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Abstract

This study estimates labor market effects of refugee immigration in Sweden 1999–2007. The setting is particularly suitable for using spatial variation within the country to estimate labor market effects of immigration. Bias from endogenous immigrant settlement is likely to be smaller when estimating the effect of only refugee immigration. Bias from internal migration of previous inhabitants is reduced by using data where the same individuals are identified over time. No significant effect of refugee immigration on total unemployment is found, but there is a large effect on the unemployment of previous immigrants from low- and middle-income countries, indicating that newly arrived refugee immigrants are substantially more easily substituted for this group than for natives in production.

Keywords: unemployment, refugee immigration
JEL codes: J23, J61, J64

1 – Introduction

Exploiting within-country spatial variation in immigrant inflows and labor market outcomes is a commonly used strategy to estimate labor market effects of immigration. In most studies, the estimated effects are close to zero. However, the credibility of these estimates hinges on two fundamental identifying assumptions: (1) that immigrants' spatial settlement patterns are not determined by variation in labor market opportunities and (2) that the immigrant inflow into one locality has no effects on the composition of the rest of the labor force in that locality. By relying on a data set covering the entire Swedish working-age population, where individuals can be followed over time, this study is able to present new strategies where the credibility of both of these identifying assumptions is firmly strengthened.

First, Sweden stands out among immigration countries in the industrialized world in receiving particularly large numbers of refugees, both in absolute numbers and relative to the home population. The large numbers of refugees enable this study to focus exclusively on the labor market impact of *refugee* immigration. In contrast to many other migrants, refugees do not migrate primarily in search of working opportunities. Their migration is, by definition, push-driven rather than pull-driven, and hence there is reason to expect less correlation between labor market opportunities and settlement patterns for this group. This expectation is also supported empirically in the study.

Second, this study uses a panel data set covering the entire Swedish working-age population. Individual-level panel data has not previously been used when estimating labor market effects of immigration, yet presents important advantages. By following the same individuals over time, the estimation bias due to compositional effects, which are otherwise present when aggregating the outcome variable data, is strongly reduced. In particular, there is no estimation bias toward zero due to previous inhabitants (natives or previous immigrants) migrating out from a locality in response to an immigrant inflow. Any compositional bias due to individuals exiting the country in response to an immigrant inflow would remain though, but should be of minor concern.

To eliminate compositional bias, this study follows the same individuals over time by looking at all individuals that are present in the Swedish population registry, and between 25 and 64 years of age, at three points in time – 1998, 2003, and 2007. The total length of the interval is limited by data availability. The refugee inflow potentially affecting the labor market for the

individual worker is measured as the sum of all refugees settling in the country, each weighted by the inverse of the squared distance between the settlement municipality of the refugee and that of the potentially affected, previously residing worker. The outcome variable is the change in the unemployment status of the affected worker between two points of observation. The structure of the Swedish labor market, with highly centralized wage-setting, makes unemployment the obvious choice of outcome variable, rather than wages.

The empirical analysis finds no significant effect of refugee inflow on unemployment probabilities of natives or of earlier immigrants from high-income countries, but large and significant effects on those of earlier immigrants from low- and middle-income countries. These results are consistent with earlier studies of the US (Ottaviano and Peri, 2012; Card, 2009), Germany (D'Amuri, Ottaviano, and Peri, 2010), and the UK (Manacorda, Manning, and Wadsworth, 2012) labor markets, which all find that immigrants and natives are less than perfect substitutes in production. In this study, this result only applies to immigrants from low- and middle-income countries, a distinction not tested in other studies. Due to the high variance in labor market performance between immigrant groups of different origin and with different reasons for immigrating, the impact of these groups on the receiving labor market should differ too. Hence, allowing the labor market effects of immigration to differ between different groups of migrants should be an important concern in future research.

2 – Swedish refugee immigration

By now Sweden has a long tradition of a relatively generous refugee immigration policy and of large refugee immigration, and during the last decade it has been particularly large, compared to both historical Swedish numbers and the numbers for other countries during the same period. Comparable data that would enable exact comparisons of numbers of actual refugee *immigrants* between countries does not exist, yet in the last decade, the total number of *asylum applications* submitted in Sweden is similar to the numbers in the important European immigration countries Germany, France, and the UK, whose total populations are 7–10 times that of Sweden. And in the industrialized world, only the small Mediterranean islands of Cyprus and Malta, which in many cases act as migrant gateways to other parts of the EU, received as many applications as Sweden or more, if the numbers are divided by home populations (UNHCR, various years).

The present study focuses on refugee immigration 1999–2007, with data availability limiting the total length of the period. The data set used is from the STATIV database of Statistics Sweden, and contains all 18–64 year old individuals registered as present in Sweden in the years 1998, 2003, and 2007. Information on immigrants includes source country, year of immigration, and reason for immigrating, including refugee status. The definition of a refugee includes relatives of refugees, as well as other immigrants with "refugee-like" reasons for immigrating, as defined by the Swedish Migration Board.[1]

Of all refugees immigrating in 1999–2007 and who are still present and of working age in 2007, almost half are from Iraq, followed by former Yugoslavian countries, Somalia, and Afghanistan. This distribution is shown in Table 1. The total number, 82,460 individuals, corresponds to 1.5% of the total working age population in 2007.

The average labor market performance of refugee immigrants is poor. For example, five years after immigrating, the employment ratio of refugees who immigrated in 2002 and were of working age in 2007 was merely 39%, compared to 76% for the rest of the Swedish population in the same age interval. Also, the quality of jobs taken by refugees is often substantially below what would correspond to their level of education (Ekberg and Rooth, 2005).

2.1 – Refugees' settlement patterns

Refugee migration is, per definition, push-driven. Since finding work is not the primary goal of refugee migration, we would expect refugees to be less informed than other migrants about where to settle in the immigration country to maximize expected income or the probability of finding work. In a study of settlement choices of US immigrants, Dodson (2001) shows that the tendency of immigrants to settle close to previous immigrants of the same ethnicity is particularly strong for refugee immigrants, while it is insignificant for labor immigrants. In Sweden, this tendency has been supported historically by the refugee placement strategy applied by the Swedish government 1985–1991. These placements were not determined by favorable labor market opportunities; rather the contrary, as they were mostly determined by available housing (Edin, Fredriksson, and Åslund, 2003), which is, if anything, negatively related to labor market opportunities. Given housing, which ethnicity was placed in which

[1] These are individuals not granted refugee status according to the UN refugee convention, but are still granted residence permits for humanitarian reasons.

municipality was partly determined by what languages were spoken by earlier immigrants in each municipality, thus enhancing ethnic concentration. Edin, Fredriksson, and Åslund document that from 1987 to 1990, about half of all newly arrived refugees were placed in an ethnic "enclave," which they define as a municipality where the concentration of the ethnic group in question is at least twice as large as in the total population. According to Ekberg (2011), this placement policy still affects the distribution of newly arrived immigrants, as they prefer to settle where previous immigrants of the same ethnicity once were placed and often still live.

Variation in refugees' settlement locations and previous residents' labor market outcomes will be used in this paper to identify a causal relation between the two. The settlement patterns of newly arrived refugees are shown in the graphical appendix. The settlement locality for immigrants arriving in 1999–2003 is identified by where they reside in 2003, and for arrivals in 2004–2007 by where they reside in 2007. Crucially for the identification strategy to be applied, settlement patterns must not be significantly predicted by initial labor market opportunities. In the Swedish setting, with highly centralized wage-setting, the obvious variable of choice for measuring initial labor market opportunities is the initial unemployment rate, which also has the advantage that information on the variable is easily available to potential settlers, compared with information on wages or total income. The finest measurement level for both refugee settlement (the dependent variable) and unemployment rates (the independent variable) is the municipality. Sweden has 289 municipalities,[2] with widely varying geographical areas between the more and less densely populated parts of the country. Although the vast majority of municipalities have a clearly defined main city or town dominating the municipality, the municipality does in several cases not well represent the local labor market, especially for municipalities in densely populated regions in the vicinities of larger cities.

To arrive at a measure of unemployment that is relevant also in municipalities near the larger cities, unemployment rates in surrounding municipalities must be taken into account. The size N_m of the local labor market relevant to a worker in municipality m is specified as:

[2] The number of municipalities changed from 289 to 290 in 2003, when Knivsta municipality was separated from Uppsala municipality. To maintain a consistent data set, this study will treat Knivsta as still being part of Uppsala.

$$N_m = \sum_{i=1}^{289} \left(\frac{n_i}{D_{im}^2} \right) \qquad (1)$$

where n_i is the number of workers in municipality i, and D_{im} is the distance in kilometers, as the crow flies, between municipalities i and m. For the more than 90% of municipalities with an easily defined main city/town, distances are measured from this town. When an obvious main city/town does not exist, they are measured from a central location in the municipality. The distance is set to 5 km when $i=m$, or when (one instance) two municipalities are less than 5 km apart. The distance is squared to capture the quickly decreasing "gravitational force" between two municipalities, as the distance between them increases. Due to this quickly declining influence, it is not necessary to specify an outer geographical bound for the local labor market. This specification implies, e.g., that in a municipality that is situated 15 km from a municipality ten times as large, it is about equally probable that workers residing in the smaller municipality will find their workplace in either of the two, while if the larger municipality is 30 km away, the probability of working in the own municipality is 3-4 times as high as that of working in the larger municipality. These magnitudes are roughly consistent with out-commuting population shares in municipalities in the vicinities of the larger cities.

To arrive at a relevant unemployment rate in a local labor market, the total number of unemployed U_m in labor market m is given by substituting total numbers of unemployed workers for total numbers of workers in Equation (1), and the unemployment rate u_m is equal to U_m/N_m. All individuals registered at the Swedish Public Employment Service on Dec 31 each year are counted as unemployed, including if they have part-time, temporary, or subsidized employment. Evidently, the constructed local labor market unemployment rates will be similar to the original municipal rates but with smaller variance, both along any vector across the map and in total. The latter is confirmed in Table 2, which shows summary statistics of the two rates for all workers and for all low- and middle-income country immigrant workers. According to the table, there is a high correlation between the two measures, and unemployment is strongly decreasing over the sample period. The geographical patterns of municipal unemployment rates in 1998 and 2003 are shown in the graphical appendix. It shows in particular that unemployment is consistently higher in the northern part of the country.

2.2 – Regression analysis of settlement patterns

To empirically investigate whether unemployment rates predict refugee settlement decisions, the number of newly arrived refugees in a municipality over a period, measured as a share of the municipality's initial total population, is regressed on the unemployment rate u_m in the relevant labor market at the start of the period, while controlling for latitude, distances – raised to minus two – to the three largest cities Stockholm, Gothenburg, and Malmö, total labor market size, and dummies for ten municipality groups, as defined by the Swedish Association of Municipalities and Regions (*Sveriges Kommuner och Landsting*).[3] The fact that unemployment is significantly higher in northern Sweden is thus controlled for both through the latitude variable and the municipality groups, where municipalities belonging to three of the groups (8,9,10) are mostly clustered in this region. Regressions are made separately for settlements in 1999–2003, with the unemployment rate in 1998 as the independent variable, and 2004–2007, with the 2003 rate as the independent variable. Summary statistics of the refugee inflow rates are shown in Table 3. Both the total unemployment rate and the unemployment rate of low- and middle-income country immigrants are tried as independent variables.[4] No distinction can be made between the unemployment of earlier refugee immigrants and other low- and middle-income immigrants, as refugee status is not appropriately coded for immigrants who arrived earlier than 1997.

Estimates of the parameter of interest are shown in column (1) of Table 4. They vary in sign and are insignificant in all four regressions, both with standard errors robust to heteroscedasticity and standard errors robust to spatial correlation (Conley method). Spatial correlation in the independent variable is accounted for by the construction of the local labor market rate, which decreases variance between municipalities close to each other. For comparison, column (2) of Table 4 shows similar parameter estimates from similar regressions for newly arrived non-refugee immigrants from low- and middle-income countries. Here, the parameter of interest always has the expected sign, and it is significant at

[3] These groups are 1) Larger cities (n=3), 2) Suburbs of larger cities (n=38), 3) Larger towns (n=31), 4) Suburbs of larger towns (n=21), 5) Commuter municipalities (n=51), 6) Tourism municipalities (n=20), 7) Goods-producing municipalities (n=54), 8) Sparsely populated municipalities (n=20), 9) Municipalities in densely populated region (n=35), and 10) Municipalities in sparsely populated region (n=16).

[4] "Low- and middle-income countries" refers to all countries except Andorra, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Liechtenstein, Luxemburg, Monaco, the Netherlands, New Zeeland, Norway, Portugal, San Marino, Spain, Switzerland, the UK, and the US, which will be referred to as "high-income countries."

the 5% level in two of four regressions, to some extent indicating that this immigrant group significantly chooses labor markets with lower unemployment rates. An increase in the unemployment rate by one percentage point reduces the migrant inflow by about 0.01–0.02 percentage points, or by about 12–25%, evaluated at the mean inflow rate. The estimates in column (3) are less directly comparable with those of columns (1) and (2), but show that internally migrating natives significantly – and strongly – take unemployment rates into account. Here the dependent variable is the relative change in the native working-age population over the time period. The coefficient estimates imply that an increase in the unemployment rate by one percentage point reduces the size of the native population 4-5 years later by around 0.3%.

In sum, there is no empirical support at all in Table 4 for refugee immigrants significantly taking unemployment rates into account in their settlement decisions, which would have invalidated a crucial identifying assumption of this study. Moreover, since the estimates indicate that other low- and middle-income immigrants *do* take these rates into account, the results give some support to the claim made in this paper that settlement endogeneity is less of a problem when estimating the labor market impact of refugee immigration than that of other immigration.

3 – Unemployment effects of immigration

An important advantage of the present study is its use of a large data set that covers the entire Swedish population and where individuals are followed over time. Similar studies normally aggregate individuals over geographical units, typically US standard metropolitan areas, and evaluate correlations between immigrant inflows and labor market outcomes (typically wages) over these geographical units (Friedberg and Hunt, 1995; Card, 2005). What these studies cannot capture, and which has led to criticism, notably from Borjas (2003), is other changes in the labor force composition in these areas, which may be correlated with the immigrant inflow. Most importantly, natives may move out when more immigrants move in.

The panel of individuals employed in this study consists of all individuals who are present in the population registry, and between 25 and 64 years of age, at three points in time, i.e., 1998, 2003, and 2007, yielding a total of 3,654,341 individuals. The time interval is cut in two to enable capturing of short-term effects, but is not divided further to still allow a sufficient time length for the refugee inflow to possibly affect the labor market, since refugees' labor market

entrance is quite slow. The middle point in time is set to 2003 rather than 2002, as this makes the refugee inflows of the two sub-periods more equal.

The independent variable is the inflow rate of refugees over the time period into the labor market where the individual resides. This inflow rate is constructed as a weighted sum of all newly arrived refugees in the country, in the same way as the labor market size and unemployment rate variables in Section 2. Summary statistics of the refugee inflow rates in the two sample periods are shown in Table 3. The dependent variable is the change in unemployment status of the individual over the time period. It can take the values 0 (no change), 1 (enters unemployment), or –1 (quits unemployment). Unemployment status is measured on December 31 in each of the three years. The main drawback of this independent variable is that it is not clear in the data whether an individual moves between unemployment and employment or between unemployment and being out of the labor force. Hence the credibility of the estimates hinges on the assumption that the first of the two dominates the second. Importantly, this crucial assumption is supported in Section 3.1, where restricting the sample to workers who are seemingly present in the labor force in all three years does not significantly affect parameter estimates.

A main advantage of the data set is that we can follow individuals who migrate between municipalities during the time period, possibly in response to immigration. This is potentially important, as in the first and second sample periods 12% and 8% of all individuals in the data set move between two municipalities, respectively. To control for internal out-migration, location-related independent variable values for the individuals are measured where they live at the start of the interval, rather than at the end, which is implicitly the case in studies using the more common setup of aggregating individuals over spatial units. Hence, if the individual migrates out of a locality in response to an immigrant inflow, it is still the inflow into that locality that is correlated with the individual's change in labor market status in the analysis and not the – presumably lower – inflow in the locality to which the individual moves. In addition, a dummy variable for internal migration in the time interval is added to the regression specification to capture whether movers perform differently from non-movers on average. Further control variables are age, age squared (these two are measured in 1998), and the controls from the regressions in Section 2: latitude, distances to Stockholm, Gothenburg, and Malmö raised to minus two, labor market size, and municipality group. These further

controls are all interacted with a time dummy for the second time period, while the effects of being a mover is assumed to be constant across periods.

Unemployment effects are evaluated in separate samples, including all workers, all natives, all previous immigrants from low- and middle-income countries (without the possibility to disaggregate between refugees and other immigrants), and all previous immigrants from high-income countries. Refugee inflows are not disaggregated by educational status, as newly arrived highly educated Swedish refugee immigrants seldom take up jobs corresponding to their education levels (Ekberg and Rooth, 2005). Outcomes, on the other hand, are evaluated for different educational levels of workers: "No high school" means that the individual does not report any high school (Swedish gymnasium) education, with or without degree; "No university" means no reported university education, with or without degree; "University degree" means having a degree requiring at least three years of university studies.

Estimates of the parameter of interest from the pooled sample of the two time periods are shown in Panel A of Table 5. The marginal effects are effects of inflow rates on the individual's probability of being unemployed, i.e., effects on unemployment *rates*. As seen in column (1), the analysis finds no significant effects of refugee immigration on the unemployment rates of the total working-age population or of smaller groups defined by level of education. In columns (2)–(4), effects are measured separately for native, low- and middle-income country, and high-income country immigrants. While there are no significant effects on natives or high-income country immigrants, large and significant effects are found on previous immigrants from low- and middle-income countries. The coefficient on all low- and middle-income country workers implies that a one percent increase in the total working-age population due to refugee immigration increases the unemployment rate of previous immigrants in this group by 2.0 percentage points. Reinterpreting this estimate as a crowding-out effect, i.e., how many previous immigrants who lose or do not find a job for every newly arrived immigrant who does, we find that this effect is as large as 0.8, with a 95% confidence interval between 0.4 and 1.2.[5] We also see large and significant effects estimated on the less

[5] Denoting the number of old jobs lost (or not found, that would otherwise have been found) by previous immigrants ΔJ_P, and the number of jobs obtained by the newly arrived refugees ΔJ_R, the crowding out effect is $\Delta J_P / \Delta J_R$. A positive coefficient in Table 5 can be interpreted as $\frac{\Delta J_P / n_P}{\Delta n_R / n_{TOT}}$, where the numerator is the change in the unemployment rate of previous immigrants and the denominator is the relative increase in the population due to immigration of new refugees. So to move from the estimated coefficient to a crowding-out

educated workers in this group, but not on those with university degrees, which is consistent with the earlier finding (Ekberg and Rooth, 2005) that the newly arrived mostly compete for lower skilled jobs.

Averages of residuals from the first row regressions of columns (1) and (3), per municipality and year, are shown in the graphical appendix. As can be seen, municipalities with positive and negative residuals are quite evenly distributed across the country, indicating that the analysis has managed to control for confounding spatial trends in the dependent variable.

Panel B of Table 5 shows parameter estimates similar to in Panel A, obtained when not controlling for internal migration, i.e., when individuals who move between municipalities are ascribed to the municipality that they move *to*, and the control variable for internal migration is excluded (parameter estimates for this control dummy varied in sign and were most often not significantly different from zero in the regressions behind Panel A). These results are quite similar to those of Panel A. The difference between similar estimates in the two panels, although always with the expected sign in columns (1) and (2), is never significant. If this result can be extrapolated to other settings, it implies the reassuring result that internal migration does not significantly bias parameter estimates in studies that cannot control for it.

3.1 – Sensitivity analysis

Since the disaggregation by level of education in Table 5 did not provide much additional information, all sensitivity analyses will be confined to the level including all workers, regardless of level of education.

A weakness of the identification strategy employed is that it is not possible to properly distinguish between a worker who moves between unemployment and employment and one who moves between unemployment and being out of the labor force, as there is no point measure of employment or labor force participation in the data. What exists is a measure, created by Statistics Sweden, that combines information from different sources into a binary measure of being employed or not in a specific year. While crude, this variable enables an alternative identification strategy that discards some information but provides more robustness against effects of movements in and out of the labor force: to run the regressions

effect, the coefficient needs to be multiplied by n_P / n_{TOT}, which is the share of previous immigrants in the population (slightly larger than 6%), and divided by $\Delta J_R / \Delta n_R$, which is the employment rate of the newly arrived refugees (around 15%). In sum, this amounts to a division by about 2.5.

only in the sample of workers who are clearly in the labor force in all three years, i.e., they are either classified as employed or they have been registered as unemployed some time during the year (not necessarily on Dec 31). The results of this analysis are shown in row (1) of Table 6. The estimated effect on previous low- and middle-income country immigrants is very similar to that in the original results and is still highly significant, and the effects estimated in other samples are still insignificant.

As a further sensitivity check, rows (2) and (3) of Table 6 report results from not pooling the two periods 1999–2003 and 2004–2007. The estimated coefficients in the low- and middle-income country immigrant samples differ by less than 5% between the two periods, hence strengthening the credibility of the results from the pooled sample for this group. In the other samples there is somewhat more variation between the two periods, and even a significant point estimate for high-income country immigrants in the second period.

In row (4), to further control for spatial correlation in the dependent variable between municipalities, standard errors are clustered at the level of the *län*, i.e., an administrative region encompassing several municipalities (14 on average). In one instance, in the capital region, what is presumably one labor market is divided into three *län*: Stockholm, Södermanland, and Uppsala Län; hence these three are merged into one. Remarkably, the coefficient of interest in the previous low- and middle-income country immigrant sample has a p value of 0.000 also in this case, although the number of *län* (after merging three of them) is only 19.

Row (5) reports results when outlier municipalities are removed. Outlier municipalities are identified in Figure 1, which plots average changes in total unemployment rates against refugee inflow rates for all municipalities and both periods. The figure shows five municipalities that could potentially have strong influence on the regression results. These are Salem (128), Södertälje (181), Strömstad (1486), Sorsele (2422), and Dorotea (2425). Four of these are small municipalities with populations below 15,000 and hence have limited influence on the regression results. Södertälje, the only municipality that is a visible outlier in both periods, is larger, with a population around 80,000. Södertälje is also well-known for having attracted very large numbers of Iraqi refugee migrants since 2005, due to the historical

presence of Assyrians in the city.[6] As shown in row (5), removing outlier municipalities brings the estimated coefficient in the low- and middle-income country immigrant sample down by about 30%, and the associated crowding-out effect between 50% and 60% may be seen as more reasonable than the original 80%.

From the decrease in the coefficient of interest in the low- and middle-income country immigrant sample when outliers are removed, one might suspect that the unemployment effect of refugee immigration is increasing rather than linear. This is also what is indicated if a squared term in the refugee inflow is added to the regression specification: it dominates the linear term, i.e., makes the coefficient on the linear term negative. Yet this conclusion may be ill-founded. When Södertälje is removed from the sample, it is instead the coefficient on the squared term that becomes negative when the linear and squared terms are used simultaneously, and unemployment in Södertälje has increased partly due to substantial layoffs and not only because of an increased supply of workers: In 2007, the year when Södertälje received particularly large numbers of refugees, AstraZeneca, one of the two strongly dominating private-sector employers in Södertälje laid off large numbers of workers (on request they have refused to disclose exact numbers). Hence, concluding that unemployment effects of immigration are increasing based on the Södertälje case could be erroneous.

Row (6) of Table 6 shows the results from analyzing a reweighted sample where each labor market, rather than each individual, is given the same weight to reduce the influence of the larger labor markets. Hence, each individual is weighted in the regressions by the inverse of labor market size. This modification has negligible impact on the regression results.

In row (7), the northern part of the country, which has a lower population density, higher unemployment, and lower immigrant inflow, is deleted from the sample. The northern part is delimited here by what is conventionally referred to as the Norrland region, i.e., all municipalities with Statistics Sweden numbers larger than 2100. In row (8), the capital region is deleted. The capital region is defined as the sum of all municipalities with centers within

[6] There are well-known explanations also for the other outliers: Sorsele and Dorotea, which are remotely situated municipalities with declining and aging populations, have actively tried to attract immigrants to turn their demographic trends. Strömstad is situated on the Norwegian border close to the Norwegian capital Oslo and benefits from flourishing cross-border trade as a result of the large price differences between Sweden and Norway. Salem is a smaller neighbor of Södertälje.

100 km of that of Stockholm. While deleting the Norrland region does not affect any of the conclusions, deleting the capital region makes the estimated coefficient in the low- and middle-income country immigrant sample somewhat smaller and less significant. This result is strongly driven by the deletion of Södertälje.

3.2 – Further analysis of effects on low- and middle-income country immigrants

The results obtained thus far are much in line with those of recent studies from the US (Ottaviano and Peri, 2012; Card, 2009), Germany (D'Amuri, Ottaviano, and Peri, 2010), and the UK (Manacorda, Manning, and Wadsworth, 2012), which conclude that newly arrived immigrants are substantially more easily substituted for previous immigrants than for natives in production, although in this study this result is confined to immigrants from low- and middle-income countries. Notably, the large estimated effect on the unemployment rate of previous low- and middle-income country immigrants does not imply a significant effect on the total unemployment rate. Hence, this negative effect on one minority group may be balanced by positive effects on other subgroups that complement newly arrived immigrants in production but that have not been identified and analyzed separately. Still, although not very different from comparable effects estimated in other countries in the studies referred to above, the derived crowding-out effect on the low- and middle-income country immigrant group of around 80% is substantial, motivating further analysis of the robustness and drivers of this result.

One theoretically possible reason for an inflated estimate of the effect of newly arrived refugees could be a positive correlation between the number of newly arrived refugees and of newly arrived non-refugees. If the settlement patterns of the two immigrant groups were positively correlated and they both affected unemployment of previous immigrants, the effect of the non-refugees would, at least partly, go into the coefficient on the refugees when no measure of the inflow of non-refugees was included in the regressions. Yet, when including the immigration rate of low- and middle-income country non-refugee immigrants, besides the refugee measure, its coefficient is very small and far from significant, as shown in column (1) of Table 7. Although large, it is not even significantly different from zero when the refugee inflow measure is not included, as shown in column (2). This result may also be interpreted in support of the identification strategy of this paper, i.e., to only look for the effects of the push-driven refugee inflow. Plausibly, the reason why the refugee inflow gives a significant effect

and the non-refugee inflow does not may be the endogenous settlement pattern of the latter, biasing its coefficient toward zero.

A further attempt to shed light on the large effect of refugee immigration on the unemployment rate of earlier low- and middle-income country immigrants is to further disaggregate this subsample. Estimated effects on samples disaggregated along likely refugee status, time since immigration, gender, marital status, and age are shown in Table 8. While refugee status is not properly coded for immigrants arriving earlier than 1997, combinations of country of origin and year of arrival can be used to identify groups of immigrants who are highly likely to be refugees.[7] The estimated effect on this group is shown in row (1) of Table 8; it is smaller, but not significantly smaller than that for all low- and middle-income country immigrants.

Time since immigration is another plausible candidate covariate that could influence the effect of immigration on the individual's probability of being unemployed, since immigrants' initial labor market attachment is poor but improves over time. The median immigration year of immigrants in the sample is 1989. Rows (2) and (3) of Table 8 show the effect on immigrants arriving before and after (and including) the median year, respectively. The difference between the estimates has the expected sign, with the estimate on later arrivals being larger, yet the difference is not significant.

In rows (4)–(7), the low- and middle-income country immigrant sample is disaggregated along gender and marital status, where marital status is measured in 1998. There is a negative and insignificant estimate for unmarried men, which may be a more footloose group that more easily adjusts to changing circumstances. The estimate for unmarried women is also smaller than that for married women and men, yet these differences are not significant. Rows (8) and (9) show results disaggregated by the midpoint in the age interval, 40 years, in 1998. As expected, the effects are stronger on younger workers, but also in this case the difference is not significant.

[7] The combinations of country of origin and year of immigration used to identify refugees are: Afghanistan 1980–1998, Bosnia-Hercegovina 1993–1998, Bulgaria 1989, Chile 1973–1980, Croatia 1993–1998, Czechoslovakia –1989, Cuba, Eritrea, Ethiopia 1974–1998, Guatemala (all years), Hungary –1989, Iran 1979–1989, Iraq 1980–1989, Liberia 1989–1998, Libanon 1975–1991, Poland 1989, Romania 1989, Sierra Leone 1992–1998, Somalia 1991–1998, Sudan (all years), and Yugoslavia 1993–1998.

In sum, the results in Table 8 do not reveal any striking differences between different subgroups of the low- and middle-income country immigrant sample. The estimated differences between subgroups consistently have the expected signs, yet the estimated coefficient was significantly different from +2.0 only for the subsample of unmarried men.

3.3 – Effects on other groups with low labor market attachment

In line with earlier research, the results obtained thus far, with large effects of refugee immigration on earlier low- and middle-income country immigrants' unemployment but no significant effects on native or total unemployment, have been interpreted in terms of substitutes and complements: new immigrants are more easily substituted for previous immigrants than for natives, presumably because immigrants, who often lack linguistic and cultural skills, concentrate disproportionately in certain occupations where these skills are less required. Another possible interpretation of the results of this study is that refugee inflows have large negative effects on workers with low labor market attachment, of whom many are earlier immigrants. This interpretation is partly different from the substitutability interpretation, as lack of linguistic and cultural skills may be, but is not necessarily, the reason for low labor market attachment. Hence, it is informative to analyze whether refugee inflows have significant unemployment effects on other workers with low labor market attachment.

Besides immigrants, the group commonly referred to in the Swedish public debate as one with low labor market attachment is young natives, and especially young natives with low education. Table 9 reports estimates of the effect of refugee immigration on the unemployment probabilities of six groups of young natives: the rows are for those aged 25–29 and 25–34 in 1998 and the columns are for all workers, those with no university education, and those with no high school education, respectively. The groups are thus cumulative in terms of both age and education. Table 9 reports a significant effect on unemployment where it was most expected *à priori*, i.e., for the group that is youngest and least educated: 25–29 years old and no high school education. The estimate is about 60% in magnitude of that on previous immigrants from low- and middle-income countries (although the difference is not significant). Hence, both of the interpretations mentioned in the beginning of this subsection seem to have some validity: a refugee inflow has an effect also on the unemployment rate of the small native group with the weakest attachment to the labor market, yet the effect on previous immigrants is probably stronger. The point estimates in the other cells of Table 9 are,

although not significant, quite large, but also quite strongly driven by the group with the significant estimate, which is part of all the other groups.

The point estimate on the youngest and least educated natives implies that each refugee who actually finds work crowds out about 0.06 of these natives. The difference between the estimated crowding-out effects on this group and on immigrants from low- and middle-income countries, 6% versus 80%, is substantially larger than the difference between the estimated unemployment rate effects, simply because the previous immigrant sample is 7-8 times as large as the native sample in question, i.e., there are more immigrants to crowd out. It is worth reiterating that although these estimated crowding-out effects sum to almost 100%, there is no significant effect on the total unemployment rate, and although the point estimate for all workers in Table 5 corresponds to a quite substantial total crowding-out effect of around 35%, several of the robustness checks reported in Table 6 even make this point estimate negative. The absence of a total unemployment effect of immigration, in spite of the substantial effects on smaller groups, indicates that plausibly there are other subgroups of the workforce, which the analysis has not managed to identify, that complement the newly arrived refugees in production, i.e., whose unemployment rates may decrease with a refugee inflow.

4 – Conclusion

This paper has estimated unemployment effects of Swedish refugee immigration using spatial variation in immigrant inflows and labor market outcomes. Refugee immigration is found to have a substantial negative impact on earlier immigrants from low- and middle-income countries, but no significant impact on natives or immigrants from high-income countries. The estimated impact on the unemployment rate of previous low- and middle-income country immigrants is high, and translates into a crowding-out effect on this group as high as 0.8 for each refugee who finds work. The effect is quite constant across different subgroups of the low- and middle-income country immigrant population, yet it does not shine through in a significant effect on the total unemployment rate, indicating that there may be positive effects on other subgroups of the workforce who complement these immigrants in production.

The results of this study are well in line with earlier results from other countries, both qualitatively and in magnitudes. Importantly though, this study derives this result using spatial variation for direct identification of effects, whereas, with the exception of Card (2009), most of the earlier studies referred to use time series data to estimate parameter values in assumed

national-level production functions, and then use these functions to simulate the impact of immigration. The results of these studies depend largely on the assumed functional forms and on stable trends in changes in parameter values and that these in turn are not affected by the immigration patterns over the decades. The generally low robustness of results thus derived are shown by Ottaviano and Peri's (2012) analysis of the results obtained by Borjas (2003), and in turn by Borjas, Grogger, and Hanson's (2012) analysis of the results of Ottaviano and Peri; and further methodological issues are highlighted by Dustmann and Preston (2012). In light of the question marks on the validity of the structural framework technique, it is important to see that similar results are obtained when using a different method that does not rely on any functional assumptions.

Another difference between this study and all previous studies that find imperfect substitutability between immigrants and natives is that in this study this finding only applies to immigrants from low- and middle-income countries, while high-income country immigrants are found to be more similar to natives. Most studies of wage effects of immigration assume immigrants from all countries to affect the labor market in the same way, and the results presented here should serve as motivation to move away from this assumption in future research.

The time interval covered by this study is one of increasingly good labor market conditions. Between 1998 and 2003, the unemployment rate in the average municipality fell by 4.8 percentage points, and in 2007 it had fallen by another 2.4 percentage points. The effects of immigration are not necessarily the same in business cycle downturns, an analysis of which should be enabled by similar data from only a few years later, when Sweden, along with most of the Western world, entered a recession.

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I am grateful to Lina Andersson, Dominique Anxo, Lars Behrenz, Arne Bigsten, Anders Boman, Jan Ekberg, Per Lundborg, Eyerusalem Siba, Måns Söderbom, and Sven Tengstam for many helpful comments.

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Table 1. Distribution of refugee immigrants by source country

Country	Count
Iraq	37,460
Former Yugoslavia	10,939
Somalia	5,760
Afghanistan	4,466
Iran	3,461
Syria	1,587
Burundi	1,320
Russia	1,283
Eritrea	1,268
Others	14,916
Total	82,460

Notes: Numbers include refugees immigrating in 1999 – 2007, still present, and 18 – 64 years of age in 2007. Former Yugoslavian countries are counted as one, as the data do not enable proper distinction between them.

Table 2. Summary statistics of unemployment rate measures

All workers

Year	Mean %	St. dev. p.p.	Min %	Max %	Corr A,B %
Municipal rates (A)					
1998	18.0	5.2	5.2	31.9	-
2003	13.2	4.3	4.3	31.2	-
2007	10.8	3.8	2.6	26.1	-
Constructed local labor market rates (B)					
1998	17.6	4.1	8.6	30.4	96.9
2003	12.9	3.5	6.5	29.0	97.5
2007	10.7	3.0	5.2	25.0	96.9

Low- and middle-income country immigrants

Year	Mean %	St. dev. p.p.	Min %	Max %	Corr A,B %
Municipal rates (A)					
1998	32.5	8.7	13.8	56.9	-
2003	23.2	7.4	7.9	56.0	-
2007	23.4	8.3	7.1	54.5	-
Constructed local labor market rates (B)					
1998	31.6	5.2	20.6	51.3	88.6
2003	22.5	4.8	12.4	43.2	90.0
2007	22.4	5.2	12.7	46.6	91.6

Notes: n=289. Rates are measured on Dec. 31 each year and refer to numbers of unemployed over total populations aged 18–64. All individuals registered at the Swedish Public Employment Service on Dec. 31 each year are counted as unemployed, including if they have part-time, temporary, or subsidized employment.

Table 3. Summary statistics of municipal refugee inflow rates

Period	Mean %	St. dev. p.p.	Min %	Max %
		Municipal rates		
1999 – 2003	0.44	0.47	0	3.0
2004 – 2007	0.63	0.49	0	3.9
		Constructed local labor market rates		
1999 – 2003	0.56	0.31	0.03	2.1
2004 – 2007	0.73	0.31	0.07	2.4

Notes: n = 289. The municipal rate is the dependent variable in Section 2.2, while the constructed rate is the main independent variable in Section 3.

Table 4. Partial effects of initial unemployment rates on settlements

		Sample		
Period	Unemployment rate	(1) New refugees	(2) New low- and middle-income country non-refugees	(3) Internally migrating natives
99-03	Total	–0.012	–0.019*	-0.374*
		(0.010)	(0.009)	(0.073)
		[0.009]	[0.009]	[0.010]
	Immigrant	–0.011	–0.010	
		(0.007)	(0.006)	
		[0.007]	[0.007]	
04-07	Total	0.011	–0.007	-0.268*
		(0.012)	(0.009)	(0.064)
		[0.011]	[0.009]	[0.071]
	Immigrant	0.006	–0.014*	
		(0.010)	(0.006)	
		[0.010]	[0.006]	

Note: Each cell contains the parameter of interest from a separate regression. n = 289 in all regressions. Initial unemployment rates are measured on Dec. 31 in 1998 and 2003 respectively. The immigrant unemployment rate refers to that of immigrants from low- and middle-income countries. Heteroscedasticity-robust standard errors in parentheses; spatial correlation-robust standard errors (Conley method) in brackets. A * denotes significance at the 5% level.

Table 5: Estimated unemployment effects of refugee immigration

	Sample – origin			
Sample – education	(1) All workers	(2) Natives	(3) Low- and middle-income country immigrants	(4) High-income country immigrants
	Panel A: with controls for internal migration			
All workers	0.053	0.152	1.98*	0.304
	(0.864)	(0.604)	(0.000)	(0.472)
	[7,296]	[6,337]	[590]	[368]
No high school	0.163	0.085	2.51*	–0.211
	(0.455)	(0.700)	(0.000)	(0.522)
	[1,275]	[1,041]	[142]	[90]
No university	0.136	0.142	2.74*	0.451
	(0.692)	(0.666)	(0.000)	(0.269)
	[4,864]	[4,202]	[400]	[260]
University degree	0.066	0.335	–0.929	0.252
	(0.778)	(0.114)	(0.253)	(0.708)
	[1,180]	[1,055]	[76]	[48]
	Panel B: without controls for internal migration			
All workers	–0.085	–0.014	2.07*	0.216
	(0.743)	(0.954)	(0.000)	(0.525)
	[7,296]	[6,337)	[590]	[368]
No high school	0.092	–0.029	2.54*	–0.356
	(0.654)	(0.891)	(0.001)	(0.186)
	[1,275]	[1,041]	[142]	[90]
No university	0.057	0.014	2.92*	0.452
	(0.838)	(0.959)	(0.000)	(0.147)
	[4,864]	[4,202]	[400]	[260]
University degree	– 0.255	0.047	–1.18	–0.036
	(0.244)	(0.806)	(0.262)	(0.956)
	[1,180]	[1,055]	[76]	[48]

Note: Each cell contains the parameter of interest from a separate regression. Standard errors are clustered at the municipality level. P values in parentheses and n values in thousands in brackets. A * denotes significance at the 5% level.

Table 6: Sensitivity analysis

	Sample – origin			
Specification	(1) All workers	(2) Natives	(3) Low- and middle-income country immigrants	(4) High-income country immigrants
(1) Strong attachment	0.139	0.292	1.81*	0.661
	(0.653)	(0.314)	(0.016)	(0.116)
	[5,875]	[5,242]	[372]	[260]
(2) First period only	–0.223	0.144	1.93*	–0.107
	(0.655)	(0.785)	(0.019)	(0.889)
(3) Second period only	0.250	0.154	2.02*	0.591*
	(0.318)	(0.478)	(0.001)	(0.035)
(4) S.e. clustered at *län*	0.053	0.152	1.98*	0.304
	(0.830)	(0.607)	(0.000)	(0.484)
(5) Deleting outliers	–0.265	–0.111	1.37*	–0.363
	(0.354)	(0.693)	(0.045)	(0.300)
	[7,208]	[6,271]	[578]	[357]
(6) Weights	0.144	0.195	1.74*	0.252
	(0.613)	(0.513)	(0.006)	(0.605)
(7) Deleting Norrland	0.134	0.223	2.20*	0.227
	(0.701)	(0.495)	(0.000)	(0.635)
	[6,343]	[5,444]	[565]	[333]
(8) Deleting Stockholm	–0.026	0.071	1.68	–0.483
	(0.931)	(0.809)	(0.085)	(0.369)
	[5,228]	[4,660]	[353]	[214]
Original results	0.053	0.152	1.98*	0.304
	(0.864)	(0.604)	(0.000)	(0.472)
	[7,296]	[6,337]	[590]	[368]

Note: Each cell contains the parameter of interest from a separate regression. Standard errors are clustered at the municipality level. P values in parentheses and n values in thousands in square brackets (only shown when deviating from original sample, or in the case of rows (2) and (3), half the original sample). A * denotes significance at the 5% level.

Table 7: Effects of refugee and non-refugee inflows

Independent variable	(1)	(2)	(3) (original)
Refugee inflow	2.03*		1.98*
	(0.002)		(0.000)
Non-refugee inflow	–0.084	0.812	
	(0.876)	(0.195)	

Notes: The sample consists of previous low- and middle-income country immigrants only. Non-refugee inflows include only low- and middle-income country immigrants. Each cell contains the parameter of interest from a separate regression. Standard errors are clustered at the municipality level. P values in parentheses. n=590,000. A * denotes significance at the 5% level.

Table 8: Effects on subgroups of low- and middle-income country immigrants

Subsample	Estimate
(1) Refugees	1.57
	(0.075)
	[220]
(2) Year of immigration < 1989	1.39*
	(0.012)
	[280]
(3) Year of immigration ≥ 1989	2.42*
	(0.001)
	[310]
(4) Married men	2.59*
	(0.000)
	[176]
(5) Unmarried men	–0.322
	(0.666)
	[113]
(6) Married women	2.62*
	(0.000)
	[197]
(7) Unmarried women	1.80*
	(0.032)
	[103]
(8) Age < 40 in 1998	2.40*
	(0.000)
	[337]
(9) Age ≥ 40 in 1998	1.40*
	(0.024)
	[253]
Original result	1.98*
	(0.000)
	[590]

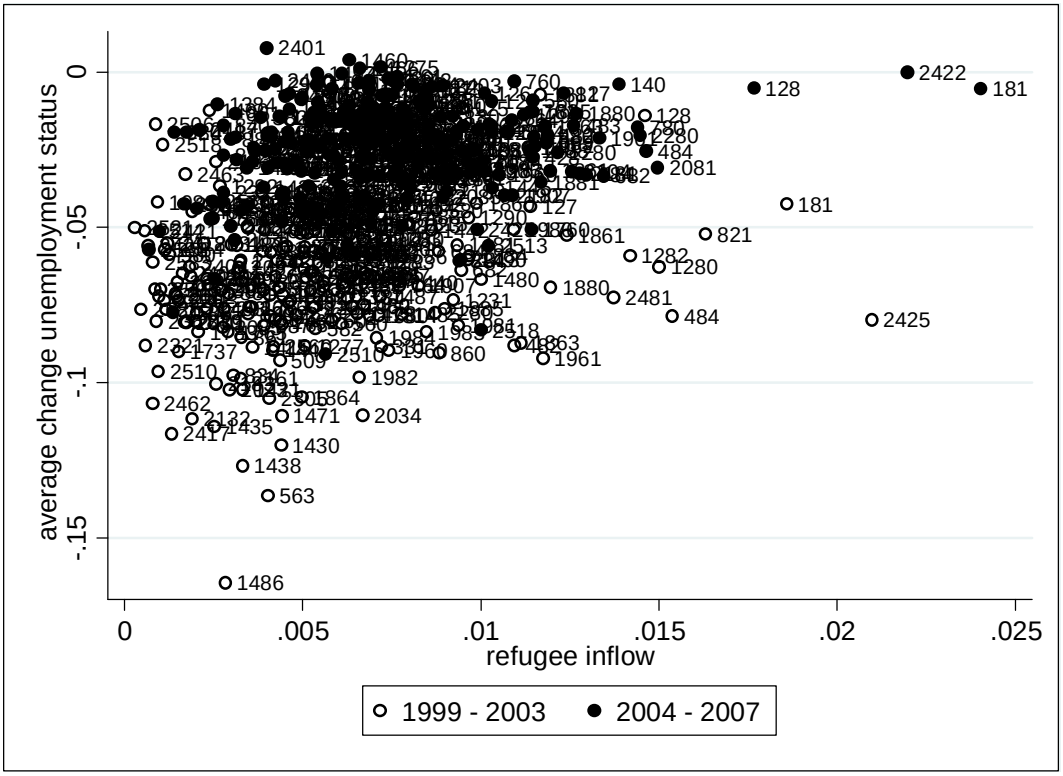
Notes: Each cell contains the parameter of interest from a separate regression. Standard errors are clustered at the municipality level. P values in parentheses and n values in thousands in brackets. A * denotes significance at the 5% level.

Table 9. Estimated effects on young natives' unemployment

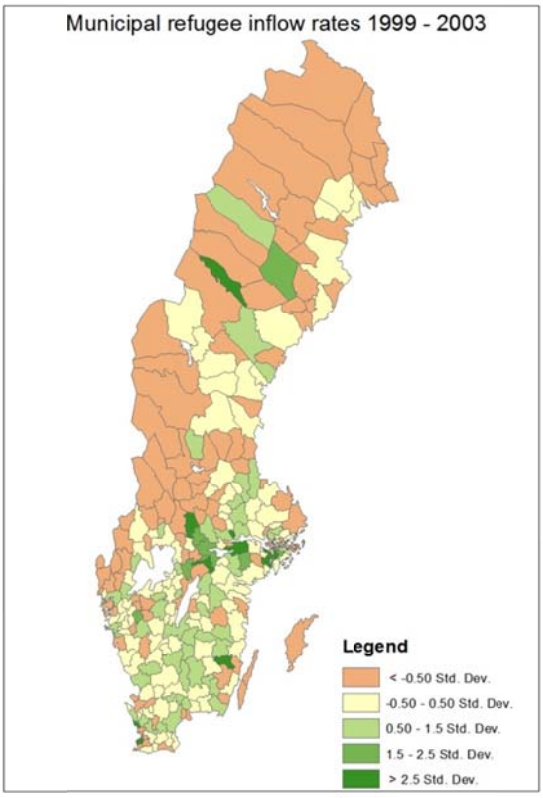
Age in 1998	All workers	No university	No high school
25–29	0.442	0.869	1.21*
	(0.470)	(0.208)	(0.043)
	[1,004]	[598]	[79]
25–34	0.260	0.473	0.621
	(0.597)	(0.388)	(0.136)
	[2,100]	[1,306]	[180]

Notes: Each cell contains the parameter of interest from a separate regression. Standard errors are clustered at the municipality level. P values in parentheses and n values in thousands in brackets. A * denotes significance at the 5% level.

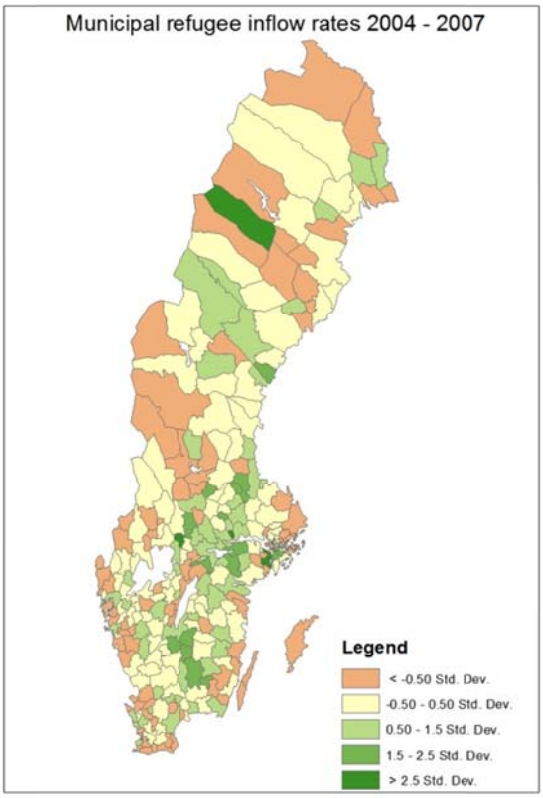
Figure 1. Outlier municipalities



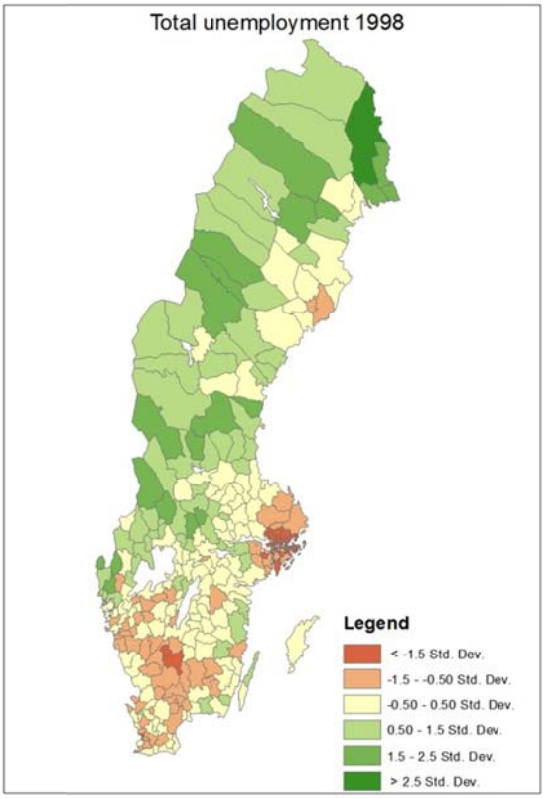
Graphical appendix: maps



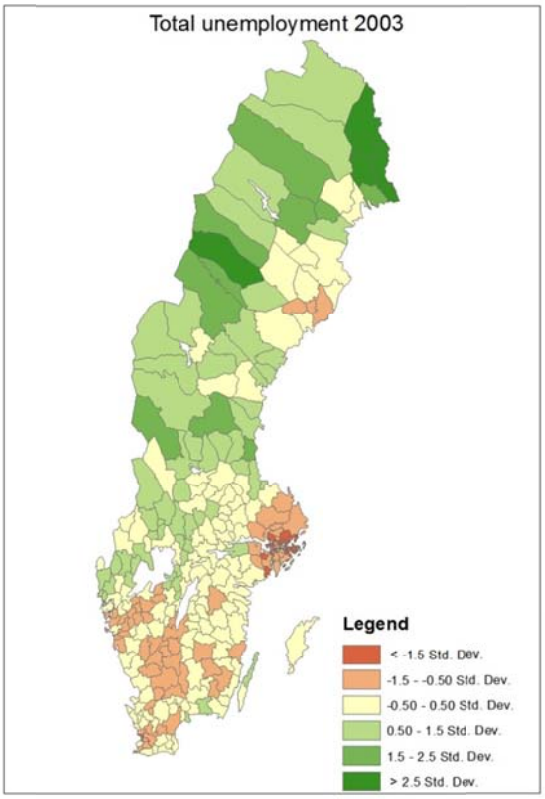
Mean: 0.44%
Std. Dev.: 0.47%



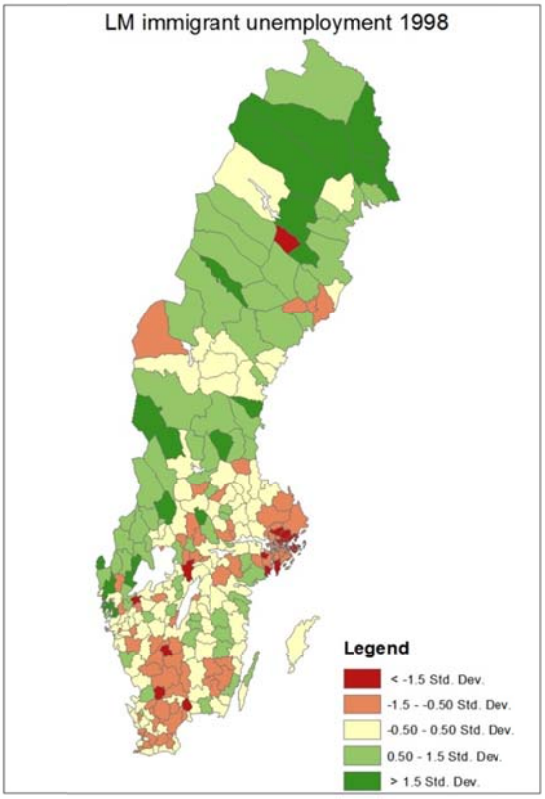
Mean: 0.63%
Std. Dev.: 0.49%



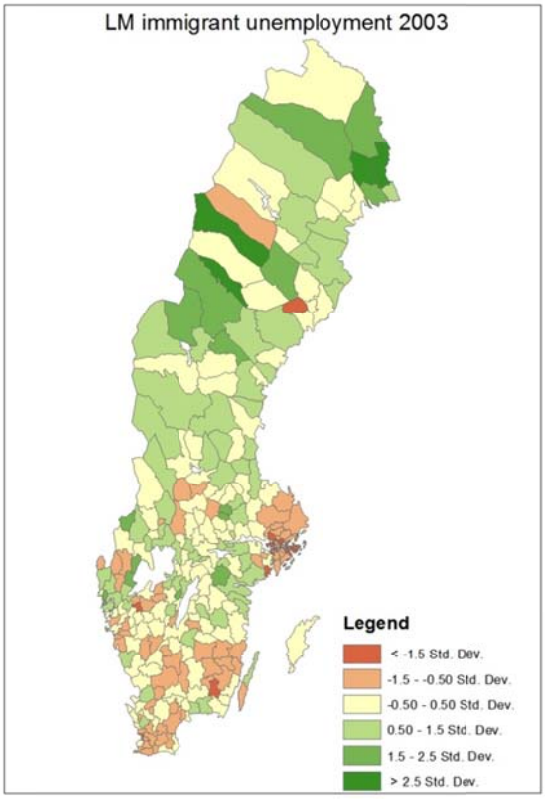
Mean: 18.0%
Std. dev.: 5.2%



Mean: 13.1%
Std. dev.: 4.3%

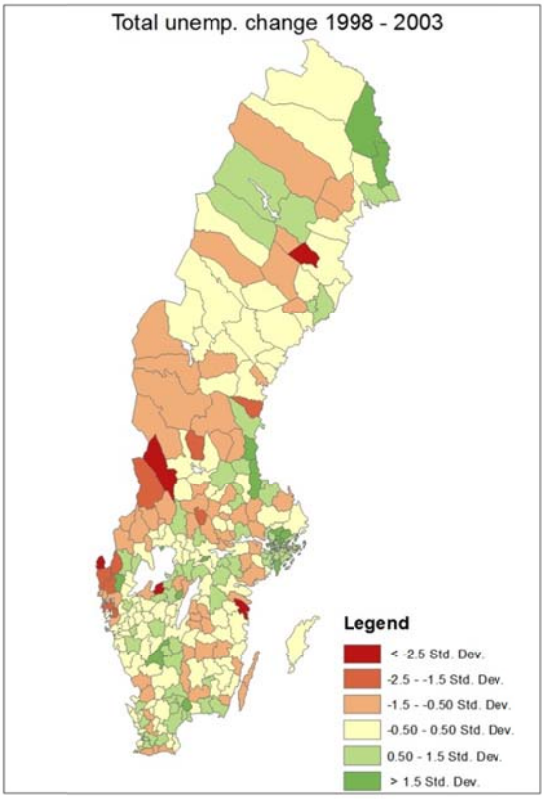


Mean: 32.5%
Std. Dev.: 8.7%

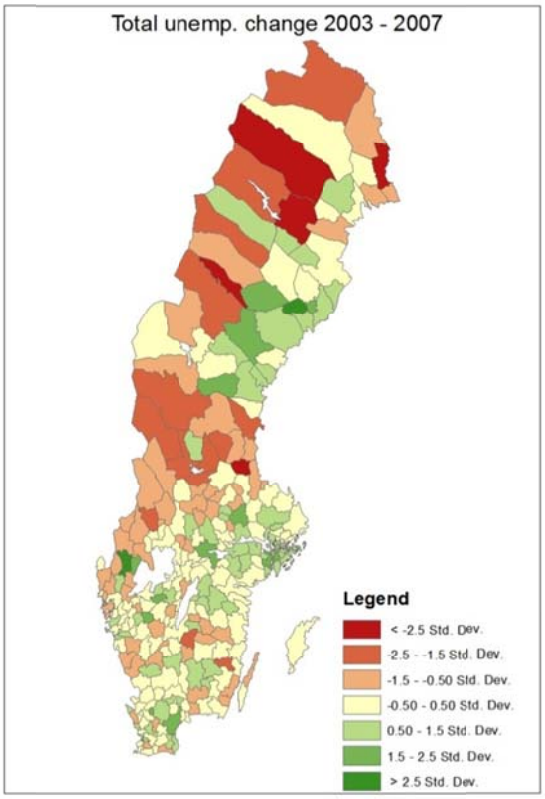


Mean: 23.1%
Std. Dev.: 7.4%

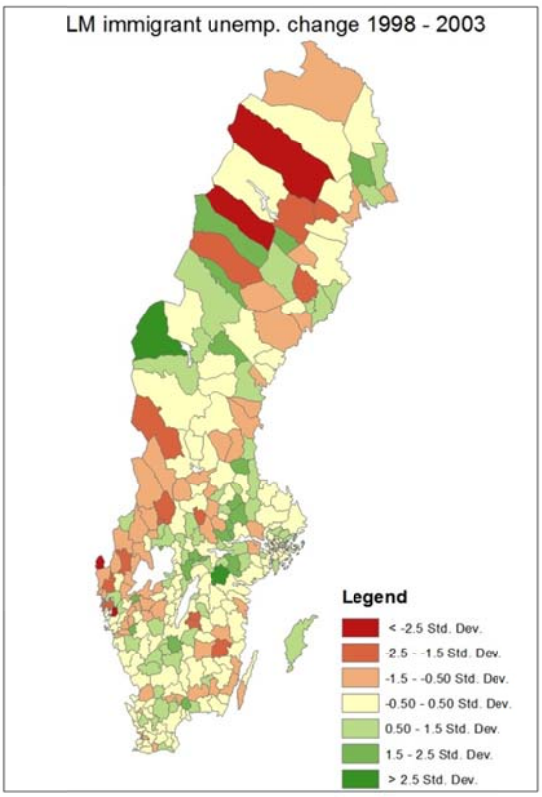
Note: "LM immigrant" refers to low- and middle-income country immigrants.



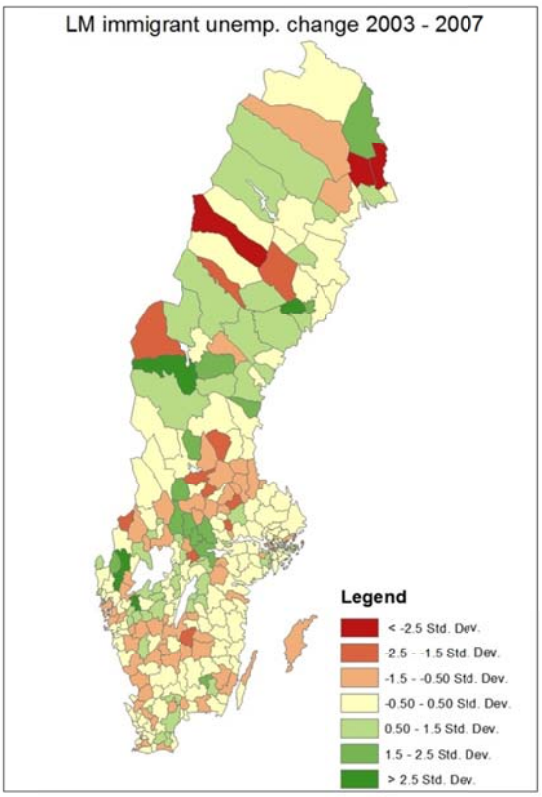
Mean: –4.8%
Std. Dev.: 2.2%



Mean: –2.3%
Std. Dev.: 1.6%

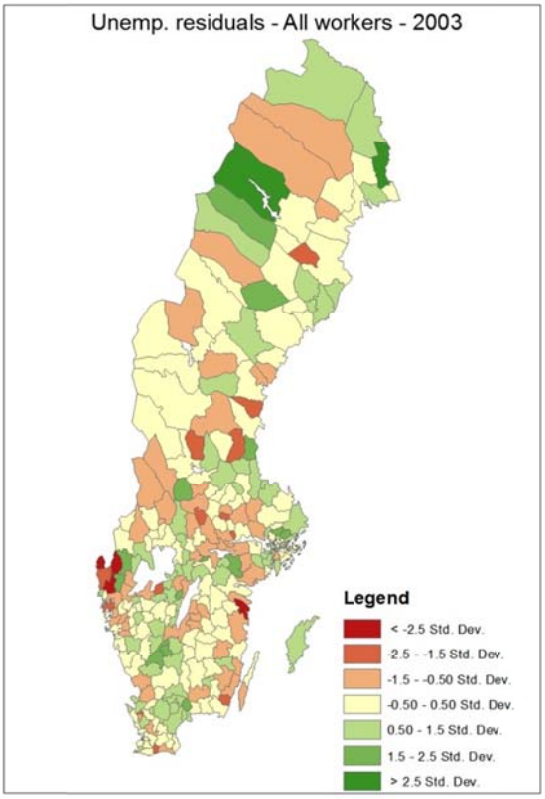


Mean: –9.4%
Std. Dev.: 6.7%

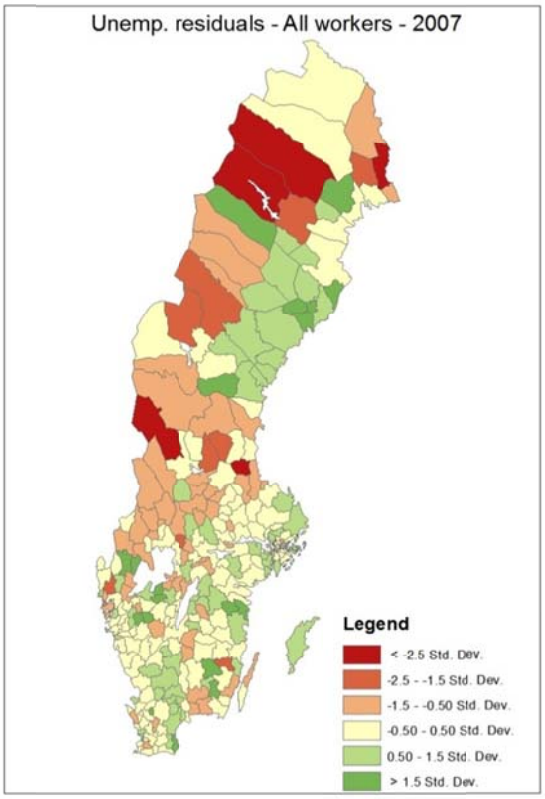


Mean: 0.2%
Std. Dev.: 6.7%

Note: “LM immigrant” refers to low- and middle-income country immigrants.

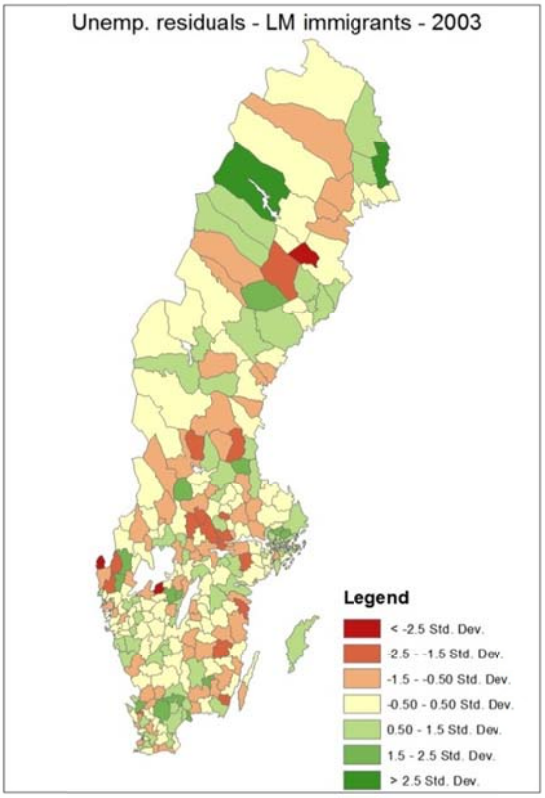


Mean: –0.000
Std. Dev.: 0.021

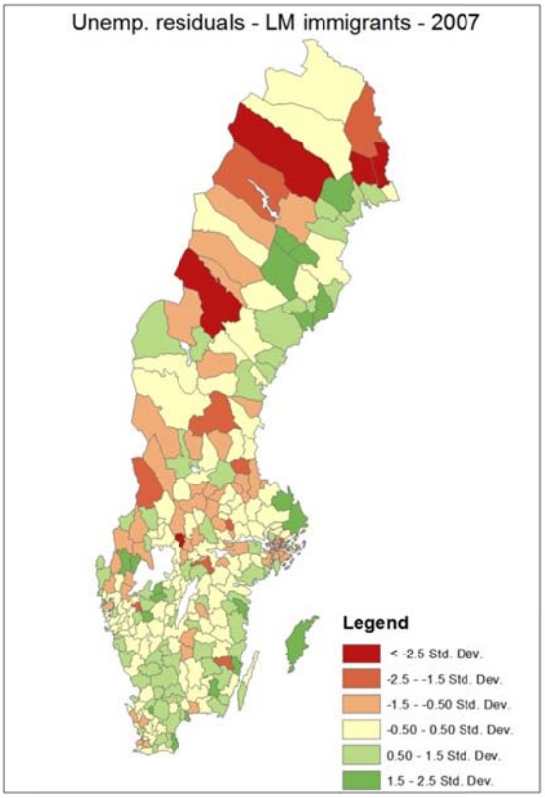


Mean: –0.001
Std. Dev.: 0.013

Note: Graphs show municipal averages of residuals from regressions reported in Table 5, column (1), first row, separately by year of observation.



Mean: 0.072
Std. Dev.: 0.024



Mean: 0.019
Std. Dev.:0.016

Notes: Graphs show municipal averages of residuals from regressions reported in Table 5, column (3), first row, separately by year of observation. "LM immigrant" refers to low- and middle-income country immigrants.

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