes in middle, upper and top level income respectively. To gauge changes stemming from the bottom half of the distribution, we also test our model separately using bottom percentile levels (the 5th, 10th and 25th) as dependent variable. [7]

4. The Model.

As we are interested in analysing changes in net migration, both domestic and international, into and between local labour markets, we choose a simple approach where we calculate the percentage change of all our variables – i.e., the absolute change between 1993 and 2003 related to their initial values or levels 1993 – where after ordinary least squares methods are used. With this approach we largely control for fixed effects and unobserved heterogeneity at the level of the local labour market; that is, different time invariant, place specific local characteristics concerning milieu, attitudes and local cultures.[8] To control for measurable differences in industrial structure and potential changes within these, our main model also includes controls for different types of small industry clusters. Further, in additional tests we also include dummy variables for the major metropolitan areas to address industry specific developments within the largest labour markets. Other differences related to size of the labour market are captured by our variables for educational inequality and industry diversity (defined below). [9]

[7] For background theory, welfare properties and formal definitions of these inequality measures, see for example Cowell (1995) or Lambert (2001).
[8] (see e.g. Malmberg and Maskell, 2002; MacKinnon, Cumbers and Chapman, 2002; Maskell, Eskelinen, Hannibalsson and Malmberg, 1998)
[9] All variables are calculated using PLACE except employment figures which are from Statistics Sweden (RAMS) and our dummy variables for industrial- and service regions which are from NUTEK, a Swedish business development agency (NUTEK, 1997).

The models tested are as follows:

$$INEQ_{i,1\text{-}4} = \alpha + \beta_1 RECENTLYARRIVED_i + \beta_2 FRGNBRN_i + \beta_3 SWEBRN_i + \beta_4 NTRLPOPCHNG_i + \beta_5 AGE_i + \beta_6 EDUCINEQ_i + \beta_7 LMDIV_i + B_8 EMPLOYMENT_i + B_9 UNION_i + B_{10} INDUSTRIALREGION_i + B_{11} SERVICEREGION_i + \varepsilon \quad (1)$$

Where,

INEQ = Percent change in inequality measures 1-4 (GE2, Theil's index, MLD and the Gini-coefficient), 1993-2003.

Population change variables:

RECENTLYARRIVED = Recently arrived foreign born, percent foreign born migrants arriving between 1999 and 2003

FRGNBRN = General foreign born population, percent foreign born having immigrated to Sweden before 1999, this variable and the former thus mutually exclusive.

SWEBRN = Total sum of Swedish born migrants arriving 1994 to 2003, as percent of local population 1993.

NTRLPOPCHNG = Natural population change, percent change in the size of local labour market population, age 20-64, net total migration.

Control variables:

AGE = Percent change in age structure, calculated as the ratio between age groups (20-29 + 60-64) / (30-59).

EDUCINEQ = Percent change in educational inequality (for definition, see below)

LMDIV = Percent change in labour market diversity (for definition, see below)

EMPLOYMENT = Percent change in the share of the labour force with employment.

UNION = Change percentage unionized among blue-collar workers.

INDUSTRIALREGION = Dummy variable for relatively small local labour markets with more than 30 percent of employment within different types of commodity production.

SERVICEREGION = Dummy variable for relatively small local labour markets with less than 30 percent of employment within different types of commodity production.

i = Local labour market, 1-100.

α = Intercept

ε = Error term

Since acquiring language skills etc takes time, and we can expect that foreign born workers have better chances gaining employment after residing some time in the country, our variable measuring change in the relative size of foreign born population is therefore divided in two. One for the recently arrived foreign born, the size of the population having arrived after 1998, and another measuring net changes in the foreign born population having resided longer within the country.

Immigrants, or the recently arrived foreign born (RECENTLYARRIVED), since connection to the labour market within this group is limited, is expected to be either positively associated or as having no effect whatsoever on levels of income inequality. As noted in our theoretical outline above, what to expect of an increase in the general foreign born population (FRGBRN) is a more complicated matter. In a central place theoretical setting, since we would expect all increases in population size to be associated with increasing levels of business diversification, and therefore increases in top wages and wage inequality, the relationship between an increase in the general foreign born population and inequality should be positive. From the perspective of neoclassical economics on the other hand, the expected outcome is dependent on who the migrants are. Holding all else constant, an increase in a certain type of labor should depress the average wage within the industries in which this type of labor is occupied, the effects on inequality thus depending on which parts of the domestic labor force the migrant labor is competing with for jobs and wages.

Given that the foreign migrant population in Sweden is more dispersed educationally as compared to the Swedish born population (with a relatively larger share of higher educated as well as lower educated, see Table A1, appendix), from a purely theoretical perspective we would expect an increase in the relative number of foreign born to be either negatively associated with changes in inequality or to have no effect whatsoever. In other words, that wages for the higher and lower educated are depressed to an equal extent. If this is not the case, we have to assume the existence of some type of positive externalities associated with the migrant population. This reasoning also goes for the Swedish born domestic migrants (SWEBRN), although this group consists of predominantly higher educated. Natural population changes (NTRLPOPCHNG), i.e. cohort effects, is intended to pick up any effects of changes in population size not associated with international or domestic migration.

As regarding expectations of these variables for our alternative hypothesis, related to Central Place theory and indivisibilities at the level of the local labour market, we expect all migration variables to be positively related to changes in inequality. Since this approach predicts migration to primarily be related to increasing income within the upper half of the income distribution, we also expect these variables to have larger effects the further up within the distribution that we measure income disparities. Because general entropy measures MLD, Theil and GE(2) belong to the same group of estimates and are defined similarly (but with differing emphasis in different parts of the distribution), we can readily compare them in this respect. Therefore, regarding these entropy measures, we expect a larger effect for the GE(2) as compared to the Theil index and MLD, respectively.

Our further controls are motivated as follows. Our variable measuring age structure (AGE) is intended to pick up changes in the spread of the local age structure. If either group in the numerator is large relative to the middle-aged workforce, we would expect higher levels of inequality, and vice versa. A positive change in this variable is thereby expected to be positively related to change in inequality. As control for human capital levels, a measure of educational heterogeneity is used (EDUCINEQ). Following Alderson and Nielsen (2002) and Breau (2007), this measure is calculated using Theil's 1967 index of entropy, (H), defined as;

$$H = \sum_{i=1}^{n} p_i \ln\left(1/p_i\right),$$

where n = 4 and p_i is the proportion of the adult population (20 to 64 years) in each educational category. The four categories are defined as individuals with university degrees (bachelor's degree or equivalent), those with some post secondary education, secondary education (13 years at most) and less than secondary education respectively (10 years or less). A larger value of H implies a greater dispersion (or inequality) of educational attainment.

Level of business diversification (LMDIV) is intended as a variable to control for changes in business diversification over time. The variable is defined as the inverse of the Herfindahl index, $1/H$, where the Herfindahl index is calculated using the local shares of employed within 11 different industries. Formally,

$$H = \sum_{i=1}^{n} (s_i^2)$$

where s_i is share of employed within industry i, and n is the number of industries. A high Herfindahl index, in our definition, indicates a larger share of workers concentrated within one or a few industries. Since high concentration implies a lower level of diversification, we expect the coefficient for LMDIV ($1/H$) to be positively correlated with inequality, and consequently, increasing diversification over time as positively correlated with increases in inequality.[10]

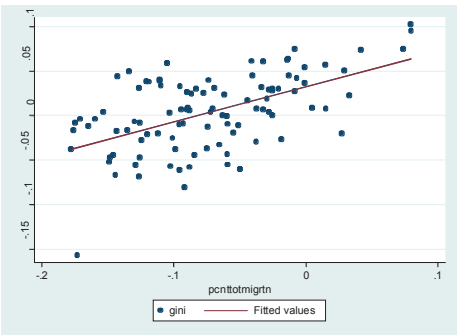
[10] For the assignment of workers to different industry categories, an industry classification by Statistics Sweden is used where workers are categorized as belonging to any of 11 broad occupational groups. These classifications basically correspond to United Nations activity classifications, ISIC. The groups used here are agriculture and forestry, construction, education and research, electricity and water supply, finance and real estate, retail and

Both employment and unionization levels, in turn (EMPLOYMENT and UNION), are expected to be negatively and positively related to wage inequality, respectively. Finally, as noted above, to control for specific developments within small industry clusters, we also add controls for certain region specific characteristics. Dummy variables INDUSTRIALREGION and SERVICEREGION signify labour markets that are largely similar as regarding population size, age structure and educational characteristics, but differing along lines of main industry; private manufacturing (small to middle sized companies within manufacturing) and public sector (health care, education). Expectations as regarding these variables are indeterminate and are only included as controls.

5. Descriptive statistics and figures

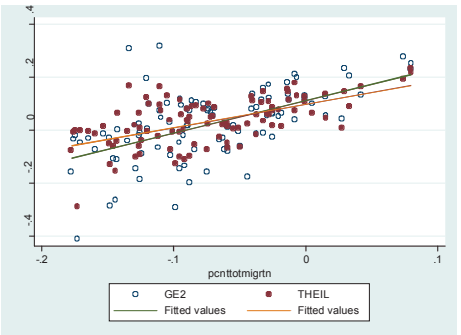
Turning to the data, Figures 1 and 2 below plot the relationship between percent changes in total net migration levels (Swedish plus foreign born) and percent change in inequality. Although at this point we cannot infer any causality between the two, for the studied time-period we clearly see a positive relationship between changes in inequality and changes in migration levels, regardless if we measure inequality using the Gini coefficient, the GE(2) or Theil's index (see Figures 1 and 2.).

Figure 1. Percent change in the Gini coefficient and total migration, 1993 2003.



Gini = 0.03 + 0.39 pcnt total migration + *e*. Adj. $R^2 = 0.3$

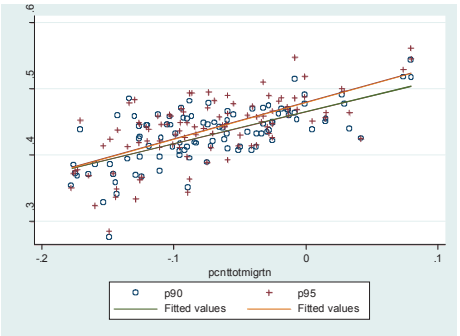
Figure 2. Percent change in GE(2) and Theil's index and total migration, 1993 2003.



GE2= 0.11 + 1.2 pcnt change total migration + *e*. Adj. $R^2 = 0.31$
Theil = 0.10 + 0.88 pcnt change total migration + *e*. Adj. $R^2 = 0.35$

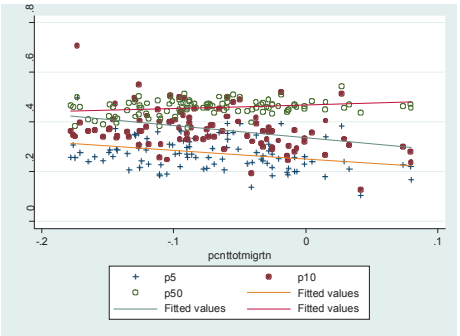
communications, health and social work, manufacturing and mining, public administration and defence, services and culture, and unspecified.

Figure 3. Percent change in percentiles 95, 90 and total migration, 1993-2003.



P95= 0.48 + .55 pcnt total migration + *e*. Adj. $R^2 = 0.44$
P90= 0.46 + .48 pcnt total migration + *e*. Adj. $R^2 = 0.44$

Figure 4. Percent change in percentiles 50, 10 and 5 and total migration, 1993-2003.



P50 = 0.46 + .14 pcnt total migration + *e*. Adj. $R^2 = 0.068$.
P10 = 0.34 - .50 pcnt total migration + *e*. Adj. $R^2 = 0.12$
P5 = 0.25 -.35 pcnt total migration + *e*. Adj. $R^2 = 0.085$

To give an indication as to which parts of the income distribution these changes in inequality stem from, we can calculate and plot the relationship between percent change in income levels (percentiles) and changes in total migration (Figures 3 and 4). Here we see that the positive relationship between migration and inequality stems from both top-wage levels increasing, and bottom-wage levels decreasing, relatively as net migration increases.[11] A tentative conclusion is however that the bulk of this increase in inequality is associated with top-wage increases. Firstly, the migration coefficient is sizeably larger in magnitude using the GE(2) as dependent variable – which focuses on top-level income – than for example using Theil's index, which measures inequality closer to median income levels (1.2 and 0.88 respectively, see Figure 2). Second, although we see a negative relationship between change in total migration and bottom wage levels, the relationship is much stronger for relative top-wage increases than for the bottom decreases, with adjusted R-square as high as .44 using percent change in the 95th and 90th as dependent variable, while much lower for the equivalent regression using the 10th and the 5th (.12 and .08 respectively).

[11] In these calculations wage increases have not been corrected for inflation. Since we are interested in relative and not real wages, this is no concern for our reasoning here.

Noteworthy is also that very few – about ten out of one hundred – of the Swedish local labour markets actually experience positive net migration in ages 20-64 during this period in time.

The figures also indicate that local labour markets can experience significant negative net migration flows without this having any consequence for the local income dispersion. The predicted values (the regression line) in Figures one and two indicate that a local labour market has to experience negative net migration of around minus 8-10 percent, over a ten year period, before any decreases in levels of inequality can be seen. With these descriptive patterns in mind we now turn to potential explanations of the shown pattern.

6. Results

The picture emerging from Table 1, columns 1-4, provides more detail on the broad positive link between total migration and change in inequality previously shown. For all our different inequality measures, the sole significant factor among our demographic variables seems to be change in the share of Swedish born domestic migrants (SWEBRN). This relationship is positive and coefficient estimates vary between 0.35-0.98 depending on which inequality measure we use as dependent variable. In other words, a one percent increase of Swedish born migrants is associated with a 0.35-0.98 percent increase in inequality. As seen in Table 1, these changes in inequality seem first and foremost to be related to changes in upper and top level income (coefficient estimates of the Swedish born migrants increase the further up the distribution that we measure inequality).

Turning to the foreign born, we have negative coefficients for both foreign born (FRGNBRN) and recently arrived foreign born (RECENTLYARRIVED). As none of these two variables are close to being significant in any of our regressions, it seems safe to assume that the increase of foreign born migrants in Sweden during the 1990s has not been a significant factor in the overall increase in wage inequality seen during the studied time-period, at least not in terms of potential negative effects through wage competition. Neither do these broad commensurate inequality estimates cloud possible negative effects of immigration happening at the bottom of the income spectrum. Even though descriptive patterns suggest possible negative effects of total migration

happening at lower income levels (see Figure 4, previously), substituting inequality measures for bottom-half percentile levels in our model yields positive but statistically non-significant estimates for the foreign born (see appendix, Table A4).[12]

Table 1. Results model nr. 1 of four different inequality measures regressed on demographic variables and other controls. Swedish local labour markets, 1993-2003.

VARIABLES	GINI	MLD	THEIL	GE2
RECENTLYARRIVED	-0.0709	-0.0512	0.200	0.865
	(0.232)	(0.414)	(0.503)	(0.892)
FRGNBRN	-0.276	-0.509	-0.0764	1.086
	(0.219)	(0.392)	(0.476)	(0.844)
SWEBRN	0.356**	0.734**	0.772**	0.974**
	(0.0820)	(0.146)	(0.178)	(0.315)
NTRLPOPCHNG	-0.127	-0.202	-0.0643	0.242
	(0.115)	(0.205)	(0.249)	(0.441)
AGE	-0.0358	-0.0430	-0.116	-0.229
	(0.0347)	(0.0621)	(0.0754)	(0.134)
EDUCINEQ	0.259**	0.402**	0.371*	0.148
	(0.0821)	(0.147)	(0.178)	(0.316)
LMDIV	0.143**	0.292**	0.305**	0.467**
	(0.0408)	(0.0728)	(0.0886)	(0.157)
EMPLOYMENT	-0.515**	-0.971**	-0.965**	-1.137**
	(0.0928)	(0.166)	(0.201)	(0.357)
UNION	0.00382	-0.00968	0.00380	0.0189
	(0.0234)	(0.0418)	(0.0508)	(0.0900)
INDUSTRIALREGION	0.00968	0.0211	0.0200	0.0190
	(0.00757)	(0.0135)	(0.0164)	(0.0291)
SERVICEREGION	-4.83e-05	-0.00717	-0.00251	-0.00465
	(0.00783)	(0.0140)	(0.0170)	(0.0301)
Constant	0.0236	0.130**	0.0864*	0.110
	(0.0196)	(0.0350)	(0.0426)	(0.0755)
Observations	100	100	100	100
R-squared	0.725	0.759	0.699	0.560

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

As for our other controls, employment and business diversification (EMPLOYMENT and LMDIV) both have the expected coefficient signs and are highly significant in all our regressions, while educational inequality

[12] Nor do these model runs yield negative estimates using total migration instead of our three separate migrant categories (results not shown; complete tables are available from the authors but cannot be included here).

(EDUCINEQ) has the expected sign and is significant except using the GE(2) as dependent variable. The fact that higher employment levels are associated with a decrease in wage income inequality is perhaps not surprising, and is also a common result in studies on the determinants of inequality. This also goes for the positive and significant relationship between educational heterogeneity and income inequality. Given this relationship, a possible explanation for the non-significant effects of increases in the foreign born population might be that their potential effect on income inequality goes through their effect on educational inequality. Their effect would thereby be hidden by the overall significance of our variable for educational composition of the local labour force. However, this does not seem to be the case since regressing only the migration variables on our inequality measures leaves us with the same result in terms of coefficient signs and statistical significance of these migration variables (see Table A2, appendix). That is, adding estimates of educational inequality does not affect the overall significance of our migration variables of interest.

Concerning our control for change in levels of business diversification, the results are somewhat puzzling. In terms of coefficient sign, results are as expected and the fact that change in diversification seems to be a factor in increasing inequality on par with changes in educational inequality is somewhat novel and potentially important. Regarding coefficient size, this increasing diversification seems to have a larger effect the further up the income distribution that we choose to focus our attention (in Table 1, estimates of LMDIV increase all through columns 1-4), while the opposite is true for our measure of educational inequality.

It may thus be that change in educational disparities disproportionately influences income inequality as measured around mean or median income levels while other factors, such as change in business diversity, play a larger role in disparities as measured at upper or top-level income. If nothing else, these combined results suggest that change in diversification levels should not, as is commonly the case, be left out of analyses of long term change in income inequality. However, with this modelling approach we cannot find support for the contention that migration has an effect on inequality by affecting local business diversity. Even though increasing diversity is positively related to change in wage inequality, its correlation with changes in migration is slight (see appendix, Table A5). Nor is this conclusion changed by for example estimating our ordinary models while adding interaction variables between

demographic change (migration) and business diversification (see appendix, Table A3). Thus, given our chosen modelling approach, we cannot understand effects of migration on income structure as affecting the whole of the local business structure, at least not significantly over a ten year span.

Our finding that migration of the Swedish born is positively related to changes in inequality lends support to our alternative monopoly hypothesis. Also in line with this hypothesis we find that the coefficients for this variable are higher the further up in the income distribution that we measure inequality (see Table 1). However, this effect on inequality we only find for the migration of Swedish born, not for the two groups of foreign born. Swedish born, on the other hand, is the largest migrant group. It is possible that the migration of foreign born in this period is not of sufficient volume as to have a noticeable effect on inequality.[13]

In the previous analysis and with our modelling approach, there are of course underlying industrial changes taking place that we are not directly able to control for. One such change is technological shifts and the growth and structural change of industries not related to either local demand or consumer services geared towards the nation as a whole. During the 1990s particularly, in both employment and value-added, Sweden experienced substantial growth and expansion within IT, telecom, pharmaceuticals and related industries. To what extent are our results robust to these developments? To try to gauge this question we also test our model while adding controls for the bigger metropolitan areas, Stockholm, Gothenburg and Malmö. During this time-span, the growth and expansion within research-intensive industries as these has been shown to be mainly a top-hierarchy phenomenon, as for example with telecom and pharmaceuticals in the Stockholm labour market (Lundquist, Olander and Svensson Henning, 2008a). After the initial crises in 1990/1993, the major metropolitan areas are also the main home to other expanding sectors such as different types of producer services and the subsequent dot-com boom of that decade. And, in the case of Stockholm, it is also home to more than half of those employed within banking and financial services (Lundquist, Olander and Svensson Henning, 2008b; Hermelin, 2007), something which also motivates a separate control. The results of these additional tests are shown in Table 2. As can be seen, adding these controls does not change our main results. Although

[13] Substituting total migration for our three migrant categories yields estimates very similar to our Swedish born migrant category, something which is also suggests this possibility (not shown).

Stockholm adds to inequality using three out of four measures (and also Gothenburg and Malmö, albeit at lower levels of significance), the main effect of these additional controls is to reduce coefficient size and significance of our variable controlling for educational disparities (EDUCINEQ). To the extent that these variables sufficiently control for developments within these industries, they do not change our main conclusions from the previous analysis.

Table 2. Results model nr. 1 adding controls for the major metropolitan areas Stockholm, Gothenburg and Malmö. Swedish local labour markets, 1993-2003.

VARIABLES	GINI	MLD	THEIL	GE2
RECENTLYARRIVED	-0.300	-0.430	-0.211	0.455
	(0.235)	(0.424)	(0.519)	(0.942)
FRGNBRN	-0.386	-0.694	-0.268	0.865
	(0.216)	(0.390)	(0.477)	(0.867)
SWEBRN	0.307**	0.656**	0.677**	0.868**
	(0.0803)	(0.145)	(0.177)	(0.322)
NTRLPOPCHNG	-0.0469	-0.0697	0.0781	0.374
	(0.113)	(0.204)	(0.250)	(0.454)
AGE	-0.0308	-0.0357	-0.105	-0.219
	(0.0337)	(0.0608)	(0.0744)	(0.135)
EDUCINEQ	0.210*	0.324*	0.279	0.0570
	(0.0803)	(0.145)	(0.177)	(0.322)
LMDIV	0.150**	0.302**	0.318**	0.471**
	(0.0396)	(0.0714)	(0.0874)	(0.159)
EMPLOYMENT	-0.554**	-1.032**	-1.044**	-1.248**
	(0.0907)	(0.164)	(0.200)	(0.364)
UNION	0.0107	0.00117	0.0173	0.0336
	(0.0226)	(0.0408)	(0.0499)	(0.0907)
INDUSTRIALREGION	0.00881	0.0197	0.0183	0.0168
	(0.00726)	(0.0131)	(0.0160)	(0.0291)
SERVICEREGION	-0.00186	-0.0101	-0.00606	-0.00888
	(0.00754)	(0.0136)	(0.0166)	(0.0302)
STOCKHOLM	0.0611*	0.0984*	0.114*	0.0852
	(0.0248)	(0.0448)	(0.0548)	(0.0995)
GOTHENBURG	0.0493*	0.0785	0.0982	0.157
	(0.0244)	(0.0440)	(0.0538)	(0.0977)
MALMO	0.0422*	0.0729	0.0680	0.0541
	(0.0249)	(0.0450)	(0.0551)	(0.100)
Constant	0.0298	0.140**	0.0984*	0.124
	(0.0189)	(0.0342)	(0.0418)	(0.0759)
Observations	100	100	100	100
R-squared	0.756	0.782	0.723	0.575

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

7. Summary and concluding discussion

As seen in our descriptive section, for the studied time-period, a change in the size of local population due to migration is positively related to changes in income structure and wage inequality. The larger the relative inflow of migrants, the larger the increases in inequality, with these changes first and foremost related to changes in upper and top level income. When estimating our different statistical models, however, this link between migration and changing income structure seems however to be restricted to Swedish born migrants, and changes in the share of foreign born migrants are not significantly related to increases in wage income inequality, regardless of which inequality measure we use. The results suggest domestic migration patterns as potentially important in understanding changes in wage inequality over time.

Further, Figure four in the descriptive section also indicates the possibility that migration patterns can also affect bottom wage levels negatively. When testing our model using different bottom percentile levels as dependent variable (Table A4), however, we cannot find any significant negative estimates for any of our separate migration categories. If nothing else, on the basis of this evidence, it seems safe to conclude that wage competition of foreign born is not a substantive factor in explaining increasing inequality during this time. Given our first neoclassic approach, related to the possibility of inequality arising through wage competition, we can thus not find much support that increasing inequality is due to this factor.

As compared to this first approach, we find relatively more support for our monopoly hypothesis related to indivisibilities at the level of the local labour market. Even though we cannot estimate any separate effects of immigration in this regard, migration of Swedish born migrants – our largest migration category – is positively related to increasing wage inequality. This is so even while controlling for competing explanations such as changes in educational composition of the local labour market, business diversification and specific industrial developments within the major metropolitan areas. In other words, migration of the Swedish born in our model is related to changes in wage inequality regardless of wage competition and while controlling for competing explanations. We can thus not reject this alternative hypothesis given the data and our chosen statistical modelling approach. If nothing else, the results open

up for a possible alternative – or complementary – explanation of changes in wage inequality, and suggest further research along these lines.

Additional conclusions are as follows. Local increases in wage inequality are associated with increases in local business diversification, a potentially important finding that corroborates results from Haworth et al (Haworth et al., 1978), but is not commonly considered in current modelling approaches to estimating change in wage or general income inequality. Also, an interesting result is that changes in business diversification seem to play a relatively larger role in explaining inequality at upper or top income levels (in Table 1, estimates of LMDIV increase all through columns 1-4), in contrast to education disparities which play a larger role using inequality measures with relatively larger weight on mean or median income. It may thus be that change in educational disparities disproportionately influences income inequality as measured around average income levels, while factors that go beyond measurable levels of human capital (such as business diversity) play a larger role in disparities as measured at upper or top-level income.

As noted previously, changing business diversification is only weakly associated with changes in migration patterns. Given our model and the available data, migration can therefore not be understood as affecting the total business structure of receiving (and sending) local labour markets. This may be because ten years is not a sufficient time span for changes in local business diversification to take effect, that changes in business diversification play out differently in net contracting as opposed to net expanding labour markets, or because our measure of business diversification – based on 11 broad industry groups – can be somewhat blunt a measure to capture these changes.

As suggested, these results both warrant and open up for further research. One direction this could take is to sharpen our measure of business diversity and further address follow-up questions like to what extent these patterns are specifically driven by certain industries. This measure could also provide a more exact test for our hypothesis derived from Central Place theory. Another approach, something which we have not addressed in the current paper, would also be to probe questions regarding differentiation processes. Regional differences in net-migration and local population growth over time also affects relative prices within local labour markets, inducing low productive industries to move out of urban areas. To the extent that this is a sub-urbanisation process

happening within local labour markets, our use of these local labour markets also covers this process. Nevertheless, the question is worth dwelling into further.

8. Appendix

Table A1. Share of higher educated (bachelor's degree or equivalent) and educational inequality among migrant and total population.

	Foreign born	Swedish born domestic migrants	Swedish born total population
Share of higher educated	23 %	19%	15%
Education inequality	1.32	1.02	1.22

Source: Place, author's calculations.

Table A2. The Gini, MLD, THEIL and GE(2) inequality measures regressed on migration variables and natural population change.

VARIABLES	GINI	MLD	THEIL	GE2
FRGNBRN	-0.289	-0.608	-0.185	0.707
	(0.293)	(0.539)	(0.593)	(0.905)
RECNTLYARRIVED	0.0549	0.194	0.479	1.226
	(0.326)	(0.598)	(0.658)	(1.005)
SWEBRN	0.557**	1.122**	1.089**	1.223**
	(0.0970)	(0.178)	(0.196)	(0.299)
NTRLPOPCHNG	0.0867	0.199	0.260	0.421
	(0.155)	(0.284)	(0.313)	(0.477)
Constant	0.0467**	0.160**	0.113**	0.102**
	(0.0119)	(0.0218)	(0.0240)	(0.0366)
Observations	100	100	100	100
R-squared	0.346	0.393	0.378	0.326

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Table A3. Results model 1 including interaction variable (INTERACTION) between change in total foreign born population and labour market diversity (LMDIV). Swedish local labour markets, 1993-2003.

VARIABLES	GINI	MLD	THEIL	GE2
SWEBRN	0.350**	0.732**	0.784**	1.029**
	(0.0836)	(0.149)	(0.182)	(0.320)
EDUCINEQ	0.250**	0.399**	0.386*	0.221
	(0.0845)	(0.151)	(0.184)	(0.324)
LMDIV	0.142**	0.292**	0.308**	0.480**
	(0.0411)	(0.0735)	(0.0893)	(0.157)
INTERACTION	0.977	0.349	-1.825	-8.489
	(2.166)	(3.872)	(4.703)	(8.292)
EMPLOYMENT	-0.516**	-0.971**	-0.964**	-1.129**
	(0.0932)	(0.167)	(0.203)	(0.357)
Constant	0.0241	0.130**	0.0853*	0.105
	(0.0198)	(0.0353)	(0.0429)	(0.0756)
Observations	100	100	100	100
R-squared	0.726	0.759	0.699	0.565

Standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05
NOTE: Only statistically significant estimates shown. Interaction between diversification (LMDIV) and other demographic variables yield similar results (not shown).

Table A4. Results model nr. 1 using percentile levels 5, 10, 25 and 50 as dependent variable.

VARIABLES	p5	P10	p25	p50
FRGNBRN	0.654	0.890	0.902	0.214
	(0.412)	(0.452)	(0.466)	(0.222)
RECENTLYARRIVED	0.455	0.899	0.923	0.296
	(0.435)	(0.477)	(0.493)	(0.234)
SWEBRN	-0.171	-0.320	0.257	0.268**
	(0.154)	(0.169)	(0.174)	(0.0829)
NTRLPOPCHNG	0.525*	0.509*	0.741**	0.286*
	(0.215)	(0.236)	(0.244)	(0.116)
AGE	-0.145*	-0.149*	-0.130	-0.0508
	(0.0652)	(0.0715)	(0.0738)	(0.0351)
EDUCINEQ	-0.392*	-0.615**	-0.759**	-0.242**
	(0.154)	(0.169)	(0.174)	(0.0830)
LMDIV	-0.227**	-0.215*	-0.100	-0.00710
	(0.0766)	(0.0840)	(0.0867)	(0.0413)
EMPLOYMENT	1.000**	1.271**	1.159**	0.393**
	(0.174)	(0.191)	(0.197)	(0.0939)
UNION	0.0323	0.0682	0.0315	-0.00200
	(0.0439)	(0.0482)	(0.0497)	(0.0237)
INDUSTRIALREGION	-0.00827	-0.0246	-0.00852	-0.00112
	(0.0142)	(0.0156)	(0.0161)	(0.00765)
SERVICEREGION	-0.000800	-0.0175	-0.0391*	-0.0151
	(0.0147)	(0.0161)	(0.0166)	(0.00792)
Constant	0.239**	0.337**	0.516**	0.480**
	(0.0368)	(0.0404)	(0.0417)	(0.0198)
Observations	100	100	100	100
R-squared	0.615	0.691	0.604	0.458

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Table A5. Correlation coefficients, selected variables

	FRGNBRN	RECAR~N	SWEBRN	NTRLP~E	AGE	EDUC~Q	LMDIV	EMPLOY~T	UNION
FRGNBRN	1								
RECARRFRGN~N	0.0109	1							
SWEBRN	0.5485	0.2394	1						
NTRLPOPCHNG	0.3841	0.2443	0.4318	1					
AGE	0.1656	0.0477	0.3454	0.2466	1				
EDUCINEQ	0.4608	0.1018	0.6044	0.5201	0.3526	1			
LMDIV	-0.2253	-0.043	0.0404	-0.0379	-0.1189	0.1667	1		
EMPLOYMENT	-0.297	-0.2335	-0.3663	-0.3071	0.0507	-0.5144	-0.3038	1	
UNION	-0.2208	-0.1098	-0.247	-0.3008	-0.124	-0.3173	-0.2425	0.349	1

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Paper 3

Does Immigration Hurt Low Income Workers? - Immigration and Real Wage Income below the 50th Percentile, Sweden 1993-2003

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Abstract

This paper addresses questions of potential effects of immigration on wage income of predominantly low income Swedish born workers. Using full population panel data for two time-periods, 1993-1999 and 1997-2003, we estimate two fixed effect models controlling for both individual and local labour market characteristics, as well as individual and regional fixed effects. The models are tested for a range of population sub-groups, the compulsory and upper secondary educated and workers within certain shares of the local income distribution (using different below median percentile levels as population cut off points). The estimates show mainly a positive relationship between increasing shares of foreign born and wage income of Swedish born workers.

Keywords: International migration, local labour markets, wage levels, labour supply
JEL-codes: F22, J22, J61, J31

1. Introduction

Much empirical research effort has been focused on whether immigration and the corresponding increases in labour supply is harmful or beneficial to wage growth and job opportunities of native born workers. Most of this research can be divided into two broad types, those using a factor analysis approach, gauging how immigration can affect substitution between different types of labour and/or labour and capital, and those employing a so-called area approach – comparing geographical areas in terms of the share of foreign born and outcomes for different sub-groups of the native working age population (see below).

Studies of the last type, whether for the US or other OECD countries, investigate this question by either cross section or panel model analysis based on regionally aggregated data. Needless to say, this approach suffers from lack of information on individual level factors affecting labour market outcomes of the native born. As a first, to our knowledge, the paper at hand furthers the research by combining local labour market characteristics with individual full population panel data on native born workers. Primarily, this allows the estimation of key variables controlling for factors affecting individual outcomes at a much more detailed level than what has hitherto been possible. Second, in terms of explained variation, it gives us an idea of the importance of these regional key variables (such as the share of foreign born) relative to other individual factors affecting wage income.

In the paper, statistical tests are made for two educational groups; the relatively low educated (compulsory + high school drop-outs, or equivalent) and workers with upper secondary education (up to 13 years of schooling). In addition, we also run our model using subsets of different income percentiles below the 50^{th} percentile. The primary research question addressed is *i)* are changes in the relative size of the foreign born population over time related to comparatively lower income levels for the native born, either looking at workers with relatively short or intermediate length of education or workers with income in the bottom half of the income distribution? As immigrants are by no means a homogenous group and the impact of immigration may also vary greatly between different regions in an economy, we also ask whether *ii)* these effects are dependent on origin of the immigrants, as defined as immigrants from OECD and non-OECD countries, and *iii)* whether the effects are limited to just economic growth

regions or if the found patterns are more of a general feature, i.e., taking place in all labour markets experiencing changes in levels of immigration?

In what follows, theory and previous studies are discussed in section 2, data and descriptives in section 3, and an outline of our empirical approaches and statistical model is provided in section 4. Results are detailed in section 5 while section 6 concludes.

2. Theory and previous studies

Theory on the impact of international migration on wages of natives can be divided into two broadly defined categories. Firstly, representing the main theoretical approach are different approaches within a neoclassical framework, second we have traditional economic geography and much of the new economic geography literature. These two theoretical strands of the literature are not altogether coherent and to some extent we are left with two competing bodies of theory with differences as regarding expected outcomes.

Within neoclassical economics, assuming constant returns scale, the skill composition and educational background of immigrants is critical in terms of the outcome. The basic reasoning corresponds to standard supply and demand theory. All else equal, an increase in the number of either low or high skilled immigrants will lower the wages of comparable native workers because these workers now face more competition in the labor market. And if different types of labour are complementary, lower wages for one group translates into higher wages for the other since downward pressure on the wages of one group should induce investment increasing demand and thus increasing wages for the other complementary group. In practice however, because much immigration has either consisted of predominantly lower educated or because higher educated immigrants often have found themselves in jobs requiring only short or compulsory education, this reasoning has mostly been applied as explanation for stagnating bottom wage income and increasing wages at the top.

Empirically, in both US and European studies, the evidence on the impact of immigration on host country wages is generally not in favour of any strong negative effects for groups competing with immigrant labour. Mostly, studies reveal elasticities that hover around zero, i.e., neither positive or negative

(Friedberg and Hunt, 1995; Borjas, 1994; Ekberg and Andersson, 1995). For instance, Card (2001) finds that an inflow rate of 10 percent for one occupation group (which raises the log population share of the group by about 0.1 – would reduce relative wages for the occupation by 1.5%. An inflow of 20% - equivalent to the highest rates seen in the U.S. data between 1985 and 1990 – would be expected to lower relative wages by 3%. For Britain, Dustmann et al (2005) find positive effects of immigration on wages for all educational groups, and no strong evidence that immigration has any negative effects on aggregate employment or unemployment. Similar results are also obtained for Germany (Frank, 2007) and for Spain (Carrasco, Jimeno and Ortega, 2008), using an array of different samples and estimation procedures.

Since the theoretical implications of immigration are rather strong while empirical studies in general reveal either small negative or even positive effects, much focus has been on potential problems of different approaches, in particular on the issue of endogeneity when estimating effects. High-wage areas tend to attract migrants and this selective settlement would lead to upwardly biased estimates of labour market outcomes for natives. But, as many have argued (for example Borjas, Freeman, Katz, DiNardo and Abowd, 1997), it would be wrong to conclude that immigration thereby causes the attractive labor market conditions. The potential endogeneity of the immigrant stock suggests that OLS may lead to inconsistent estimates and that an instrumental variable approach is essential. One of the main challenges in the literature has therefore been to find suitable instruments: variables that are correlated with inward immigration but not directly related to changes in natives' wages. An instrument commonly used in studies has been the stock of migrants in previous periods. The underlying justification is that earlier immigrant concentrations are unlikely to be correlated with current economic shocks if measured with a long enough time lag, but related to existing concentrations since current inflows are also determined by historic settlement patterns of previous immigrants (see for example Federal Reserve Bank of Philadelphia, 2005). Using this instrument for immigrant inflows has also relied on the fact that not all immigrants settle in particular locations for economic reasons. Some migrants come to settle more by way of the existence of networks and the presence of individuals with the same cultural and linguistic background, inducing immigrants to settle in areas with already

high immigrant concentrations such as enclaves (Edin, Fredriksson and Åslund, 2003; Åslund, 2004).[1]

Overall however, a common notion seems to be that this instrument usually also has a high correlation with current wage developments (see e.g. Longhi, Nijkamp and Poot, 2005), and studies using instrumental variables find modest impacts as well. In their meta-analysis of a set of 18 papers (Longhi et al., 2005), the majority of effect sizes are clustered around zero with an overall mean of -0.119. This implies "that a 1 percentage point increase in the proportion if immigrants in the labor force lowers wages across the investigated studies by only -0.119 percent" (pp. 472).

However, in light of non-neoclassical approaches, our second theoretical category broadly defined, the lack of any strong negative effects of immigration may not be all that surprising. Much of the new economic geography literature and traditional economic geography underline the role of migration and labour movements as part of regional growth processes, driving investment and various economies of scale in growth regions and thereby opening up for a potentially positive impact on local wage formation (see e.g. Fujita and Thisse, 2002; World Bank, 2009; Myrdal, 1957; Pred, 1966). Within these approaches, migration, and by extension immigration, is also often seen as being part of cumulative causation processes and positive feedback loops, thereby making the "contra factual" question – i.e., what workers would have earned without the migrants moving in – more speculative in nature. As is noted by Dustmann *et al*. (2005), the key problem in general with empirical analysis in this matter is "to compare the economic outcomes of certain groups of the resident population in particular cells after immigration with the counterfactual outcomes that would be observed had migration not taken place" (pp. F328). The second measure is not observable, and needs to be constructed with assumptions which are always debatable, i.e. it is hard to assess what economic growth would have been if migrants were not where they are now.

[1] Because of these concerns, so-called "natural experiments" have also been exploited. A famous example is Card's analysis of the influx of Cuban refugees during the "Mariel boatlift" on the Miami labor market (Card, 1990). Card found that the event had little adverse impact on the labor market outcomes of Miami's existing less-skilled workers. Other European studies along these lines with similar results include Carrington and de Lima (1996), Hunt (1992), Friedberg (2001) and Frank (2007).

So far research along these lines has been mostly theoretical, and theoretical implications are often hard to test explicitly. For our purposes however, it is important that under assumptions of increasing returns to scale, positive externalities and cumulative causation processes, theoretically we need not expect negative supply side effects as in a constant returns framework. And these approaches provide an alternate explanation for lack of negative effects or positive signs of coefficients for increasing immigration. Rather than being the results of measurement error or lack of good instruments, as is often suggested, the common clustering of immigration effects around zero may in fact reflect the existence of theses types of agglomeration economies, broadly defined.

3. Data and descriptives

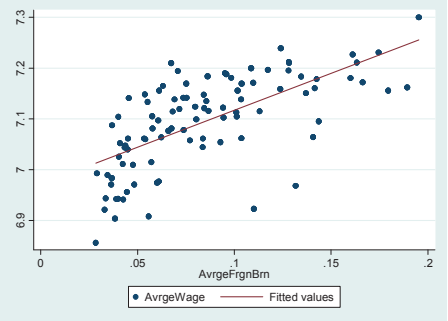
The study at hand utilizes full population register data from Statistics Sweden, detailing level and source of income and a range of additional individual level data such as household type, level of education, country of birth and sources of income. The studied time period is divided in two, 1993-1999 and 1997-2003 respectively, with each data set providing data on around 4.5 million workers for every second year included in the panel. Primarily, this measure allows for potential differences over the changing stages of the business cycle and other differences between the two periods which are somewhat hard to control for. 1993 marks the bottom of a severe recession with employment picking up – albeit quite slowly – until 1999. And in general, the first half of the 1990s marks a thorough restructuring of the Swedish economy; a net loss of employment of around 300 000 jobs, a relative move away from public to private sector service employment and a net loss of manufacturing jobs, albeit with substantial regional differences (see e.g. Lindbeck, 1997; Thakur, 2003). Although the period ends in recession, 1997-2003 is characterized by generally higher employment rates and constitutes somewhat of a return to normalcy, even if employment never reaches similar levels as before the downturn.

The individual data used pertains to native born workers, ages 18-64. As is common in studies on income distribution, we seek to confine the data to workers with a reasonably strong attachment to the labour market and also to some extent to limit the share of part time workers in the data set. We therefore exclude individuals with a yearly wage income below 34 400 Swedish crowns in 1993 (around 4200 dollars in ‘93 exchange rates), and people below the

equivalent of that amount adjusted for inflation, for all consecutive years.[2] Also excluded are all individuals with income pertaining to intermediate and university level studies (student loans and subsidies). In addition, because household formation and household break-ups may affect individual hours worked and this behaviour is hard to control for, we limit our data to individuals living within stable households, i.e., households that are either single or two person households throughout the two time periods. To further simplify interpretation of results, regional domestic migrants are also excluded from our population.

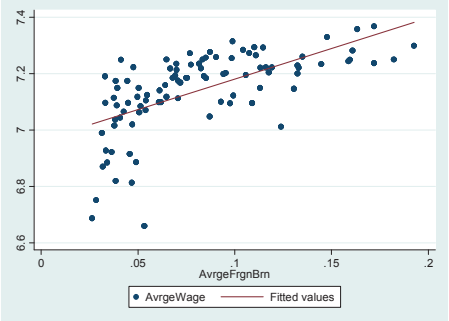
To provide a first immediate sense of the data and the issue at hand, in figures 1.1 and 1.2 below, we plot summarized labour market average wage income (for the primary educated) and average share of foreign born for periods 1993-1999 and 1997-2003 respectively. As indicated by the regression line, both show a clear positive relationship between these two variables.

Figure 1.1. Average wage income for native born compulsory educated workers, and average share foreign born, 1993-1999. Swedish labour local markets.



Source: Statistics Sweden, calculations by the authors.[3]

Figure 1.2. Average wage income for native born compulsory educated workers, and average share foreign born, 1997-2003. Swedish local labour markets.

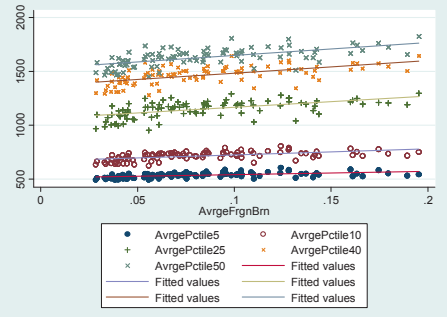


Source: Statistics Sweden, calculations by the authors.

[2] This amount corresponds to one unit of a summarized income measure normally used by Statsitics Sweden to compare individual- and family living standards over time (”basbelopp”).
[3] Labour markets Haparanda, Sorsele, Pajala and Övertorneå excluded in Figures 1.1-1.4. These labour markets are outliers in the sense that they either contain unusually high shares of foreign born (the some 40 percent mostly Finnish born population in Haparanda, right on the northern border to Finland), or have both unusual low income levels and low shares of foreign born, as the case with Sorsele, Pajala and Övertorneå, also in the north of the country. These labour markets however constitute a very small share of the total working age population.

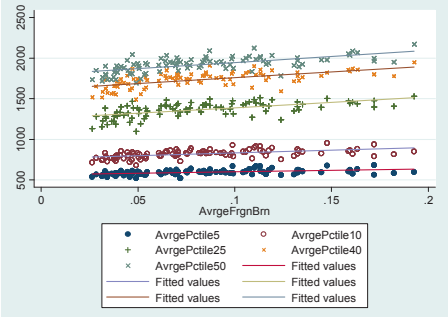
Nor does this basic positive relationship between these two variables seem to hide any large disparities within the group itself, that is, the compulsory educated. Figures 1.3 and 1.4 below show the relationship between average (local) labour market percentile levels and average shares of foreign born. Even though bi-variate regression lines for percentiles five and ten are somewhat more level than for percentiles 25, 40 and 50, the basic picture still seems to be one of a positive relationship between domestic wage income and shares of foreign born. The pooling and averaging of data does of course cloud differences over time, and as we are interested in whether this positive relationship remains also after introducing relevant controls, we therefore turn to our modelling of these patterns.

Figure 1.3. Average percentile levels (in hundreds, Swedish crowns), and average share of foreign born, 1993-1999. Swedish local labour markets.



Source: Statistics Sweden, calculations by the authors.

Figure 1.4. Average percentile levels (in hundreds, Swedish crowns), and average share of foreign born, 1997-2003. Swedish local labour markets.



Source: Statistics Sweden, calculations by the authors.

4. Methodology and empirical model

As results vary somewhat depending on empirical approach (cf. Longhi et al, 2005), and as it is not straightforward as to which is the most correct, we provide results from two different estimation strategies: OLS with regional fixed effects and individual fixed effects (difference in differences). First, we run ordinary OLS adding dummies for local labour markets. The dummies control for labour market fixed effects, for instance in terms of industry structure. Of course, the dummies control for all differences between regions that remain constant over time, including differences in individual level factors correlated within regions. Examples of the latter could be health, but also factors

commonly discussed in the literature on industrial clusters such as innovativeness, drive and tradition, essentially non-measurables which are often seen as being "in the air" in different localities (see e.g. Maskell and Malmberg, 1999, 2002; MacKinnon, Cumbers and Chapman, 2002). This model acts as a point of reference in that it corresponds to the models commonly estimated in the literature, although in those cases the regional fixed effects often are controlled for through differencing regional level data. Second, we difference the data and estimate parameters by way of fixed effects regression, a procedure which removes any additional unobserved fixed heterogeneity among individuals living in different local labour markets. As variation across regions can pertain to both individual and regional level factors, by essentially adding an individual dummy variable to our estimates, this can be seen as an alternative way of controlling for regional fixed effects while estimating our main variables of interest. Finally, to address the issue of simultaneity and the possibility of our main variable of interest being endogenous, we also provide IV-estimates using the corresponding two year lag as instrument for the share of foreign born, the most common approach within the literature to address this issue. All estimates include year specific dummy variables to capture business cycle effects across regions. The following regional and individual fixed effect models (model number 1 and 2, respectively) are tested for our two time periods, 1993-1999 and 1997-2003:

$$\begin{aligned} y_{it} = {} & \alpha + \beta_1 \mathrm{AGE}_{it} + \beta_2 \mathrm{AGE2}_{it} + \beta_3 \mathrm{BUSINESS}_{it} + \beta_4 \mathrm{CAPITAL}_{it} + \\ & \beta_5 \mathrm{NEGCAPITAL}_{it} + \beta_6 \mathrm{OTHER}_{it} + \beta_7 \mathrm{WORKRELATED}_{it} + \beta_8 \mathrm{EDUC}_{it} + \\ & \beta_9 \mathrm{JOBCHANGE}_{it} + \beta_{10} \mathrm{JOBCHANGE2}_{it} + \beta_{11} \mathrm{EMPLOYMENTRATE}_{it} + \\ & \beta_{12} \mathrm{SHAREFRGNBRN}_{it} + \beta_{13} \mathrm{YEAR} + \begin{cases} a_i \\ b_j \end{cases} + \varepsilon_{it} \end{aligned} \qquad (1)\ \&\ (2)$$

Where,

y_{it} = Individual yearly real wage income (logged values)

AGE_{it} = Individual age

$\mathrm{AGE2}_{it} = (\mathrm{AGE})^2$, i.e. age squared

$\mathrm{BUSINESS}_{it}$ = Income from privately owned business, non-money market income

$CAPITAL_{it}$ = Income from stocks, interest etc.

$NEGCAPITAL_{it}$ = Loss of income due to stocks, interest paid on loans etc.

$OTHER_{it}$ = Income from welfare, housing subsidies.

$WORKRELATED_{it}$ = Income from benefits related to unemployment, early retirement, student subsidies, sick and parental leave

$JOBCHANGE_{it}$ = Dummy variable if person changes jobs

$JOBCHANGE2_{it}$ = Dummy variable if additional household member changes jobs

$EDUC_{it}$ = Variable signifying educational level, non-specified (drop-outs), compulsory and upper secondary

$EMPLOYMENTRATE_{it}$ = Employment rate in local labour market

$SHAREFRGNBRN_{it}$ = Share foreign born within each labour market

YEAR = Dummy controlling for year specific effects, 1993 and 1997 used as reference category for time period one and two respectively.

a = Regional fixed effect, included in model nr. 1

b = Individual fixed effects, included in model nr. 2.

α = Intercept. Since the intercept disappears when controlling for individual fixed effects (by time-demeaning), the intercept is estimated only in model nr 1.

i = individual

t = 1…n (year ’93, ’95, ’97 and ’99, for time period one. ’97, ’99, 2001 and 2003, for time period two)

j = local labour market, 1…n.

ε_{it} = Error term

AGE and AGE2 (age squared) controls for age effects, the second of these for differences in income growth trajectory over the life-cycle, while our different income variables (five, in all) are intended to pick up on any changes in wage income stemming from behavior related to sources of income other than wages.

The most important of these is perhaps our variable for work related income (WORKRELATED) covering all income stemming from temporarily being away from ordinary salaried work, either because of unemployment or parental leave, sickness, etc. Conveniently, and as we are not interested in such specific behavior per se, this measure spares us a lot of additional work constructing variables (and is probably also a more efficient control). Change of employer (JOBCHANGE), however, and the equivalent variable for spouses (JOBCHANGE2), are not covered by any of these variables and need to be controlled for.

Turning to our labour market variables, firstly, the local labour market employment rate (EMPLOYMENTRATE) is included to capture wage pressure stemming from the ups and downs of the business cycle, while dummies for local labour markets are intended to capture labour market specifics and any differences across local labour markets not captured by our other controls. Third, our main variables of interest, share of foreign born (SHAREFRGNBRN) and share OECD and Non-OECD migrants (OECD and Non-OECD), are included to test our hypotheses on changes in the share of foreign born migrants residing within local labour markets. Lastly, dummies for each separate year are included to capture year-specific events across labour markets, with the initial first year used as reference category.

Expectations as regarding the signs of our individual level variables (variables 1-11) are straightforward and need not explicitly be detailed further. As regarding our remaining variables, employment rate is expected to be positive, while – as was argued in the initial theoretical discussion – the sign for foreign born indefinite and can depend on the choice of theoretical approach. In a neoclassical setting, a negative sign is what to expect. Under a broader paradigm of increasing returns, or cumulative causation, increasing immigration may reflect and further enhance growth and investment, thus potentially overruling any negative supply side effects. Therefore, along those lines, a positive coefficient may be what to expect.

5. Results

As we are working with full population data, any inference to the population is made without sampling error. The standard errors and significance levels will instead be interpreted with respect to the underlying data generating mechanism, as indicators of the uncertainty of the estimated parameters in a correctly specified model.

Results of the analyses of potential immigrant worker supply side effects on yearly wage income of native born workers are provided in Tables 1 through 5. First, estimates for the total share of foreign born using our two educational sub-groups of native born workers are shown in Table 1 and 2. Second, estimates for the share of foreign born using different percentiles of the local income distribution as population cut-off points are shown in Table 3. Tables 4 and 5 again provide estimates for our two educational sub-groups, but with the share of foreign born now divided into OECD and Non-OECD migrants. In the analyses presented in Tables 6 and 7 we then address the question of the importance of region by examining the consequences of excluding population growth regions from our analyses. Finally, in Tables A3 and A4 (in the appendix) we explore the effect of using the standard approach to modelling endogeneity providing IV-estimates using lagged population shares as instrument.

Regarding the two educational sub-groups, in both cases we find the share of foreign born to be positively related to native wage income. As can be seen in Tables 1 and 2, this result holds regardless of time period and estimator. Comparing the results for the two groups, point estimates are generally larger (around double in size) for those with upper secondary education compared to those with a degree from compulsory school. For graduates from compulsory education, estimates vary in between 0.09 to 0.72 while they range between 0.53 and 1.31 for those with an upper secondary degree.

As we are using the log yearly income as dependent variable, these estimates do also reflect elasticities. Thus, among those with compulsory education, a one percent increase in the share of foreign born is associated with 0.09 and 0.72 percent higher income, and 0.53 and 1.31 for upper secondary graduates. All estimates except one – Table 1, column one – are also highly significant.

Comparing our two estimators, for both educational groups and time periods estimates are larger using our individual instead of our regional fixed effect estimator. Estimates are also generally larger for the second of our two periods as compared to the first.

Table 1. The effect on compulsory educated natives' yearly wage income of the share of foreign born immigrants, 1993-1999, 1997-2003.

	Regional fixed effects		Individual fixed effects	
	1993-1999	1997-2003	1993-1999	1997-2003
SHAREFRGNBRN	.087	.654***	.373**	.722***
	(0.117)	(0.117)	(0.119)	(0.155)
Constant	6.502***	6.284***	4.749***	5.161***
	(0.072)	(0.168)	(0.060)	(0.083)
Observations	1936344	1551465	1936344	1551465
R-squared	.3721	.3567	.1124	0.1791

legend: * p<0.05; ** p<0.01; *** p<0.001.
Note: Robust standard errors in parenthesis. Estimates include all controls as specified in models 1 and 2. Complete tables are available from the authors but cannot be included here.

Table 2. The effect on upper secondary educated natives' yearly wage income of the share of foreign born immigrants, 1993-1999 & 1997-2003

	Regional fixed effects		Individual fixed effects	
	1993-1999	1997-2003	1993-1999	1997-2003
SHAREFRGNBRN	.524***	1.004***	.865***	1.306***
	(0.118)	(0.188)	(0.152)	(0.315)
Constant	6.243***	6.112***	4.367***	4.818***
	(0.150)	(0.204)	(0.138)	(0.121)
Observations	5801502	5727102	5801502	5727102
R-squared	.3987	.3588	0.1868	.1934

legend: * p<0.05; ** p<0.01; *** p<0.001.
Note: Robust standard errors in parenthesis. Estimates include all controls as specified in models 1 and 2. Complete tables are available from the authors but cannot be included here.

Turning to our analyses of workers in different shares of the local income distribution (using percentile levels 5-50 as population cut-off points), the patterns evident in Table 3 are very similar to those in the analyses above. As previously, the basic picture for both periods is one where the coefficient for foreign born is positive regardless of using a regional or individual fixed effects

estimator. However, compared with Tables 1 and 2 where we found larger coefficient estimates for the relatively more educated, we do not find our positive coefficients increasing the further up the cut-off point in the income distribution. Rather, the pattern is one where the largest coefficient estimates are found when the cut-off is the 25th percentile, with estimates decreasing somewhat in size using the 40th and 50th percentiles. There is probably a rough overlap between the population of workers with the lowest level of educational attainment and with the lowest incomes, and the results are also roughly comparable. However, the analyses using a higher cut-off are more likely to combine workers with different educational qualifications, and these estimates are therefore less comparable to the previous ones. Nevertheless, one similarity is that the estimated coefficients are substantially larger for the second period as compared to the first, regardless of estimator.

The mean association between foreign born population and income is thus positive in all populations. However, the spread around these point estimates is large at the very bottom of the distribution and, as a rule, decreases the closer we get to the 50th percentile. Most of these bottom estimates (below the 25th) are also not significant on ordinary levels of significance. And, notably, no estimate except one for our first period is significant, regardless of estimator.

Table 3. The effect on native workers' yearly wage income of the share of foreign born immigrants. Models estimated for different sub-groups of native workers below percentile levels 5-50, 1993-1999 and 1997-2003.

	Regional fixed effects		**Individual fixed effects**	
	1993-1999	1997-2003	1993-1999	1997-2003
<5th	0.057	0.651	0.402	0.415
	(0.238)	(0.326)	(0.339)	(0.428)
<10th	0.080	1.110*	0.186	0.538
	(0.299)	(0.475)	(0.312)	(0.436)
<25th	0.303	1.498***	0.374*	0.744**
	(0.239)	(0.390)	(0.181)	(0.244)
<40th	0.127	1.137***	0.226	0.487***
	(0.140)	(0.227)	(0.153)	(0.143)
<50th	0.131	1.002***	0.265	0.613***
	(0.104)	(0.177)	(0.138)	(0.126)

legend: * p<0.05; ** p<0.01; *** p<0.001

Note: Robust standard errors in parenthesis. Estimates include all controls as specified in models 1 and 2. Complete tables are available from the author but cannot be included here.

To summarize, although the size of the estimates varies across populations, on the level of the local labour market increasing shares of foreign born migrants is positively related to income for both our educational groups and for the whole of the income distribution below median income. For our first period however, these coefficient estimates are largely indistinguishable from zero for the compulsory educated as well as workers below our different income percentiles.

Turning to our second research question, whether these results to some extent depend on the origin of immigrants, the sign of the estimated coefficients presented in Tables 4 and 5 differ for workers with compulsory and upper secondary education. For those with compulsory education, all coefficient estimates are positive for both the share of OECD and Non-OECD migrants. Among those with a secondary degree, the estimate for share of OECD is generally negative while share of Non-OECD is positive all throughout. Apart from this, the results largely display the same patterns as in Tables 1 and 2. Coefficient estimates are thus larger for graduates from upper secondary as compared to those from compulsory education and larger for the second of our two periods. The spread around the estimates relative to coefficient size is also larger for those having completed compulsory school as compared to those with degree from secondary education and larger for our first relative to our second period. Thus, of the estimates for 1993-1999 for compulsory educated, only one in four estimates – for Non-OECD using individual fixed effects – is statistically significant while three out of four are significant for 1997-2003. For the secondary educated in turn, all estimates except one (Table 5, column 4) are significant at 95 to 99.9 percent level of confidence.

The negative estimate for OECD migrants among those with upper secondary education, for the first of our time periods, can be interpreted in one of either two ways (for the second period, coefficient sign depends on the estimator used with the negative estimate insignificant); Either causally as a negative supply side effect, or as a possibly spurious correlation. Supporting the first interpretation would be the fact that relatively higher education levels among immigrants from OECD countries, and potentially lower language and cultural barriers, can give them easier access to the Swedish labour market, and therefore to a larger degree constitute potential competition for jobs and wages of the native born with an upper secondary degree. On the other hand, the negative sign may also reflect the fact that the share of OECD migrants for most of this period actually decreases as a share of the Swedish working age population (see

Figure A1, Appendix). We return to possible interpretations of this in our concluding discussion below.

Table 4. The effect on compulsory educated natives' yearly wage income of the share of OECD and Non-OECD immigrants, 1993-1999, 1997-2003.

	Regional fixed effects		Individual fixed effects	
	1993-1999	1997-2003	1993-1999	1997-2003
OECD	.473	.833**	.128	.343
	(0.455)	(0.265)	(0.207)	(0.196)
Non-OECD	.090	.610***	.372*	.801***
	(0.118)	(0.112)	(0.120)	(0.191)
Constant	6.441***	6.266***	4.79***	5.212***
	(0.133)	(0.179)	(0.071)	(0.071)
Observations	1936344	1551465	1936344	1551465
R-squared	.3721	.3567	.1129	0.1818

legend: * p<0.05; ** p<0.01; *** p<0.001
Note: Robust standard errors in parenthesis. Estimates include all controls as specified in models 1 and 2. Complete tables are available from the author but cannot be included here.

Table 5. The effect on upper secondary educated natives' yearly wage income of the share of OECD and Non-OECD immigrants, 1993-1999 & 1997-2003.

	Regional fixed effects		Individual fixed effects	
	1993-1999	1997-2003	1993-1999	1997-2003
OECD	-.538**	.672***	-.832*	-.0970158
	(0.185)	(0.176)	(0.385)	(0.301)
Non-OECD	.494***	1.076***	.828***	1.578229***
	(0.101)	(0.200)	(0.129)	(0.348)
Constant	6.428***	6.143***	4.647***	4.983***
	(0.106)	(0.208)	(0.053)	(0.094)
Observations	5801502	5727102	5801502	5727102
R-squared	.3987	.3588	0.1868	.1934

legend: * p<0.05; ** p<0.01; *** p<0.001
Note: Robust standard errors in parenthesis. Estimates include all controls as specified in models 1 and 2. Complete tables are available from the author but cannot be included here.

Our third and last research question concerns to what extent our general estimates of the effects of immigration are driven by certain economic and population growth regions, e.g. larger metropolitan areas. That is, are our positive coefficients for shares of foreign born generated by the comparatively few large growth regions where immigrants also settle disproportionately? (Edin et al., 2003).

To gain some insight into this, we present estimates where we exclude all population growth regions, defined as labour market regions where the Swedish born working-age population increases between any two consecutive years. However, as is seen in Tables 6 and 7, this does not change our basic results. For both periods and both educational groups, our estimate for share of foreign born thus remains positive, although the positive coefficients are reduced depending on estimator and educational group. (A bit more for the upper secondary as compared to the compulsory educated, and a bit more using our individual fixed effects estimator as compared to regional fixed effects). Thus, the mostly positive estimates presented in Tables 1-5 are largely general in character and only to a minor degree driven by the inclusion of population/economic growth areas.[4]

Table 6. The effect on compulsory educated natives' yearly wage income of the share of foreign born immigrants, excluding population growth regions, 1993-1999, 1997-2003.

	Regional fixed effects		**Individual fixed effects**	
	1993-1999	1997-2003	1993-1999	1997-2003
SHAREFRGNBRN	0.083	0.588***	0.174	0.503***
	(0.154)	(0.129)	(0.166)	(0.138)
Constant	6.498	6.486	4.900	5.268
	(0.077)	(0.065)	(0.056)	(0.087)
Observations	767032	671815	767032	671815
R-squared	0.388	0.375	0.346	0.332

Legend: * p<0.05; ** p<0.01; *** p<0.001.
Note: Robust standard errors in parenthesis. Estimates include all controls as specified in model 1 and 2. Complete tables are available from the author but cannot be included here.

[4] As comparison, we also test our model excluding metropolitan areas Stockholm, Gothenburg, Malmö, Linköping and Umeå. Although we cannot include the results here, these estimates are very similar to what we get when excluding all population growth regions as in Tables 6 and 7.

Table 7. The effect on upper secondary educated natives' yearly wage income of the share of foreign born immigrants, excluding population growth regions, 1993-1999 & 1997-2003.

	Regional fixed effects		Individual fixed effects	
	1993-1999	1997-2003	1993-1999	1997-2003
SHAREFRGNBRN	0.321**	0.469	0.484***	0.418**
	(0.112)	(0.130)	(0.105)	(0.156)
Constant	6.434***	6.452***	4.627***	4.989***
	(0.064)	(0.050)	(0.031)	(0.049)
Observations	2035609	2186921	2035609	2222871
R-squared	0.407	0.373	0.392	0.234

legend: * p<0.05; ** p<0.01; *** p<0.001.

Note: Robust standard errors in parenthesis. Estimates include all controls as specified in model 1 and 2. Complete tables are available from the author but cannot be included here.

Last, as discussed in Section 2, problems of endogeneity are often a concern in studies of the potential impact of immigration. To address the issue of possible simultaneity, Tables A3 and A4 (see appendix) also provide IV-regression estimates where corresponding two year lags are used as instrument for the share of foreign born, OECD and Non-OECD migrants. For the compulsory educated estimates are positive for both 1993-1999 and 1997-2003 with somewhat stronger results for the second of the two periods (see Table 8.). For those with upper secondary education the estimates provide a more mixed picture. In contrast to Table 2, the estimated sign for share of foreign born is negative for 1997-2003. Nevertheless, as in Table 5, share of OECD is negative in both periods while Non-OECD is positive.

These results thus largely seem to corroborate those obtained in the previous analyses. In theory, a good instrument should be correlated with the problematic endogenous variable but not correlated with the dependent variable, or as this is commonly expressed, with the error term. Since immigrants tend to move to places were previous immigrants have settled, using lagged values as instruments for current shares of migrant population surely meets the first of these two requirements. The likelihood of the instrument also fulfilling the second of these two requirements, however, increases with the length of the lag. Using two year lags may in this regard not be optimal, but we have here been limited by the available data. Further complicating our case is that normal statistical tests for endogeneity are problematic when observations are clustered within geographic areas. Observations within these clusters are therefore not independent, motivating correction of standard errors when estimating our

models. However, ordinary specification tests of instruments cannot be conducted with the number of exogenous variables exceeding the number of clusters without this compromising the validity of the test statistics.

Nevertheless, we have examined the instruments using a model in which we have significantly reduced the number of exogenous variables (dummies controlling for labour market fixed effects). Using this alternative specification, ordinary tests of both relevance and weakness of the instruments provide no cause for concern. That is, the instruments are sufficiently correlated with the problematic endogenous variables.[5] This however is not the case testing for validity (i.e., to what extent the instrument is also correlated with the dependent variable). In none of the above regressions – albeit in reduced form – are we able to reject the null-hypothesis of the tests involving the so-called Hansen J-statistic, i.e., that all instruments are invalid (not shown). Even though these specification tests thus have been done on a reduced – and therefore essentially different – model, the tests readily correspond to the intuition of the instruments that we outlined above.

This may indicate that our instruments are problematic and that we cannot rule out our main variables of interest being endogenous. However, to the extent that the instruments are appropriate they would seem to support our main results. Also strengthening our case vis-à-vis any endogeneity problems, is that our mostly positive estimates hold even while excluding the major economic and population growth regions from our regressions. Thus, even if positive labour market conditions to some extent cloud cause and effect – in our study as in others – it should be noted that the estimates are not dependent on the inclusion of these growth regions, in the literature deemed as the major cause for concern as regarding endogeneity.

Issues of endogeneity aside, how important are these estimated effects? Although both variables Share foreign born and Share OECD and Non-OECD survive F-tests for joint significance together with employment rate (not shown), their contribution to R-squared and explaining total variation is limited. When testing different specifications of our model, starting off with our main variable of interest (the share of foreign born, or equivalent) and subsequently adding our

[5] In STATA, a number of statistics for instrument weakness and relevance are reported. Conclusions here are based on Sheas's partial R-squared and the Kleinbergen-Paap rk LM and rk Wald statistic, respectively.

additional controls, the simple bi-variate regression between average wage levels for those with compulsory and secondary education yield very low R-squared, less than one percent of total variation (see Tables A5 and A6, in the appendix). Further, this figure is only marginally affected by adding our additional contextual variable (employment rate), time dummies and even our controls for labour market fixed effects. As measured by their effect on levels of R-squared, the main variables of importance are the individual level variables (see specification number 4, Table A5 and A6), increasing R-squared by around 30 percentage points. Neither does adding the independent variables in the opposite order alter this conclusion. In other words, individual level variables add to explained variation by around 30 percentage points regardless of the order by which our controls are introduced, while our variables related to the share of foreign born migrants add less than one percent.

6. Summary and conclusions

The analysis conducted previously shows that increasing shares of foreign born at the level of the local labour market are related to increasing real wage income for the vast majority of the native born population within our different sub-groups. This conclusion holds regardless of time period and sub-population analysed. The relationship is generally weaker for the less educated as compared to the relatively more educated, with a one percent increase in the share of foreign born associated with around 0 to 0.7 and 0.5 to 1.3 percent higher income for the first and latter group respectively (with size of the estimates increasing over time).

Though not directly comparable, this positive relationship also holds for our analysis using different shares of the income distribution as population cut-off points (Table 3.). As in Tables 1 and 2, estimate size also clearly increases over time, albeit to a very modest degree using the lowest percentiles as population cut-off points.

These generally positive estimates are for the most part not dependent on the composition of the foreign born as measured by the share of OECD and Non-OECD migrants. However, for the secondary educated we find the share of OECD to be negatively related to native income development for the first of our time periods, thus possibly indicating a negative supply side effect. Supporting

this interpretation would be the fact that relatively higher education levels among immigrants from OECD countries, and potentially lower language and cultural barriers, can give them easier access to the Swedish labour market, and therefore to a larger degree constitute potential competition for jobs and wages of the native born with an upper secondary degree. These two disparate estimates do however represent something of a conundrum: to interpret one from the other as a negative supply side effect begs the question why the share of Non-OECD is positively related to native wage income. The interpretation is also to some extent (as always) dependent on our chosen theoretical approach; in a neoclassical setting the negative estimate is more or less straightforward and a result of, for the first period decreasing, and for the second slightly increasing wage competition. This is because the share of OECD migrants decreases during our first and slightly increases during our second period (see Figure A1). Under the paradigm of cumulative causation and non-neoclassical approaches discussed in section 2, this negative estimate could however largely represent a spurious correlation and the generally positive estimates of the share of foreign born (in Tables 1 to 3) is where we should focus our attention.

Further comparing the two broad theoretical approaches outlined in section two, neoclassic and non-neoclassic approaches, we can readily conclude that we find most support for the latter. Except for the share of OECD migrants during the first of our two time periods, all estimates are positive for both our educational groups and for percentile levels as low as the bottom 25^{th}. And except for this negative estimate, we can rule out negative supply side effects for Sweden and for the time period and sub-populations analyzed here. A possibility remains however, in that our population sub groups are perhaps too broadly defined to really get to possible wage competition. An area of future study could therefore be to further decompose sub groups along lines of occupation, and particularly look at occupational groups where immigrants tend to find work.

Even though most estimates are positive, as shown in Tables A3-A4, we must keep in mind that the share of foreign born represent a very modest contribution to explaining wage disparities within our different sub-populations. Not at any time, and regardless of estimator and the order by which variables are added, does the share of foreign born exceed one percent of the total explained variation, substantially less than for example our individual level variables.

All in all, we therefore conclude that this study largely corroborates results from previous studies, both for Sweden and for other countries. In terms of coefficient sign and size, for the most part our results are positive and any negative effects are modest. In addition to what has been done previously, our study also points to something worth exploring further; the contribution of the share if immigrants as explaining changes in income for the native born – whether positive or negative – seems to be very modest as well.

7. Appendix

Table A1. OLS and fixed effects regression results of the effect of share of foreign born immigrants on native yearly wage income, excluding major metropolitan areas. Compulsory educated natives, 1993-1999 and 1997-2003. (T-values in parenthesis)

	Regional fixed effects		**Individual fixed effects**	
	1993-1999	1997-2003	1993-1999	1997-2003
SHAREFRGNBRN	0.100	0.579***	0.267*	0.477***
	0.721	(4.123)	(2.115)	(3.525)
Constant	6.512***	6.523***	4.829***	5.281***
	125.934	(108.069)	(116.392)	(89.592)
Observations	1236330	984840	1236330	984840
R-squared	0.381	0.369	0.347	0.330

legend: * p<0.05; ** p<0.01; *** p<0.001

Table A2. OLS and fixed effects regression results of the effect of share of foreign born immigrants on native yearly wage income, excluding population growth regions. Upper secondary educated natives, 1993-1999 & 1997-2003. (T-values in parenthesis)

	Regional fixed effects		**Individual fixed effects**	
	1993-1999	1997-2003	1993-1999	1997-2003
SHAREFRGNBRN	0.257**	0.514***	0.506***	0.450**
	(2.646)	(3.988)	(5.422)	(3.342)
Constant	6.441***	6.510***	4.597***	5.079***
	(153.678)	(127.568)	(154.511)	(155.283)
Observations	3283754	3246790	3283754	3246790
R-squared	0.407	0.365	0.400	0.355

legend: * p<0.05; ** p<0.01; *** p<0.001

Table A3. IV regression results of the effect of share of Foreign born, OECD and Non-OECD immigrants on native yearly wage income, compulsory educated natives, 1993-1999 & 1997-2003. (The two year lag of each group used as instrument, robust standard errors in parenthesis).

	IV-estimates, compulsory	
	1993-1999	1997-2003
SHAREFRGNBRN	0.242	0.857**
	(0.172)	(0.302)
OECD	0.566	1.077**
	(0.574)	(0.374)
Non-OECD	0.243	0.696**
	(0.173)	(0.228)

legend: * p<0.05; ** p<0.01; *** p<0.001.
Note: Robust standard errors in parenthesis. Estimates include all controls as specified in model 1, page 9.

Table A4. IV regression results of the effect of share of foreign born, OECD and Non-OECD immigrants on native yearly wage income, upper secondary educated natives, 1993-1999 & 1997-2003. (The two year lag of each group used as instrument).

	IV-estimates, upper secondary	
	1993-1999	1997-2003
SHAREFRGNBRN	0.477***	-0.403
	(0.121)	(1.338)
OECD	-0.677**	-0.755
	(0.253)	(1.073)
Non-OECD	0.450***	0.160
	(0.116)	(0.645)

legend: * p<0.05; ** p<0.01; *** p<0.001.
Note: Robust standard errors in parenthesis. Estimates include all controls as specified in model 1, page 9.

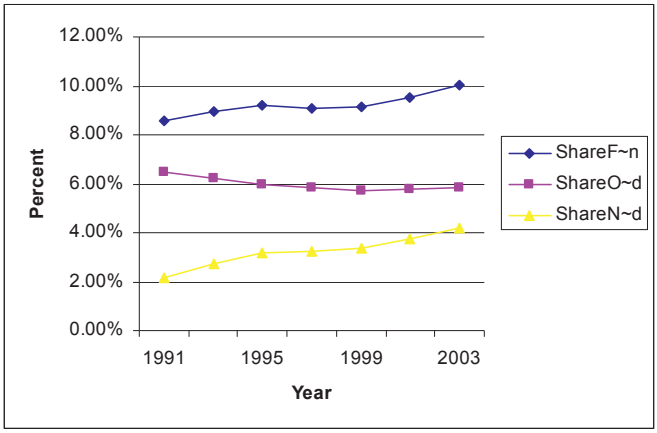
Table A5. R-squared and sequentially added independent variables, 1993-1999. Compulsory and secondary educated. Dependent variable is real annual earnings.

	1	2	3	4	5
Specification	Share foreign born	+ Employment	+ Year fixed effects	+ Individual controls	+ Labour market fixed effects
Compulsory	0.007	0.011	0.032	0.369	0.372
Secondary	0.015	0.019	0.049	0.394	0.398

Table A6. R-squared and sequentially added independent variables, 1997-2003. Compulsory and secondary educated. Dependent variable is real annual earnings.

	1	2	3	4	5
Specification	Share foreign born	+ Employment	+ Year fixed effects	+ Individual controls	+ Labour market fixed effects
Compulsory	0.007	0.011	0.015	0.354	0.357
Secondary	0.016	0.022	0.029	0.355	0.359

Figure A1. Foreign born, Oecd and Non-Oecd migrants as share of population, ages 18-64. Sweden, 1991-2003



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Paper 4

The Urban Hierarchy and Domestic Migration - The Interaction of Internal Migration, Disposable Income and the Cost of Living, Sweden 1993-2002

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Abstract

This paper examines the variation in gains and losses from migration within the Swedish urban hierarchy. The central questions focus on whether increases in disposable income outweigh the associated increases in housing costs, especially with movements up the urban hierarchy to larger and more expensive locations. The paper extends the literature which considers cost of living adjustments associated with individual and household migration. The questions are addressed using Swedish Census data for 3.5 million individuals and two fixed effect panel models are estimated for four consecutive time periods, 1993-2002. The results consistently show relatively higher increases in disposable income moving up the urban hierarchy. Taking changes in housing expenditure into account, this pattern is however reversed; the largest gains are made by households moving from larger to smaller labour markets, a significantly smaller share of total domestic migration. The results point to factors beyond short term nominal income gains as important in explaining the bulk of domestic migration.

Keywords: local labour markets, housing costs, regional migration
JEL-codes: O61, O15, R21, R22.

Introduction

There is a well documented relationship between internal migration and changes in labour force participation rates and nominal wages. The results, both for Sweden and other OECD countries, fairly consistently show that migration is most often associated with positive changes in nominal individual and family income and that regional differences in employment opportunities have the expected effects on migration (Nakosteen and Westerlund, 2004; Nakosteen and Zimmer, 1982; Hunt and Kau, 1985; Fredriksson, 1999). Few of these studies, however, specifically take into account how the conclusions hold when changes in housing costs are factored into the outcomes. Taking these into account, gains and losses from migration are more complex than when nominal income alone is examined (Davies Withers and Clark, 2006). Not surprisingly perhaps, family wage income increases with movements to larger metropolitan areas and decreases with movements to small cities and towns. Considering the associated changes in housing costs the picture is however more diverse, with many families seeing housing costs rising more than family income when moving to a more expensive urban area and the opposite pattern for families moving to more affordable, less densely populated areas.

The paper at hand builds upon this last approach. Combining unique individual level panel data for a majority of the Swedish working-age population with detailed data on regional housing cost disparities, the paper calculates changes in both disposable income and disposable income net housing costs, associated with in-between labour market migration. More specifically, three research questions are addressed: *(i)* what are the immediate changes in disposable income and disposable income post housing expenditure, for regional migrants, and are these changes empirically robust to controls for observable and non-observable individual characteristics? (*ii*) Does the notion that households move for higher income also hold while taking differences in regional housing costs into account? Further, in line with both traditional and recent approaches (Ravenstein, 1885; Henrie and Plane, 2008; Plane, Henrie and Perry, 2005; Lindgren, 2003), we argue that internal migration can fruitfully be analyzed as a phenomena happening within the urban hierarchy and that outcomes for migrant households are much dependent on the direction of migration. Given that we have a strong gradient to housing costs within the hierarchy (outlined below), we also ask *(iii)*; how do family disposable income and disposable income net

housing costs vary depending on the direction of the move; upwards vs. downwards in the urban hierarchy?

To carry out the analyses, using data for both single and two person households, we employ a structured set of three year panel models extending over the period 1993 to 2002. Controlling for age, educational attainment, job changes, movements in and out of employment as well as individual fixed effects, we test for migration effects on both disposable income and disposable income adjusted for housing expenditure. In addition to movements within the urban hierarchy we also test separately for interaction effects of movements in and out of population growth regions.

The paper argues that factoring housing costs and costs of living into the question of gains and losses from internal migration, and situating movements within the urban hierarchy, has potential consequences for the behavioural analysis of internal migration. In short, we find relatively higher increases in disposable income for households moving up the hierarchy (and into population growth regions). Taking housing expenditure into account, this pattern is however reversed; the largest gains are made by moving from larger to smaller labour markets (and out of population growth regions), a significantly smaller share of total domestic migration. Given that these findings are not just reflections of tastes for quality of housing (discussed below), these differences in outcome put focus on other factors than short term economic gains as explaining the lion's share of internal migratory movements, factors such as amenities, long term economic gain etc. The substantial post housing expenditure gains in income for some of these migrants also illustrate a strong incentive for moving down the urban hierarchy and out of population growth regions.

The findings are also interesting in light of seemingly unrelated areas of research. For example, in the debate over the economic effects of immigration (in the US and elsewhere) an influential argument has been that these effects cannot be traced by comparing local labour markets for shares of foreign born workers and economic outcomes for native born potentially competing with immigrant labour (the so-called area approach). This because international and domestic migrants are assumed to react to any downward pressure on wages by moving out of growth areas experiencing positive net inflows, thus largely nullifying wage disparities between regions (Borjas, G. J., 1994). By showing

that the potential gains from moving down the hierarchy (and out of population growth regions) are very substantial compared to the gains from moving up (and in), this research highlights a potentially important economic incentive explaining these counter urban movements. In consequence, migratory outflows from growth regions which are assumed to be responses to downward wage pressure (an assumption subject to debate, see e.g. Friedberg and Hunt, 1995), can to some extent be responses to local costs of living.

What follows in section 2 is a discussion of theory and previous studies, while data and methods are discussed in section 3 and descriptive statistics in section 4, respectively. Models and statistical results are provided in section 5 and 6 while section 7 concludes.

2. Theory and Previous Studies

There are two main bodies of theory with respect to the study of inter-regional migration - labour market economic equilibrium and family negotiation. The traditional approach within the first of these two has almost always been to assume that people migrate in search of economic opportunities and increased income. The standard interregional migration models use variations in employment and wage rates to predict the size of the interregional flows (Greenwood, 1985; Isserman, Taylor, Gerking and Schubert, 1986; Hunt and Kau, 1985). This also goes for situations in which the interregional migration models have been extended to examine family movements, the focus is still on the notion that families move in expectation of long-term economic gains and that those economic gains outweigh the costs of moving. Even the most recent research by those focusing on interregional international flows still privilege the economic motivation for changing locations (Borjas, George., Bronars and Trejo, 1992), although the work sometimes raises questions about the role of wage differentials alone (Newbold, 1996; Pellegrini and Fotheringham, 1999).

In the past two decades, there has been research questioning the focus solely on wages as the motivation for migration, arguing that there is likely a more complex interpretation of regional population. Part of a more complex interpretation invokes the role of amenities and quality of life as stimuli to migration, another part recognizes the embedded nature of migration in changes

in the cost of living, and yet another emphasis is on the way in which migration is negotiated within family structures.

In an attempt to measure the role of amenities in migration Roback (1982) argued that if we assume that residents are indifferent between cities with respect to rents and wages we can calculate the effect of amenities on rents and wages from the derivatives of the equilibrium price and wages. This work did not deal with the behavioural responses to differences in rents and amenities but it did emphasize that there are a set of points in rent- wage- population space that will satisfy local labour market equilibrium, and it provided a theoretical underpinning to construct measures of the residents' willingness to pay for quality of life. In this and related research it is the individual and household response to different quality of amenities (individual disequilibrium) that creates the migration which in turn is supposed to bring the labour market into equilibrium. Regardless of whether we can assume this process to actually bring about equilibrium, by way of extension we can argue that it is a resident's willingness to pay more for housing (rent) along with higher wages which is one important element of understanding an individual or a household's response to individual disequilibrium and their choice within the urban hierarchy.

The process by which households relate increases in wages to increasing housing costs or decreased wages and lower housing costs, can of course bring about gains for some workers and losses for others consequent on migration.[1] Dumond et al (1999) showed that with an adjustment for cost of living some workers in the United States in the South realized significant gains when they moved but others, especially those moving to large Metropolitan areas were likely to have losses (the large city disadvantage) when costs of living were taken into account, even though wages are in general higher in large metropolitan areas. Other work on the impacts of variations in the cost-of-living on migration examined the effects of regional house price dispersion on interregional population mobility by looking at place-to-place migration in the context of the relative labour market opportunities in the origin and destination regions and regional house prices (Gabriel, Shack-Marquez and Wascher, 1992; Berger and Blomquist, 1992). They showed that not only wage differences but also housing costs play a role in the likelihood of inter-regional moves. For Sweden, similarly, Nakosteen and Westerlund (2004) find significant positive

[1] In the Roback formulation, in equilibrium, households are indifferent to combinations across cities.

effects from regional migration on gross real income, i.e. corrected for inflation, while also seeking to take into account the effects of differences in costs of housing on these migrant outcomes. In their approach, post migration gross income is deflated with a factor combining general municipality level housing cost indexes and the average – national level – share of income going into housing (for Sweden, usually about one third of disposable income).

The interaction of housing costs and migration outcomes can also be interpreted through the lens of gender roles in the migration process. A series of papers show how the effects of migration are played out for men and women when women's labor force participation is entered into the migration dynamic (Clark and Davies Withers, 2002; Davies Withers and Clark, 2006; Fosu, 1999). These papers show how the effects of migration are played out for men and women when women's labour force participation is entered into the migration model. The findings show that women's labour market entry and exit plays an important role in the outcomes of regional migration. Women leave the labour force when the migration is to a more affordable place but, in contrast, they may enter the labour market when the move involves a change to a more expensive location. Clearly, there are family negotiated strategies related to migration. It is no longer simply a single "bread winner" decision, at least in the US, and it may be through affordability that the gender negotiation of family migration is played out. Although not the primary focus in the present paper, in light of these results we introduce control for changes in labour force participation of spouses and additional household members when estimating household outcomes of migration into more expensive or more affordable housing markets.

The studies reviewed above approach the kinds of questions that we are examining in the present analysis. They are attempts to examine wage differentials in the contexts of housing costs on the impact of place to place migration and, implicitly or explicitly, all are dependent on the basic theories which invoke the equilibrating labour market process as the force in inter regional migration. In this context it is however important to recognize that migration may not be something which actually brings about labour market equilibrium. Indeed, when looking at Swedish post WWII domestic migration and regional development, it is hard to argue for anything of the kind, at least if we with this concept imagine anything approaching stable equilibrium (ERU, 1970; Håkansson, 2000). Using somewhat different terminology, regional disequilibrium is also the approach taken within traditional economic geography

such as in Myrdal (1957), Pred (1966), Hirschman (1958) or the growth-pole theories of Perroux (1961; Darwent, 1969). In this literature, the focus is on the often very uneven process of regional development where domestic migration is treated as a partly self-reinforcing mechanism, with positive net migration into growth regions giving way to increasing local division of labour and demand for housing and local services, something which in turn entails further investments, increasing demand for workers and continued positive net migration. And, as a concomitant development, the opposite pattern and reverse mechanisms to some extent being at work in depopulating regions. Similar notions of the role domestic migration as part of 'cumulative causation' processes have also been embraced within the emerging literature in spatial economics. In the present paper, as it is not of direct relevance, we do not explicitly put our foot down as to the correctness of any of these two approaches, but the theoretical differences are relevant as a backdrop when interpreting our results.

In the past decade the rapid changes in the housing markets have further complicated the migration process. Interregional migration is occurring within a rapidly changing housing market with substantially increasing housing costs, particularly in regions experiencing population growth. While there have always been housing cost differentials across regions and metropolitan areas, it appears that recent price changes are exacerbating regional and metropolitan differences. Both in Sweden, as well as in the United States and Europe in general, migration decisions are now being taken in a context of significant house price changes in which prices have risen to new highs. For example, in the U.S., where previously house price differences between the very large cities and small metropolitan areas were in the nature of 10 to 15 percent, now those house price differences are often in the nature of 50 percent or more (Mapezzi, Chun and Green, 1998). And for Sweden, similar though not as marked discrepancies have emerged with this development particularly taking off during the second half of the 1990s (Korpi, forthcoming).

It is possible that increasing outflows from the larger labour markets and metropolitan areas to some extent can be seen in light of these increasing regional housing cost disparities (Rodda, 2005). Clearly migration is still attracted to the large labour markets and we would not expect it to decline, but increasing housing costs may have important impacts on the differential flows between places.

3. Data and Methods

The study utilizes three data sources. Firstly, we calculate median regional rent cost for municipalities and labour markets using data from the Swedish Survey of Housing and Rents, HBU.[2] This database consists of bi-yearly survey data where respondents are surveyed about rents, mortgage payments, nominal housing costs and questions regarding standard of housing and living space. Second, for data on income and other individual characteristics, we utilize a longitudinal database covering all individuals living in Sweden sometime between the years 1990-2004. This database (PLACE) has been compiled in cooperation between Statistics Sweden (SCB), The Department of Social and Economic Geography and the Institute for Housing and Urban Research (IBF), both at Uppsala University. The database details place of residence and work plus a series of individual level data, including educational and occupational status as well as source and level of income. Thirdly, added to this data, for information on tenure and forms of ownership we also utilize government housing registry data for all privately and publicly owned housing.

The sample size of the Housing and Rent Survey is not sufficient to get statistically accurate geographical data for each municipality (total sample size is around 8000 for each survey). Thus, we are faced with a trade off between the accuracy of the estimated housing costs on the one hand and geographical level of detail on the other. If we use only municipalities with sufficient sample size for each separate year of the survey, to get sufficient sample size (statistical accuracy) we then have to cluster geographical areas into a few large regional aggregations, and the calculated average costs of housing for these regions may well hide large geographical variation. On the other hand, if we pool the different surveys, i.e. different years, into one data set and thereby increase sample size and the possible geographical level of detail, we lose accuracy in our housing cost estimates since housing costs of course change over time.

We use a comprehensive strategy. First, we pool the different surveys in pairs with one year in between (this lessens the impact of housing price change), and use a minimum sample size of twenty to determine geographical level of detail.[3]

[2] *Bostads- och hyresundersökningarna.*

[3] As we are aware that sample sizes here are somewhat small, we also test our results using 30 as minimum for housing expenditure estimates. Even though this measure significantly reduces the number of individual households, this has a very marginal effect on the regression estimates (these tables are available from the authors but cannot be included here).

This principle of a minimum sample size of twenty is also used for the three broad types of housing included in the Housing and Rent Survey; rent housing, small single family houses and privately owned apartments/condos. As a consequence, since the first two of these are more prevalent on the Swedish housing market, the number of municipalities with sufficient sample size to determine housing costs for privately owned apartments is smaller than the equivalent number for the other two types of housing.

As noted, pooling surveys from different years into one sample generates some uncertainty concerning the housing cost estimates, to a lesser degree when it comes to rent housing (Swedish rent housing is mostly a regulated affair and rents increase only slowly), to a larger degree for private homes and apartments which are subject to larger fluctuations over time. As the pooling is done within comparatively short intervals, this problem is however not likely large enough to compromise our results.

To calculate the short term gains and losses from migration, following Clark and Davies Withers (2006), we use a simple approach where income and housing costs for individual migrant households are compared in the year before and after the year of the move. In other words, individuals are thereby given one year to find work or however else 'adjust' at the place of destination and to the new labour market conditions.

Migrants, in turn, are defined as households moving in between local labour markets. According to the definition of local labour markets used here (LA98), Sweden can be divided into 100 local labour markets comprising some 290 municipalities, the main separation criteria for these being the share of working age population commuting out of a municipality on a daily basis (Statistics Sweden, 2003).

The geographical level of accuracy of housing costs (i.e. yearly household housing expenditure) within each of the municipalities included in the analysis is very precise. PLACE-data, combined with register data on property and housing taxes for the years 1995 and 2000, enables us to produce estimates of ownership form, or tenure, within 10 000 square-meters for all inhabited areas in Sweden. As we can combine these estimates with our Housing and Rent survey data for different types of tenure within each municipality, we are therefore able to produce municipality and tenure specific 100 by 100 meter housing costs

estimates for each municipality included in the analysis (around 328 by 328 feet). As PLACE-data contains the equivalent 10 000 square-meter housing coordinates for individuals, we thereby get very detailed housing costs estimates at both migrant origin and migrant destination.

As for our individual level register data, for each studied time-period the initial population consists of all individuals aged 18-64. From this we exclude those living in municipalities for which we do not have housing cost estimates, and households with zero disposable income in any of the two consecutive years. In order to reduce the influence of outliers on the estimates we also exclude single-person households with increases in annual disposable income exceeding 340 000 Swedish crowns, for the years 1993-1995, and increases corresponding to double that amount for two person households (these thresholds are adjusted for average wage growth for our other studied time-periods). The exclusion of these outliers (around 10 000-15 000 depending on the studied time-period) leads to somewhat lower migration effects but does not change our main findings. Our remaining population consists of around 1.9 million households made up of some 3.5 million individuals.[4]

The available Housing and Rent survey data enables us compare migration and changes to disposable income over four three-year periods; 1993-1995, 1995-1997, 1997-1999, 2000-2002. All statistics correspond to estimates made for December each year.

[4] The procedure also makes our results somewhat comparable to a previous Swedish study (Nakosteen and Westerlund, 2004) based on a much smaller sample but where corresponding wage income increases of about the same order are disregarded as outliers. What we do is essentially take their threshold increases, 500 000 crowns for ’94 -’95 and single households, and decrease this amount with an average tax rate of 32 percent to get the equivalent increases in disposable post taxation income.

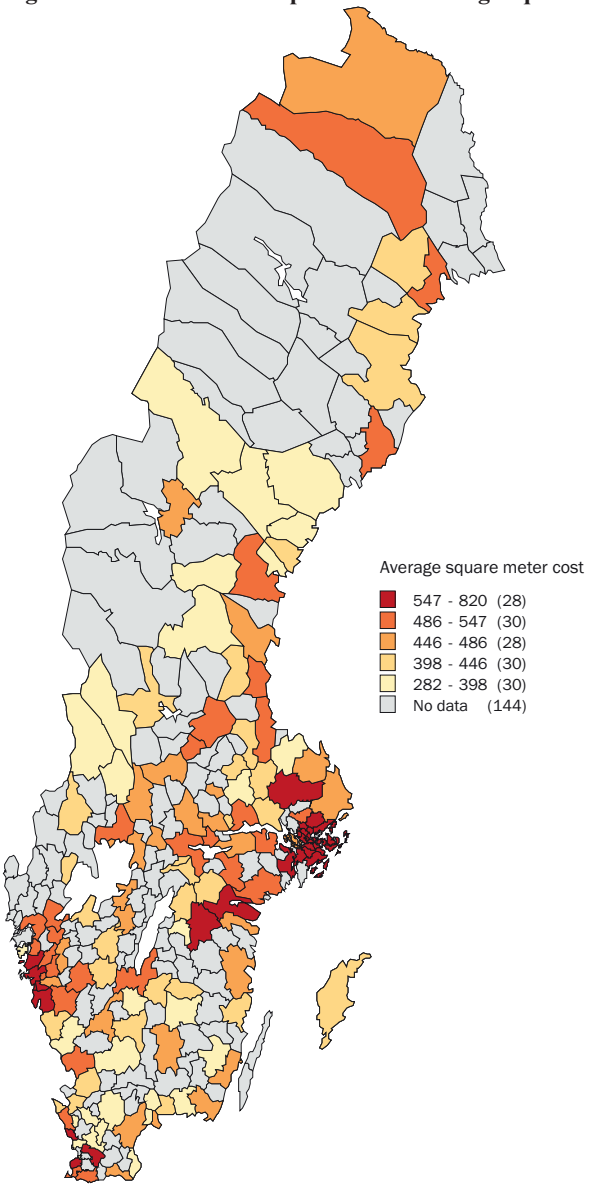
4. Descriptive figures and statistics

4.1. Regional housing cost disparities

As an illustration of regional differences in the costs of housing, we map average yearly square meter expenditure using Housing and Rent survey data pooled for 1997-1999, (Figure 4.1). As expected, the three major urban areas, Stockholm, Gothenburg and Malmö, show the highest average costs while these tend to be lower in relatively more peripheral areas. However, this broad general picture contains considerable regional variation, with some less densely populated areas also showing relatively high average levels. This is true even after taking some very small sample sizes into account.

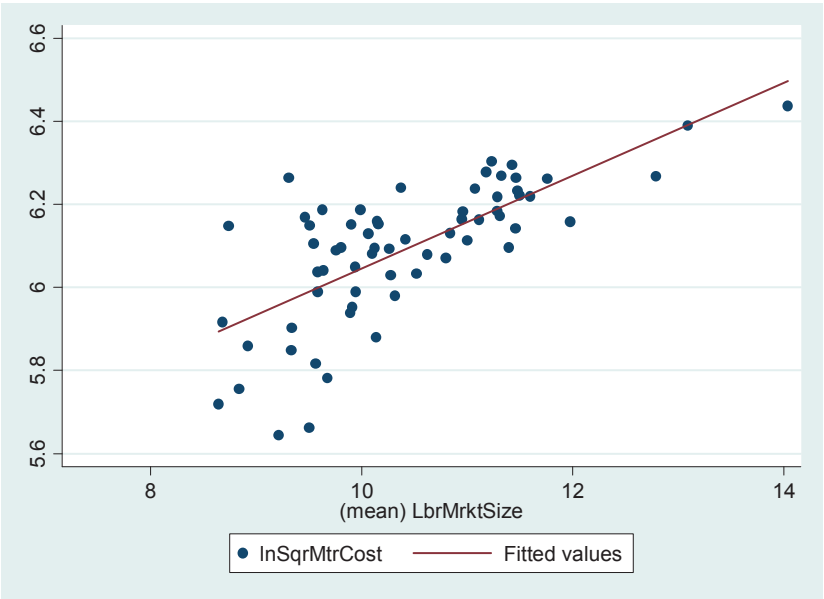
A different take on this same data is also seen in Figure 4.2., plotting a broad measure of average square-meter costs and agglomeration size as measured by the size of local labour market population. Square-meter prices, measured as an average for all forms of tenure for municipalities within each labour market for which we have sufficient data within, clearly increase with size of local labour market population. The systemic variation within the urban hierarchy often found regarding wage levels, income inequality, and business diversification (Korpi, 2008; Strömquist and Johansson, 1998) thus also seems to vary for housing prices and cost of living.

Figure 4.1. Swedish municipalities and average square meter housing costs, 1997-1999.



Source: Statistics Sweden and IBF. Map by Oskar Karlin, Stockholm University.

Figure 4.2. Log average square meter costs, and log size of local labour market population, 1997-1999.



Sources: Statistics Sweden and the Institute for Housing - and Urban Research (IBF). Calculations by the authors.

4.2. Household migration patterns, 1993-2002.

During the 1990s and continuing into the following decade, only a few regions and their local labour markets show positive net migration rates. Primarily these areas constitute the larger, and generally more expensive major metropolitan areas with a handful of the others showing similar patterns, their composition varying somewhat over the studied time period. As illustration of these migrant patterns, in Table 4.1 we decompose the migration data for each three-year period into four major groups; upwards and downwards in the urban hierarchy (i.e. migration from smaller to larger, and from larger to smaller labour markets) and into and out of population growth regions, that is, migrants moving from labour markets experiencing net decreasing migration rates to labour markets experiencing positive net migration, and vice versa.

As a rule, and for the whole time period, the lion's share of domestic migration is directed into relatively larger labour markets (Table 4.1.), in other words, upward movements as opposed to downward movements in the urban hierarchy,

while a smaller share heads the opposite direction. This, by definition, also goes for those regions experiencing positive net migration rates, even though their composition varies slightly over time. Consistently, although substantial in numbers, the migrants heading out from these relatively fewer population growth regions represent a significantly smaller share of migrants as opposed to those heading into the population growth regions. As seen below, this is true both looking at the migrant shares within our different samples (Table 4.1.) and the whole working age population (see appendix, Table A3).

Table 4.1. Regional migration flows by direction. No. of individual migrants, ages 18-64. 1993-2002 (percent of sample total in parenthesis).

Migrant direction	1993-1995	1995-1997	1997-1999	2000-2002
To larger labour markets	38022 (65.0)	44929 (65.6)	49073 (64.1)	41588 (63.4)
To smaller labour markets	20506 (35.0)	23561 (34.4)	27459 (35.9)	24012 (36.6)
Total no. migrants	58528 (100)	68490 (100)	76532 (100)	65600 (100)
Out of which:				
Depopulating to growth region	21881 (37.4)	26121 (38.1)	28229 (36.9)	20800 (31.7)
Growth to depopulating	10268 (17.5)	12298 (18.0)	13426 (17.5)	9032 (13.8)
Other	26379 (45.1)	30071 (43.9)	34877 (45.6)	35768 (54.5)

Source: Statistics Sweden (SCB), calculations by the authors.

4.3. Changes in household income and housing costs.

Table 4.2 shows to what extent migration related changes in income and housing costs differ depending on the 'hierarchical' direction of the move. The table is organized in the same way as Table 4.1. and shows, for every time period studied, that migrants moving towards larger metropolitan areas experience larger increases in disposable income than migrants that move to smaller regions. Migrant households belonging to the first of these two groups experience increases in disposable income in between 11 to around 26 percent

respectively, but also the largest changes in housing costs, with median increases of around eight to twelve percent. On the other hand, migrant households heading in the opposite direction also experience substantial – but not as high – income increases. In this case however, median housing costs decrease by around four to nine percent depending on the period of time. Thus, in terms defined as the elasticity between income changes and changing housing costs associated with the migrant decision, the households moving to larger labour markets experience less of a net gain in income as compared to the latter type, i.e., households moving out of larger metropolitan areas to more affordable housing.

Table 4.2. Median percent change in household disposable income and housing- and square meter costs, by migrant direction. Migrant households, ages 18-64.

Migrant direction	1993-1995	1995-1997	1997-1999	2000-2002
To larger labour markets	0.11 Δ Dsp. Inc 0.11 Δ Hsng. cost 0.10 Δ m^2 cost	0.14 Δ Dsp. Inc 0.08 Δ Hsng. cost 0.11 Δ m^2 cost	0.22 Δ Dsp. Inc 0.08 Δ Hsng. cost 0.12 Δ m^2 cost	0.26 Δ Dsp. inc 0.12 Δ Hsng. cost 0.10 Δ m^2 cost
To smaller labour markets	0.08 Δ Dsp. Inc -0.07 Δ Hsng. cost -0.09Δ m^2 cost	0.11 Δ Dsp. Inc -0.05 Δ Hsng. cost -0.09 Δ m^2 cost	0.15 Δ Dsp. Inc -0.04 Δ Hsng. cost -0.11 Δ m^2 cost	0.18 Δ Dsp. inc -0.09 Δ Hsng. cost -0.11 Δ m^2 cost
Depopulating to growth region	0.11 Δ Dsp. Inc 0.16 Δ Hsng. cost 0.14 Δ m^2 cost	0.15 Δ Dsp. Inc 0.12 Δ Hsng. cost 0.15 Δ m^2 cost	0.24 Δ Dsp. Inc 0.09 Δ Hsng. cost 0.15 Δ m^2 cost	0.25 Δ Dsp. inc 0.10 Δ Hsng. cost 0.13 Δ m^2 cost
Growth to depopulating region	0.08 Δ Dsp. Inc -0.10 Δ Hsng. cost -0.13 Δ m^2 cost	0.11 Δ Dsp. Inc -0.08 Δ Hsng. cost -0.13 Δ m^2 cost	0.14 Δ Dsp. Inc -0.05 Δ Hsng. cost -0.14 Δ m^2 cost	0.18 Δ Dsp. inc -0.07 Δ Hsng. cost -0.13 Δ m^2 cost
Non-migrants, growth regions	0.03 Δ Dsp. Inc	0.06 Δ Dsp. Inc	0.09 Δ Dsp. Inc	0.13 Δ Dsp. inc
Non-migrants, depopulating regions	0.03 Δ Dsp. Inc	0.04 Δ Dsp. Inc	0.07 Δ Dsp. Inc	0.12 Δ Dsp. inc

Source: Statistics Sweden (SCB), calculations by the authors

To conclude, migrants moving from, as compared to migrants moving into, the larger urban areas, i.e. 'down' vs. 'upwards' in the urban hierarchy respectively, seem to experience the largest net gains after taking changing housing costs into account. This pattern also seems fairly stable over time. It should also be noted that, regardless of migrant direction, the median income increase for migrant households are larger than median increases for the population that remain at origin, this regardless if we look at income development in depopulating regions or income development within growth regions (see Table 4.2).

5. Statistical models

These descriptive patterns do of course not say much about the reasons behind these migration income effects. For example, by and large, migrants represent a younger cross-section of the working age population as compared to the non-movers, and, as young workers are generally on a steeper income growth trajectory than their older counterparts the differing income development seen in Table 4.2 may therefore largely be a reflection of the migrants' younger age.[5] Similarly, it is sometimes argued that higher income among migrants is – to an uncertain degree – a reflection of potential migrant-specific individual characteristics like ambition, talent and drive, characteristics that are often hard to control for in ordinary OLS models. And since we never know the contra factual result – what they would have earned staying behind – there is still some methodological uncertainty as to the measurement of the 'true' migrant income effects.

To address these issues, and our initial research questions, we estimate two fixed-effect panel models; one for disposable household income and another for disposable income adjusted for housing expenditure, where we simply subtract the municipality and area specific housing expenditure from the disposable income of all households. In both these models we hereby get estimates of income effects from measurable factors that change over time, e.g. the completion of education, changing jobs and moving in and out of unemployment and full-time studies, while at the same time controlling for factors that do not change, i.e. individual specific characteristics.[6] A panel fixed effect approach, by

[5] For a study showing the age structure of Swedish migrants, see Hansen & Niedomysl (2008)
[6] As we cannot assume that these idiosyncratic characteristics are random (i.e. not correlated with our other controls), and the methodological problem we are addressing concerns these

means of demeaning the data or first-differencing, is also largely neutral as to the initial level of income and sector of the economy, so the estimated coefficients can therefore to a large extent be seen as reflecting general 'all-worker' effects. Apart from substituting the one dependent variable for the other, the two models are identical.

The models are tested for each of the three year intervals, 1993-2002, including dummies for migration up and down the urban hierarchy and also separately for interaction between these dummies and migration in and out of population growth regions, respectively.[7]

A note on the potential problem of self-selection in studies of migration: Much attention in migration literature within the field of economics has been focused on the issue of self selection among migrants, i.e. that migrants do not represent a random sample of the population and that therefore, causal interpretation of migrant outcomes are problematic (see for example Greenwood, 1985; Nakosteen and Zimmer, 1980). This problem can be dealt with in various ways. In the present paper, we address the issue by using panel data and the unobserved heterogeneity and possible selection bias that we can thereby control for. Further controls, as for the fact that migrants are often relatively young, perhaps the most basic criteria by which they are selected, are outlined below.

characteristics being possibly correlated with our other controls, we do not use a random effect approach in these tests.

[7] In addition we also test for general regional migration (direction neutral), these additional tables are available from the authors but cannot be included here (for estimates, see footnote number 9 below).

Models 1 and 2. Fixed effect model for (1) family disposable income, and (2) family disposable income adjusted for housing expenditure.

$$y_{it} = \alpha_{it} + \beta_1(\text{AGE18TO24}_{it}) + \beta_2(\text{AGE25TO34}_{it}) + \beta_3(\text{BUSSINESSINC}_{it}) + \beta_4(\text{CAPITALINC}_{it}) + \beta_5(\text{NEGCAPITALINC}_{it}) + \beta_6(\text{OTHERINC}_{it}) + \beta_7(\text{EDUC}_{it}) + \beta_8(\text{EDUC2}_{it}) + \beta_9(\text{JOBCHNGE}_{it}) + \beta_{10}(\text{JOBCHNGE2}_{it}) + \beta_{11}(\text{EMPLOYMENT}_{it}) + \beta_{12}(\text{EMPLOYMENT2}_{it}) + \beta_{13}(\text{UNEMPLOYMNT}_{it}) + \beta_{14}(\text{UNEMPLOYMNT2}_{it}) + \beta_{15}(\text{LOCALMGRNT}_{it}) + \beta_{16}(\text{URBANMGRNT}_{it}) + \beta_{17}(\text{CNTRURBNMGRNT}_{it}) + a_i + \varepsilon_{it},$$

Where,

y_{it} = the log of summarized disposable household income (model 1), or log summarized disposable household income adjusted for housing costs (model 2)

AGE18TO24_{it} = Dummy if head of household is between ages 18 to 24, reference group age +34

AGE25TO34_{it} = Dummy if head of household is between ages 25 to 34, reference group age +34

BUSINESSINC_{it} = Log income from privately owned business

CAPITALINC_{it} = Log summarized income; stocks, other market related

$\text{NEGCAPITALINC}_{it}$ = Log summarized negative income (debt), market related

OTHERINC_{it}=Log summarized income measure; welfare and government financial housing support

EDUC_{it} = Dummy, achievement of university (bachelor or equivalent) or PhD-level degree

JOBCHNGE_{it} = Dummy, change of employer and place of work (main source of income)

EMPLOYMENT_{it} = Change to employment from unemployment

$UNEMPLOYMNT_{it}$ = Change to unemployment from employment
$LOCALMGRNT_{it}$ = Change of residence within the local labour market

$EDUC2_{it}$, $JOBCHNGE2_{it}$, $EMPLOYMENT2_{it}$ and $UNEMPLOYMNT2_{it}$ are the equivalent dummy variables for spouses or any additional household member.
The migrant dummies tested are, in turn:

$URBANMGRNT_{it}$ = From smaller to larger local labour markets
$COUNTERURBAN_{it}$ = From larger to smaller local labour markets
$GROWTHREGION_{it}$ = Interaction dummy, moving from smaller to larger local labour markets, but also from a depopulating to a population growth regions
$DEPOPULATING_{it}$ = Interaction dummy, moving from larger to smaller local labour markets, and growth region to depopulating region

i = household (individual or two-person, with or without children)
t = 1, 2 (time period one and two)
α_{it} = intercept
a_i = Household fixed effect
ε_{it} = Error term

All dummy variables signify change over time, i.e. are equal 0 in t=1, and 1 in t=2.

As mentioned earlier, because of a leveling off of seniority's relationship with the rate of income growth, i.e., the older the worker the lower the percent increase in income (after some break point), dummy variables AGE18TO24 and AGE25TO34 are included to capture income effects associated with age. Since the majority of both domestic and international migrants are overwhelmingly below 35 years of age, this is something we need to take into account when estimating migrant income. Both are expected to be positively related to change in disposable income, the first with a possibly larger coefficient than the last.

Out of our income variables, in turn, we expect income from private business and capital (BUSINESSINC and CAPITALINC) to be positively related to disposable income, while expectations regarding negative capital income (NEGCAPITALINC) are indefinite, this because taking on debt can either go into some kind of investment, leading to higher income, and/or consumption lowering disposable income. Further, our variable summarizing different government welfare related support (OTHERINC) is expected to be positively related to disposable income.

Out of our remaining controls, all are dummy variables with intuitive expected effects. A positive sign is expected from acquirement of higher educational status (EDUC), change of job (JOBCHANGE) and entering the work force (EMPLOYMENT), while leaving the workforce for unemployment (UNEMPLOYMNT) is expected to be negatively related to disposable income. The equivalent signs are also expected for additional household members (EDUC2, JOBCHANGE2, EMPLOYMENT2 and UNEMPLOYMNT2). For the first of our migrant dummies, within labour market migration (LOCALMGRNT), we do not have any strong a priori expectations, but an assumption is that local moves are not associated with any negative income development, although this can be of course be the case, especially in the face of an economic downturn. As we mentioned earlier in the text, since we pool the different housing cost surveys, and housing costs therefore are fixed for each time period in our model, any change in individual housing costs can only stem from either local or regional resettlement. As we are not concerned with local movements, local migration is controlled for mainly as to get as exact as possible estimates on the changes in housing costs associated with regional migration. Concerning our two main variables of interest, urban- and counter urban migration (URBANMGRNT and COUNTERURBAN), both are expected to be positive with a larger coefficient for the first as opposed to the second.

Before turning to the model results a few caveats are in place. Firstly, as income and housing costs can also drive migration in itself, with our empirical approach we naturally have a potential source of endogeneity in our estimates. As our focus is to highlight differences in outcomes for households ex ante and ex post housing expenditure, and differences as regarding the direction of the move, these concerns do however not compromise our main findings. As always however, potential endogeneity suggests some measure of caution in causal interpretations of the findings. Second, as noted, our empirical approach does not take possible differences in quality of housing into account. For example, an argument can be made that if migrants earning more also decide to spend more on buying a better home or renting a nicer apartment, our estimates would reflect an income housing price elasticity rather than migratory outcomes. As we cannot control for quality, this remains an issue worth exploring but is not likely a major concern for our purposes. This because the main driver behind regional housing cost disparities in Sweden during this time does not seem to be quality but rather differences in net migration and demographic patterns (see for example Turner, 2000).

6. Model results

6.1. Disposable income

Table 6.1 shows results of Model 1, with household disposable income as dependent variable, run with separate dummies for migrants moving up vs. down the urban hierarchy respectively. The fixed effects estimates indicate that the 'direction dependent' migrant income developments shown in Table 4.2 also hold while both controlling for factors common in ordinary wage regressions and addressing the issue of unobserved individual heterogeneity. For all our studied time periods, introducing controls reduces both the effects of moving upwards and down in the urban hierarchy but by roughly the equal amount. Still, the differences we see in Table 4.2 remain with additional income effects ranging from around eight to ten percent for urban migrants (URBANMGRNT), and four to five percent for counter urban migrants (COUNTERURBAN).[8] All controls have the expected signs and are all highly significant, something however not surprising given the large number of individuals used in the regressions.

So, to conclude, after controlling for both initial level of income, individual fixed effects and standard labour market variables, migration movements into larger labour markets still seems very much associated with substantial income increases, and moves in the opposite direction, while still exerting positive effects on disposable income, are somewhat smaller in magnitude. This pattern is largely similar all throughout the studied periods.

With this in mind we turn to the question of changes in housing costs associated with these migrant decisions, and the effects of migration on disposable income adjusted for changes in cost of living.

[8] As a comparison, using a single 'direction neutral' dummy variable for regional migration, i.e. disregarding any urban hierarchy considerations, the estimated equivalent coefficients range from ~.6 to ~.8, for '93 to '95 and '00-'02 respectively (not shown).

Table 6.1. Household disposable income for urban and counter-urban migrants, with controls. 1993-2002.

VARIABLES	'93-95	'95-97	'97-99	'00-02
URBANMGRNT	**0.0773**	**0.0713**	**0.101**	**0.101**
	(0.00330)	(0.00358)	(0.00283)	(0.00355)
COUNTERURBAN	**0.0434**	**0.0451**	**0.0492**	**0.0492**
	(0.00406)	(0.00499)	(0.00348)	(0.00408)
Controls:				
AGE18TO24	0.186	0.215	0.246	0.224
	(0.00171)	(0.00170)	(0.00200)	(0.00207)
AGE25TO34	0.0571	0.0714	0.107	0.122
	(0.000667)	(0.000656)	(0.000759)	(0.000916)
BUSINESSINC	0.00224	0.00311	0.00605	0.00537
	(0.000384)	(0.000393)	(0.000410)	(0.000463)
CAPITALINC	0.0515	0.0569	0.0679	0.0748
	(0.000335)	(0.000296)	(0.000307)	(0.000341)
NEGCAPITALINC	0.0318	0.0285	0.0337	0.0444
	(0.000266)	(0.000242)	(0.000267)	(0.000298)
OTHERINC	0.0140	0.0130	0.0140	0.0114
	(0.000225)	(0.000166)	(0.000240)	(0.000247)
EDUC	0.212	0.218	0.235	0.0432
	(0.00540)	(0.00496)	(0.00477)	(0.00347)
EDUC2	0.0800	0.0763	0.112	0.101
	(0.00576)	(0.00521)	(0.00526)	(0.00403)
JOBCHNGE	0.0213	0.0363	0.0646	0.0697
	(0.000707)	(0.000715)	(0.000709)	(0.000735)
JOBCHNGE2	0.0438	0.0499	0.0882	0.101
	(0.000807)	(0.000814)	(0.000786)	(0.000823)
EMPLOYMENT	0.321	0.315	0.399	0.494
	(0.00380)	(0.00410)	(0.00372)	(0.00519)
EMPLOYMENT2	0.183	0.177	0.224	0.258
	(0.00254)	(0.00273)	(0.00226)	(0.00323)
UNEMPLOYMNT	-0.237	-0.246	-0.255	-0.346
	(0.00294)	(0.00305)	(0.00389)	(0.00509)
UNEMPLOYMNT2	-0.105	-0.109	-0.0811	-0.0905
	(0.00298)	(0.00303)	(0.00377)	(0.00415)
LOCALMGRNT	0.0359	0.0386	0.0609	0.0678
	(0.00121)	(0.00110)	(0.00110)	(0.00151)
Constant	7.225	7.250	7.261	7.362
	(0.00120)	(0.00102)	(0.00112)	(0.00124)
Observations	3554066	3863271	3639266	3349796
No. of households	1817610	1971590	1870840	1721446
R-squared	0.092	0.115	0.177	0.165

Robust standard errors in parentheses, all estimates significant at 99.9 percent level of confidence.

6.2. Disposable income adjusted for housing costs

As mentioned above, a central question in this study concerns investigating how regional housing cost disparities affect the 'real' – i.e. changes in disposable income adjusted for changes in housing costs – outcome of in-between labour market movements. In particular, we are interested in how the interaction between changing income and housing costs plays out for migrants moving upwards vs. downwards in the urban hierarchy; that is, moving to generally higher housing costs but also somewhat higher levels of income, vs. to lower housing costs and somewhat lower income levels. To test this, using the same large sample of households as in section 6.1, we first subtract median housing cost from household disposable income. Then, we run the same income fixed-effect regression model but with disposable income adjusted for housing costs as dependent variable. The results are shown in Table 6.2.

Firstly, by now adding an area specific housing cost dimension to our data, variation between individual households increases significantly, something which generally raises both standard errors and our coefficient estimates as compared with the previous regressions. This is also reflected in a general drop in R-squares of around 3-6 percentage points as compared with using disposable income as dependent variable.

Secondly, interesting for our purposes is that the previous disparities between urban and counter-urban migrants seen in Table 6.1 – with the former group making larger nominal gains than the latter – are now reversed; counter-urban migrants are now at the receiving end of the largest migrant income gains. Again, as in Table 6.1, these results seem fairly stable over time. Noteworthy is also that the disparities between these two migrant groups are now larger. Whereas before these were in the range 2.5-5 percentage points they now vary between three (for '97-99) to ten and 18 points for the other periods. As for our other coefficient estimates, with one exception (for 1995-1997, business income is now negative, however at a lower in level of confidence), all are still highly significant and have the expected signs.

Table 6.2. Adjusted household disposable income, urban- and counter urban migrants, with controls. 1993-2002.

VARIABLES	'93-95	'95-97	'97-99	'00-02
URBANMGRNT	**0.129**	**0.0956**	**0.194**	**0.102**
	(0.0121)	(0.0103)	(0.00990)	(0.0118)
COUNTERURBAN	**0.234**	**0.202**	**0.217**	**0.279**
	(0.0142)	(0.0129)	(0.0124)	(0.0136)
Controls:				
AGE18TO24	0.729	0.722	0.883	0.778
	(0.00690)	(0.00685)	(0.00787)	(0.00800)
AGE25TO34	0.0915	0.124	0.198	0.226
	(0.00220)	(0.00205)	(0.00241)	(0.00282)
BUSINESSINC	0.00124	-0.00241**	0.0113	0.0104
	(0.00118)	(0.00112)	(0.00118)	(0.00128)
CAPITALINC	0.0973	0.0906	0.108	0.125
	(0.000951)	(0.000754)	(0.000780)	(0.000825)
NEGCAPITALINC	0.0673	0.0506	0.0615	0.0812
	(0.000835)	(0.000690)	(0.000771)	(0.000828)
OTHERINC	0.0306	0.0194	0.0367	0.0247
	(0.000746)	(0.000498)	(0.000764)	(0.000767)
EDUC	0.524	0.616	0.602	0.0584
	(0.0208)	(0.0184)	(0.0176)	(0.0128)
EDUC2	0.0827	0.0778	0.123	0.106
	(0.0119)	(0.0106)	(0.0119)	(0.00740)
JOBCHNGE	0.0200	0.0435	0.0786	0.0999
	(0.00224)	(0.00221)	(0.00213)	(0.00218)
JOBCHNGE2	0.0469	0.0567	0.0884	0.105
	(0.00164)	(0.00151)	(0.00142)	(0.00140)
EMPLOYMENT	1.020	0.835	1.183	1.581
	(0.0120)	(0.0121)	(0.0111)	(0.0146)
EMPLOYMENT2	0.338	0.308	0.349	0.413
	(0.00698)	(0.00685)	(0.00592)	(0.00827)
UNEMPLOYMNT	-0.652	-0.561	-0.790	-1.043
	(0.00865)	(0.00807)	(0.0109)	(0.0127)
UNEMPLOYMNT2	-0.234	-0.209	-0.192	-0.193
	(0.00808)	(0.00714)	(0.00867)	(0.00891)
LOCALMGRNT	0.0645	0.0636	0.0950	0.130
	(0.00433)	(0.00367)	(0.00352)	(0.00490)
Constant	6.380	6.536	6.465	6.514
	(0.00369)	(0.00285)	(0.00313)	(0.00334)
Observations	3577895	3863271	3666737	3381617
No. of households	1828623	1971590	1883809	1737023
R-squared	0.066	0.066	0.105	0.105

Robust standard errors in parentheses. All estimates significant at 99.9 percent level of confidence except **, significant at 95 percent.

How stable are the estimates? In modelling these outcomes, due to over-specification, we have chosen between including controls for specific labour market behaviour (for example, job changes and employment status) on the one hand, and all possible income variables on the other (e.g. wage income, student and unemployment benefits). An objection might be that as we thereby are not controlling specifically for student related migration and as these constitute a sizeable share of domestic migration, results might be driven by this specific group receiving relatively low income. However, substituting these additional income variables for some of our labour market dummy variables gives very similar migrant estimates (not shown). Also, as we have already mentioned, the results are not very sensitive to whether or not we include households with very large income increases. Both these factors no doubt lend strength to the results.

Turning to our final question; is this all a growth region effect? As seen in Table 4.1 earlier in the text, movements in and out of population growth regions make up around half of all domestic migration, and these movements are by and large directed in and out of the three major metropolitan areas. It could therefore be the case that these population growth regions dominate to the extent that what we hitherto have interpreted as a consequence of movements up and down the urban hierarchy is merely a major metropolitan or growth region effect. This aspect is also relevant considering that in population growth regions both income and housing costs increases in general are the highest.

To gain some insight into this, in Tables A1 and A2 in the appendix, we run our two models with separate dummies for movements in and out of population growth regions, i.e. between hierarchical movements from a region with net decreasing to a region with net positive migration, and vice versa, (dummy variables GROWTHREGION and DEPOPULATING, respectively) and all other movements up and down the urban hierarchy (OTHERURBAN and OTHRCNTRURBN). For household disposable income (Table A1), introducing these controls does not affect the previous estimates to any significant degree, the previous direction dependent differences remain and the conclusions drawn from the earlier analyses largely hold. However, introducing these controls into our second model modifies previous conclusions somewhat. All throughout the studied time period, and over the whole of the business cycle, the big differences are now instead between migrants moving in and out of the population growth regions, with those heading into these regions making substantially smaller gains than migrants moving in the opposite direction (between 8 to 18

percentage points less). At the same time, this measure reduces the differences between other movements up and down the urban hierarchy (i.e. between the variables OTHERURBAN and OTHRCNTRURBN), but except for the years 1997-1999 the counter urban migrants still have larger gains in disposable income adjusted for housing costs. Indeed, for the period 2000 to 2002 they are nearly equivalent of the original estimates in Table 6.2.

So, the answer to our last question (is it a growth region effect?) is "yes, but not completely"; Movements in and out population growth regions do not dominate our results as regarding disposable income but they do to a considerable extent when it comes to income adjusted for housing expenditure. The differences between our original migrant dummies remain for most of the studied time period, albeit significantly reduced. The estimates bear witness to the strong pull effects of these relatively few population growth regions, and as will be discussed below, they are relevant from a regional- and economic growth perspective as they put focus on factors other than nominal economic gain, and/or the possible long-term economic gains, as a motive behind internal migration.

7. Concluding discussion

The three substantive findings in this research are as follows. Firstly, the urban hierarchy matters when estimating migrant outcomes, i.e., nominal migrant outcomes are to a substantial degree dependent on direction of these movements within the urban hierarchy. All else equal, migrants heading upwards into larger labour markets add approximately double the amount to their nominal income as compared to migrants heading in the opposite direction, i.e. moving from larger to smaller local labour markets. Further, as shown in Table A1, these direction dependent effects are not dominated by the major metropolitan areas or the population growth regions, but seem rather to be more of a city-system effect. The results therefore underline the urban hierarchy and local labour market context of migration in understanding and estimating the outcomes. This point is also strengthened by the fact that we are controlling for individual heterogeneity. To the extent that the controls are sufficient, if an outcome cannot be ascribed to individual characteristics, or only to some degree, this fact puts increased focus on the labour market context of these moves. After all, if non-observed

individual characteristics were a major part of the story, this would render our migrant dummies insignificant.

Second, these conclusions also seem to hold regardless of when in the business cycle we study this migratory behaviour. Even though the beginning of our studied time period is rather exceptional (the first years of the 1990s marked the biggest economic downturn in Sweden since the Great Depression), this is a potentially important additional finding because it argues for the power of migratory behaviour as independent of the business cycle.

Finally, the third finding of the research underlines the importance for taking regional housing cost disparities into account when estimating economic outcomes of domestic migration. As seen above, adjusting for changing housing costs associated with these moves rather dramatically alters the results, and to some extent the conclusions as regarding outcome are hereby overturned. As compared with only looking at nominal disposable income, and for most of the studied time period, the by far largest gains are realized by households moving to relatively lower nominally increasing income. These outcomes are however only realized by a significantly smaller share of migrant households, so instead of migratory behaviour by and large fitting ordinary economic explanations, that is, the majority of migrants move to where nominal economic outcomes are optimal, we now see the opposite pattern.

Arguably, the interpretation of this is to some extent dependent on how we view housing and housing expenditure. If we regard housing as a ‘luxury good’, a good for which share of expenditure increases with income, the conclusion readily at hand is one where migrants moving up the urban hierarchy and into more expensive labour markets move for higher nominal income gains but simply choose more expensive urban dwelling as a type of luxury consumption. If instead we regard housing as necessity or ‘normal good’, this in turn puts focus on factors other than nominal income gains, for example availability of jobs, tastes for diversity or different kinds of amenities, as key to explaining the bulk of migratory behaviour. As mentioned, this result clearly underscores the strong pull effects of larger cities and labour markets as destination for domestic migration, and also puts increased focus on the more long term economic outcomes of these migrant decisions.

8. Appendix

Table A1. Model nr. 1 (Household disposable income), with separate dummies for migration in and out of population growth regions.

VARIABLES	'93-95	'95-97	'97-99	'00-02
GROWTHREGION	**0.0834**	**0.0743**	**0.110**	**0.0925**
	(0.00445)	(0.00365)	(0.00411)	(0.00541)
DEPOPULATING	**0.0406**	**0.0472**	**0.0521**	**0.0544**
	(0.00583)	(0.00520)	(0.00579)	(0.00708)
OTHERURBAN	**0.0703**	**0.0689**	**0.0897**	**0.107**
	(0.00481)	(0.00451)	(0.00465)	(0.00457)
OTHRCNTRURBN	**0.0459**	**0.0427**	**0.0486**	**0.0468**
	(0.00559)	(0.00512)	(0.00524)	(0.00495)
Controls:				
AGE18TO24	0.186	0.213	0.247	0.224
	(0.00171)	(0.00170)	(0.00221)	(0.00207)
AGE25TO34	0.0571	0.0700	0.108	0.122
	(0.000667)	(0.000657)	(0.000847)	(0.000916)
BUSINESSINC	0.00225	0.00313	0.00580	0.00537
	(0.000384)	(0.000393)	(0.000454)	(0.000463)
CAPITALINC	0.0515	0.0568	0.0679	0.0748
	(0.000335)	(0.000296)	(0.000343)	(0.000341)
NEGCAPITALINC	0.0318	0.0285	0.0337	0.0444
	(0.000266)	(0.000241)	(0.000298)	(0.000298)
OTHERINC	0.0140	0.0130	0.0140	0.0115
	(0.000225)	(0.000166)	(0.000267)	(0.000247)
EDUC	0.212	0.213	0.238	0.0432
	(0.00540)	(0.00496)	(0.00527)	(0.00347)
EDUC2	0.0801	0.0759	0.114	0.101
	(0.00576)	(0.00522)	(0.00599)	(0.00403)
JOBCHNGE	0.0213	0.0356	0.0651	0.0697
	(0.000707)	(0.000716)	(0.000793)	(0.000735)
JOBCHNGE2	0.0438	0.0497	0.0879	0.101
	(0.000807)	(0.000814)	(0.000877)	(0.000823)
EMPLOYMENT	0.321	0.314	0.396	0.494
	(0.00380)	(0.00409)	(0.00414)	(0.00519)
EMPLOYMENT2	0.183	0.177	0.222	0.258
	(0.00254)	(0.00273)	(0.00250)	(0.00323)
UNEMPLOYMNT	-0.237	-0.246	-0.255	-0.346
	(0.00294)	(0.00305)	(0.00431)	(0.00509)
UNEMPLOYMNT2	-0.105	-0.109	-0.0812	-0.0905
	(0.00298)	(0.00303)	(0.00418)	(0.00415)
LOCLMGRNT	0.0359	0.0398	0.0610	0.0678
	(0.00121)	(0.00110)	(0.00123)	(0.00151)
Constant	7.225	7.250	7.261	7.362
	(0.00120)	(0.00102)	(0.00125)	(0.00124)
Observations	3554066	3863271	2911075	3349796
No. of households	1817610	1971590	1496421	1721446
R-squared	0.092	0.116	0.178	0.165

Robust standard errors in parentheses

Table A2. Model nr. 2 (Adjusted household disposable income), with separate dummies for migration in and out of population growth regions.

VARIABLES	'93-95	'95-97	'97-99	'00-02
GROWTHREGION	**0.0918**	**0.0609**	**0.187**	**0.0747**
	(0.0163)	(0.0132)	(0.0145)	(0.0184)
DEPOPULATING	**0.266**	**0.248**	**0.265**	**0.299**
	(0.0204)	(0.0178)	(0.0205)	(0.0238)
OTHERURBAN	**0.173**	**0.146**	**0.208**	**0.118**
	(0.0178)	(0.0162)	(0.0166)	(0.0150)
OTHRCNTRURBN	**0.205**	**0.153**	**0.173**	**0.269**
	(0.0195)	(0.0185)	(0.0189)	(0.0164)
Controls:				
AGE18TO24	0.729	0.723	0.884	0.778
	(0.00690)	(0.00685)	(0.00880)	(0.00800)
AGE25TO34	0.0915	0.124	0.199	0.226
	(0.00220)	(0.00205)	(0.00270)	(0.00282)
BUSINESSINC	0.00123	-0.00241	0.0108	0.0104
	(0.00118)	(0.00112)	(0.00131)	(0.00128)
CAPITALINC	0.0973	0.0906	0.108	0.125
	(0.000951)	(0.000754)	(0.000871)	(0.000825)
NEGCAPITALINC	0.0673	0.0506	0.0613	0.0812
	(0.000835)	(0.000690)	(0.000863)	(0.000828)
OTHERINC	0.0307	0.0194	0.0367	0.0247
	(0.000746)	(0.000498)	(0.000853)	(0.000767)
EDUC	0.523	0.614	0.614	0.0585
	(0.0208)	(0.0184)	(0.0197)	(0.0128)
EDUC2	0.0822	0.0776	0.123	0.106
	(0.0120)	(0.0106)	(0.0134)	(0.00740)
JOBCHNGE	0.0200	0.0435	0.0810	0.0999
	(0.00224)	(0.00221)	(0.00239)	(0.00218)
JOBCHNGE2	0.0469	0.0566	0.0883	0.105
	(0.00164)	(0.00151)	(0.00160)	(0.00140)
EMPLOYMENT	1.020	0.835	1.173	1.581
	(0.0120)	(0.0121)	(0.0124)	(0.0146)
EMPLOYMENT2	0.338	0.308	0.347	0.413
	(0.00698)	(0.00685)	(0.00661)	(0.00827)
UNEMPLOYMNT	-0.652	-0.561	-0.792	-1.043
	(0.00865)	(0.00807)	(0.0122)	(0.0127)
UNEMPLOYMNT2	-0.234	-0.209	-0.190	-0.193
	(0.00808)	(0.00714)	(0.00962)	(0.00891)
LOCLMGRNT	0.0645	0.0636	0.0937	0.130
	(0.00433)	(0.00367)	(0.00394)	(0.00490)
Constant	6.380	6.536	6.466	6.514
	(0.00369)	(0.00285)	(0.00350)	(0.00334)
Observations	3577895	3863271	2933030	3381617
No. of households	1828623	1971590	1506817	1737023
R-squared	0.066	0.066	0.105	0.105

Robust standard errors in parentheses

Table A3. Migration flows by direction. Ages 18-64. 1993-2002, full population. (Percent of total in parenthesis).

Migrant direction	1993-1995	1995-1997	1997-1999	2000-2002
To larger labour markets	107 130 (58.7)	115 526 (60.2)	128 975 (59.1)	116 019 (55.8)
To smaller labour markets	75 382 (41.3)	76 250 (39.8)	89 663 (40.9)	91 939 (44.2)
Total nr. Migrants	182 512 (100)	191 776 (100)	218 117 (100)	207 949 (100)
Out of which:				
Decreasing to growth region	60 636 (33.2)	65 725 (34.3)	70 471 (32.3)	58 177 (28.0)
Growth to decreasing	36 938 (20.2)	36 874 (19.2)	43 279 (19.8)	41 200 (19.8)
Other	84 938 (49.6)	89 177 (46.5)	104 367 (47.9)	108 572 (47.8)

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