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Migration and Increasing Wage Inequality: Can Imperfect Competition Explain the Link?

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Abstract: In this paper, we test two 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 detailed information on Swedish local labour markets, derived from Swedish full population data, for 1993 and 2003, a panel model of percent changes in inequality is estimated. Thereby controlling for local level fixed effects as well as other competing explanations, the results suggest that positive net migration may affect income dispersion regardless of possible negative wage competition.

Keywords: Income inequality, local labour markets, business diversification, 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 (Smith and Edmonston, 1997; Ekberg, 2003; Dustmann and Glitz, 2005; Card and Shleifer, 2009), 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 local demand is sufficiently large for additional 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 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 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.[1]

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, 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 of the native population. As mentioned, however, the approach of these studies have 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 instead argue 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, 2011). 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, M., 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 make up a smaller share of total

migration raises some doubt as to counter-urban migrants effectively equilibrating wages over geographical space. [2]

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 markets is highly correlated with local population size, the available data does not contradict this argument (Strömquist and Johansson, 1998; Korpi, 2008).[3]

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 same time, due to existence of industry specific indivisibilities and entry barriers, different industries are to a varying degree shielded from increasing local competition following the concomitant

increase in demand for goods and services.[4] 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 more 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.

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 dataset 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 last 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 its objective is to confine the data only to workers with a reasonably strong attachment to the labour market.[5]

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 well as the bottom. Our entropy measures are chosen since they, in this listed order, focus on changes in mid, 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 5^{th}, 10^{th} and 25th) as dependent variable. [6]

4. Statistical Model.

As we are interested in analysing changes in net migration, both total as well as domestic and international, we choose a simple approach where we, firstly, 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.[7] 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. This is further motivated since we do not use a weighted regression approach and all local labour markets carry equal statistical importance. 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 labour diversity (defined below). [8]

The models tested are as follows:

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

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 a 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 pure 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, (T), defined as;

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

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 T 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,

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

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.[9] 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.).

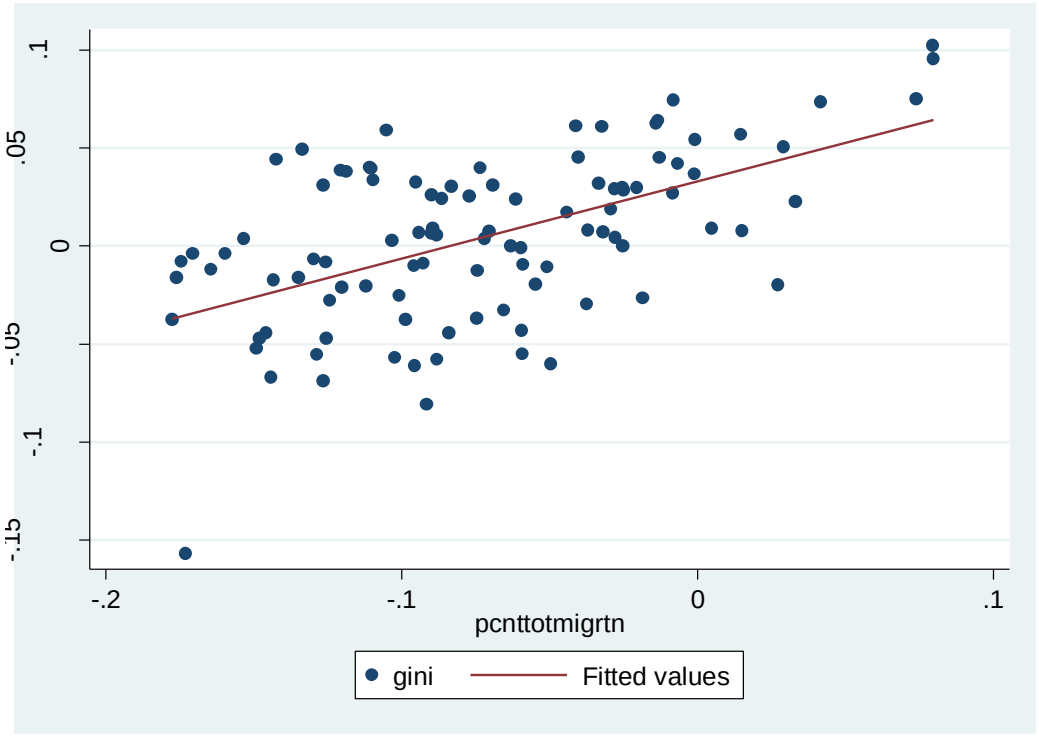
To give an indication as to which parts of the income distribution these changes in inequality stem from, we can calculate and plot the relationship between percent change in income levels (percentiles) and changes in total migration (Figures 3 and 4). Here we see that the positive relationship between migration and inequality stems from both top-wage levels increasing, and bottom-wage levels decreasing, relatively as net migration increases.[10] 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 95^{th} and 90^{th} as dependent variable, while much lower for the equivalent regression using the 10^{th} and the 5^{th} (.12 and .08 respectively).

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.

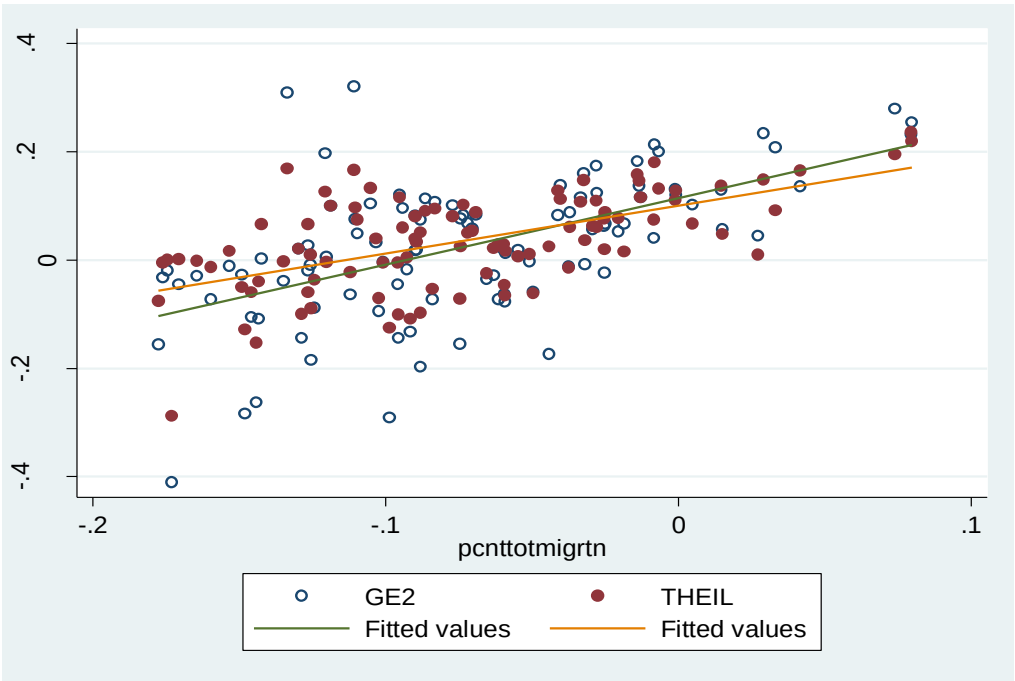
The figures also indicate that local labour markets can experience significant negative net migration flows without this having any consequence for the local income dispersion. The predicted values (the regression line) in figures one and two indicate that a local labour market has to experience negative 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.

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



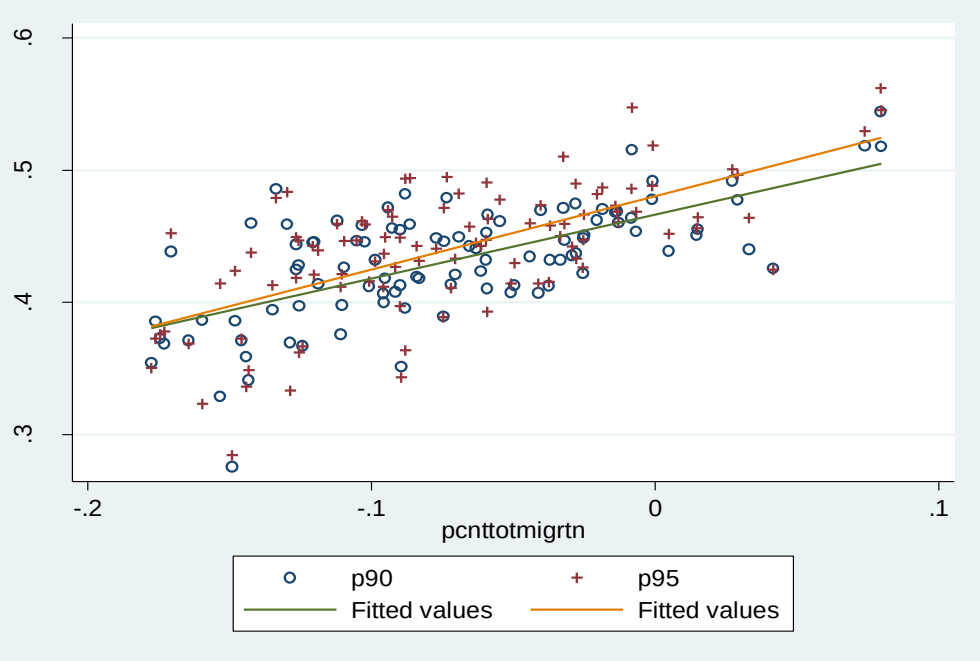
Gini = 0.03 + 0.39 prcnt total migration + *e*. Adj. R^2 = 0.3

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



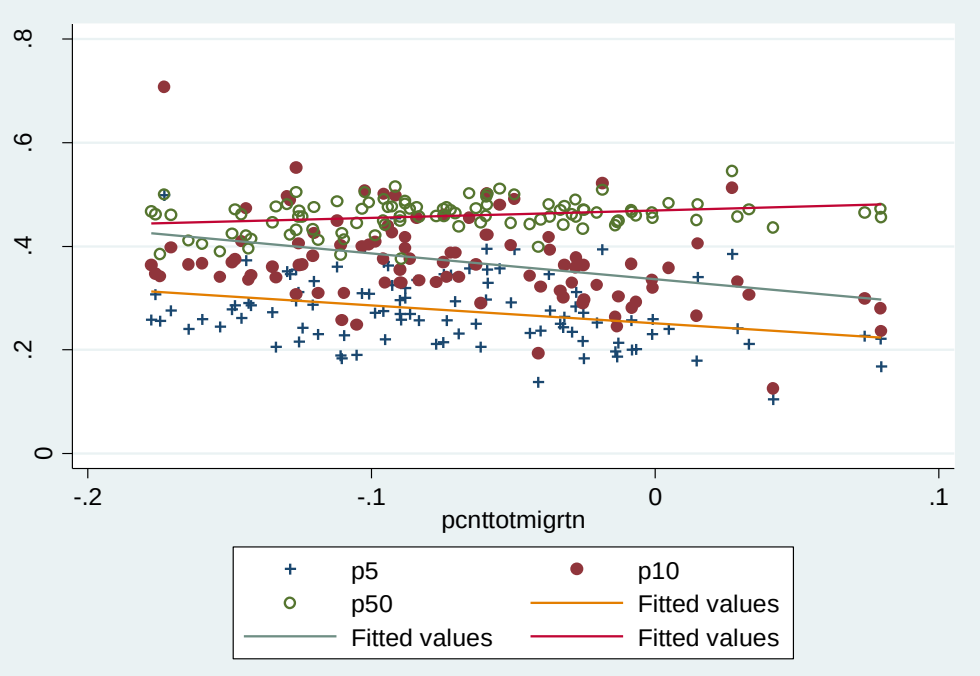
GE2= 0.11 + 1.2 prcnt change total migration + *e*. Adj. R^2 = 0.31
Theil = 0.10 + 0.88 prcnt change total migration + *e*. Adj. R^2 = 0.35

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



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

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



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

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 Figures 3 and 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).

Table 1. Results model no.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 (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 our inequality measures on only the migration variables 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. As regards 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 through its potential effects on 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). Given our chosen modelling approach, we can thus not

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. 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. Further in line with this, substituting our different variables for migrant groups for a summarized measure of total net migration also yields estimates very similar to our variable for Swedish born domestic migrants (not shown).

In the previous analysis and with our modelling approach, there are of course underlying industrial changes taking place that we are not directly able 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 experiences

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 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 thus 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, 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, the descriptive section (Figures 3 and 4) also indicate 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 an important 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 second 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 modelling approach. The results thereby open up for a possible alternative – or additional – 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 relatively larger role in explaining inequality at upper or top income levels (in Table 1, estimates of business diversification increase all through columns 1-4), in contrast to education disparities which play a larger role using inequality estimates which put relatively larger weight around mean or median income. It may thus be that change in educational disparities disproportionately influences income inequality as measured around mean or median 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 either because ten years is not a sufficient time span for changes in local business diversification to take effect, that changes in business diversification plays 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 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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[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.
[2] A possibility could of course be that the counter urbanization predominantly consists of workers competing with the urban migrants moving into population growth regions.
[3] 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).
[4] 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.
[5] By comparison, studies in the US usually only include workers who had a salary income for more than 13 weeks of the last year, (c.f. Wheeler, 2004).
[6] For background theory, welfare properties and formal definitions of these inequality measures, see for example Cowell (1995) or Lambert (2001).
[7] (See e.g. Malmberg and Maskell, 2002; MacKinnon, Cumbers and Chapman, 2002; Maskell, Eskelinen, Hannibalsson and Malmberg, 1998)
[8] 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).
[9] 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 communications, health and social work, manufacturing and mining, public administration and defence, services and culture, and unspecified.

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