The Impact of Immigration on Average Income in Sweden

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Abstract

The economic impact of immigration has been one of the most salient issues for many countries in Europe. Does the increase of immigration lead to negative economic outcomes for the local population? We study the effect of the rise in immigration density on the local income levels in all 290 municipalities in Sweden. We utilise the panel data of the average income in the region as well as the average income of identified ethnic groups to study the heterogeneous impact of immigration on the labour market. By using the internal instrument of immigration density level in 2011, we address the issue of reverse causality present between immigration density and local income levels. Moreover, we exploit the variation in immigration policy between Denmark and Sweden to conduct a Difference in Differences estimation on the impact of immigration. Our study shows that there was a negative impact of immigration on the average income level in Sweden. However, marginal income estimates provided evidence that immigrant labour acts as a complement to the native population, displaying a positive impact of 0.8% on the income of Swedish citizens for every 1% increase in immigration density in our two stage least squares estimation. Despite this positive economic impact on the native population, we find that having a 1% increase in immigration density in the previous year correlates to 2-3% increase in the vote of the far-right political party, Sweden Democrats.

1 Introduction

Immigration has been increasing in Sweden since the 1940s, particularly after 2014 and the onset of the European refugee crisis, the question of migrant economic impact rose to salience. Sweden took in far more refugees per capita in Europe during this period.[1] Sweden has had an open and humanitarian approach to immigration throughout recent history. From the 1940s to the 1970s, Sweden welcomed significant labour immigration from Eastern and Southern Europe, filling a domestic labour shortage in heavy industry and natural resources extraction sectors. The country's economy has been expanding rapidly as a result of a high demand for raw materials, ships and other goods, from the war-torn powers of Europe. The export-focused growth started to slow in the 1970s. From the 1980s a different type of migrant, most notably refugees and tied-workers, settled in Sweden in large numbers taking up low-skilled jobs.

At the beginning of the migration wave in 1980, Sweden implemented comprehensive integration schemes for migrants, offering housing, benefits and Swedish language classes. It was said to be one of the best cultural assimilation schemes provided in Europe, but it was also very costly. This level of service proved difficult to provide during the European refugee crisis: the influx of immigrants was too large to manage effectively. At its peak in 2016 Sweden took in 163,000 immigrants [2] most of whom were Syrian refugees. This considerable for a country with 9.8 million citizens. In addition, there was no shortage in low-skilled labour, leaving many refugees struggling to integrate and find employment. The Swedish labour market had changed dramatically, from one focused on heavy industry and shipping to a service-sector focused high-skilled economy, with an increased emphasis on Swedish language proficiency (Schön 2000).

This failure in assimilation and integration has led to an increase in anti-immigrant sentiment in Sweden, most clearly seen in the rise of the Sweden Democrat (SD) party, Sweden's most extreme anti-immigration party. In Sweden's long history of accepting refugees this is the first time there has been significant political backlash. Even in the Balkan crisis of the 1990s, Sweden took in numbers refugees fleeing the remnants of Yugoslavia. However, there was comparatively little opposition, despite the large cultural and ethnic differences. This break in trend suggests a probable change in voter sentiment on the impact of immigration. It is hypothesised that voters expect immigrants to have a negative economic impact on the incomes of domestic Swedes and also that they will

[1] https://foreignpolicy.com/2016/02/10/the-death-of-the-most-generous-nation-on-earth-sweden-syria-refugee-europe/

[2] https://www.migrationsverket.se/English/About-the-Migration-Agency/Statistics/Asylum.html

increase the burden on the Swedish welfare system. This view is supported by a report by the Institute of Futures Studies [3] which found that 31-37% of SD voters believe that immigrants take jobs from the natives. The study also found that SD voters also tend to worry about the cultural impact of the largely Muslim refugees on the Christian/Atheist Swedish culture and heritage. This may point to the possibility that the change in the opinion on migrants is not entirely due to economic reasons, but instead a part of the overall shift in European politics prevalent since the start of the refugee crisis. These hypotheses are often made without backing of empirical research, it can be hard for politicians to accurately assess their validity.

The primary objective of this paper is to assess the impact of immigration density on local income levels. Specifically, the paper focuses on the impact of immigration on the median income at the kommun (municipality) level, the most localised government body in Sweden. The rest of the paper is organised in the following way: the next section reviews the long-standing debate on immigrants and their impact on the labour market followed by the descriptive statistics. We next present the panel data analysis. To explore further, we carry out a Differences-in-Differences (DiD) estimation using Denmark as a counterfactual to Sweden. We use the immigration density in 2011 as the internal instrument for future immigration and carry out an Instrumental Variables Two Stage Least Squares (IV-2SLS) estimation. We then present an analysis of Gini coefficients, income percentiles and voting behaviour. The final section concludes.

1.1 Previous Relevant Literature

Considerable relevant literature today remains divided on the impact of immigration on the labour market. Borjas (1987) and Grossman (1982) for the United States found that an increase in the number of immigrants did not impact the wage levels of the native population. Pischke and Velling (1997) also found little to no evidence of immigrants displacing ethnically German labour in late 1980s. Altonji and Card (1991), using the 1970 share of foreigners as an instrument for 1970-1980 period, found that there was only a small displacement of local workers from increased supply of immigrant labour. More recent study by Manacorda et al (2010) found that despite significant rise of immigration in the UK, there was no appreciable effect on the average wages. They attributed this to the imperfect substitution of natives and immigrants in production.

However, the impact of immigration appears to be heterogeneous according to skill level. Zimmermann and De New (1994) found evidence that blue-collar German workers

[3] https://www.iffs.se/media/22618/swedendemocrats˙eng.pdf

in West Germany were negatively impacted by migration whilst white-collar German workers had benefited from increased wages. However, the effects did not offset each other and the overall impact of immigration on wages was negative. Similar results were found by Ruhs and Vargas-Silva (2020) in the UK, with low-waged workers more likely to lose out and medium and high-paid workers more likely to gain.

2 Descriptive Data

We constructed a panel data set[4] from 2008 to 2018 on 290 Swedish municipalities through Statistics Sweden[5]. However, the marginal income data for individual ethnic groups starts from 2011 rather than 2008. Our main covariates include average years of education and population density.

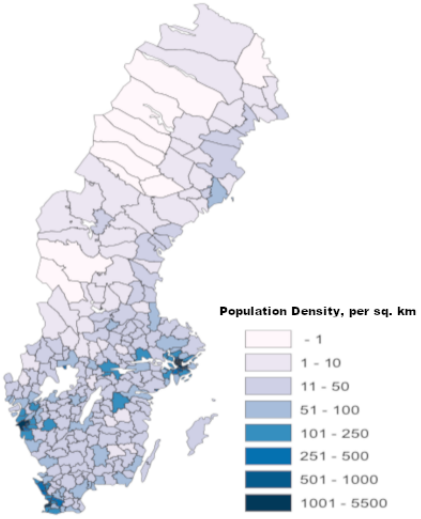

Figure 1: Population density of Swedish municipalities (per km^2)[6]

Immigration density is calculated by the share of foreign-born population in the municipality. From the above table it is evident that immigration density has been increasing steadily in Sweden since 2008, with a noticeable surge in 2014 and 2015 (an increase of 5.6 percent and 7.6 percent). This period of increased immigration corresponds to the period of Syrian refugee crisis, hence the increase can be attributed to Sweden's intake

[4]available upon request
[5]https://www.scb.se/en/
[6]2017. Image from Wikimedia Commons, Moralist / CC0. (Modified)

Table 1: Descriptive Statistics

	Mean Values		
	Average Income	Immigration Density	Population Density
2008	239701.9	.1024255	132.6497
	(21505.78)	(.0531566)	(451.3722)
2009	244201	.1059295	135.0141
	(22386.72)	(.0539617)	(464.3212)
2010	242049	.1090714	136.8514
	(23424.15)	(.0546902)	(473.5512)
2011	241247.2	.1119452	139.1772
	(24065.84)	(.055373)	(485.1847)
2012	246575.7	.1153815	141.0414
	(24651.37)	(.0559015)	(495.6904)
2013	252500.1	.1205177	143.4152
	(25283.86)	(.0567022)	(508.674)
2014	256334.7	.1269357	145.6669
	(26793.5)	(.0577307)	(519.4594)
2015	263839.7	.13405	148.2934
	(27830.26)	(.0588567)	(533.3965)
2016	270870.7	.1442842	151.0838
	(28271.28)	(.0601666)	(545.9557)
2017	274990.5	.1498849	153.7338
	(28711.08)	(.0612609)	(558.4769)
2018	275904	.1539196	156.1121
	(29234.71)	(.062707)	(568.313)

of immigrants. The variance of immigration density is also increasing over time, which most likely indicates that immigration is becoming more region-specific in Sweden.

A notable feature in Swedish population density is that the variation in density across the municipalities is very high. This is largely due to the fact that the majority of Sweden's land, especially the northern region is sparsely populated as it can be seen in Figure 1. Most of Sweden's population is aggregated in the southern, urban municipalities, creating the high variance in population density. Later we explore the potential heterogeneous effect from the urban-rural divide in Sweden.

Due to the 2008 recession, median income per capita is increasing overall due to the economic recovery. This time-specific trend is visible in the data and we use time fixed effects and first differences to tackle this issue.

3 Panel data analysis

We first run an Ordinary Least Squares (OLS) regression on our data.

The regression equation is:

$$\log\left(AverageIncome\right)_i = \alpha_i + \gamma \log\left(ImmDensity\right)_i + \delta \mathbf{X} + \epsilon_i \tag{1}$$

$\log(AverageIncome)$ is the logarithmised median income, $log(ImmDensity)$ is the logarithmised immigration density and X includes all the controls. It is important to note that due to the changes in immigration density being very large, we have logarithmised it in order to facilitate interpretation. For instance, if the immigrant density in the region increased from 25% to 27.5%, this would be a 10% increase rather than a 2.5 percentage point increase. We believe that smoothing out the function is more representative of shocks to the labour market. We control for years of education in the municipality since it could indicate a concentration of high-skilled labourers, which will affect the general wage level in the municipality. For example, a university town like Uppsala that has a higher education level affects both the immigration density due to international population as well as high average income due to high levels of education.

The above plot shows the cross-sectional estimate of immigration density on income over the time period available on our data. With reference to figure 2, we see that there is a general negative trend, indicating that the effect becomes stronger over the years. When the data is pooled, the effect of immigration density on average income is positive

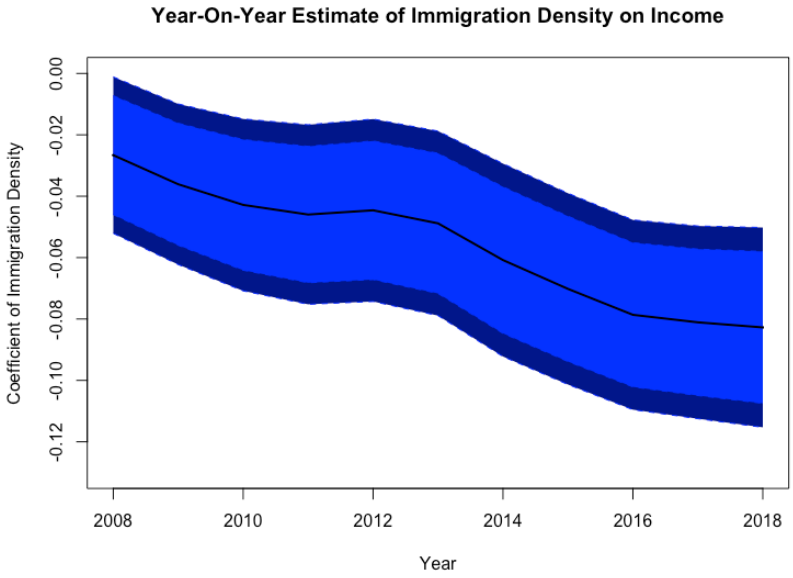

Figure 2: Coefficient against year

and insignificant. However, this estimate evidently ignores endogeneity problems that are present in the data such as the serial correlation in states and variation across time. Thus, the pooled OLS model does not reflect the causal relationship between immigration density and income.

We then use the fixed effects panel data model. Our main specification is as follows:

$$\log\left(AverageIncome\right)_{it} = \alpha_t + \beta_i + \gamma \log\left(ImmDensity\right)_{it} + \delta_1 \log\left(PopDensity\right)_{it} + \delta_2 YearsOfEducation_{it} + \epsilon_{it} \tag{2}$$

Fixed effects remove the state-specific income level present in the regression. This would be the case where a municipality has inherent differences that is uncaptured by our specification. These involve municipalities' geographical location and infrastructure, which are important in Sweden because of its polarized population distribution. As it can be seen in Figure 1, southern municipalities are much more populated and offer better infrastructure compared to sparsely population northern municipalities.

The results of the first panel data regression show a statistically significant positive effect, with a 1% increase in immigration density increasing average income by 10.4% (Table 2). This is likely due to the economic recovery post 2008 financial crisis. We introduce the

year fixed effects in the following regression and the coefficient on $log(ImmDensity)_{it}$ changes to negative 4%, which is highly significant. If this is a causal estimate, it is likely to be aligned to the hypothesis that migrant labour is a substitute for local labour. These results mean that observables included in the year fixed effects, such as a positive financial shock recovery, are correlated to both income and immigration density in the first panel data regression.

To control for heterogeneous effects of financial shocks over time in each state, we included the state-specific time trends, presented in the third column. These are largely accounting for time trends within each municipality, which may occur when financial recovery is faster in one state than the other due to having a different economic structure. The coefficient on $log(ImmDensity)_{it}$ is still negative and significant, with a 1% increase in immigration density leading to a decrease of 3.735% in average income. We used clustered standard errors to robustify our results. Though the standard error nearly doubles, the coefficient of negative 3.7% remains highly significant.

However, average income level alone does not prove the detailed labour mechanism that drives the relationship with immigration density. Hence, we present marginal incomes of each ethnic groups to evaluate those most affected by the negative shocks.

From table 3, it can be seen that in fact, Swedish income is positively affected by the increase in immigration density. Contrastingly, we see that immigrant income plummets, providing evidence for our alternative hypothesis that native workers and migrant workers are complements, not substitutes. Nordic immigrant's income only decreases by a small amount compared to other immigrants' income, showing that the negative shock to income is perhaps a function of how assimilated workers are to the Swedish population. Intuitively, discrimination in the labour market should be lower for immigrants who come from countries which are culturally similar to Sweden. Notably, Nordic citizens have a permanent residency in Sweden, allowing complete freedom of labour across these countries, giving little room for income discrimination.

More importantly, the negative effect is pronounced for the income of Asian immigrants, where one percent increase in immigrant density leads to a drop in income by more than 150%. It is evident that the negative 4% drop in overall income that we saw above is largely due to the Asian population absorbing this effect. On the contrary, we see insignificant results for EU citizens. This is likely due to the great heterogeneity among EU migrants, ranging from immigrants with an educational and cultural background

Table 2: Panel Data Regressions

	Dependent Variable: log Average Income				
	(1)	(2)	(3)	(4)	(5)
	OLS	FE regression	FE regression	FE regression	FE regression
log(ImmDensity)	0.00251	0.10395***	-0.04087***	-0.03735***	-0.03735***
	(0.00359)	(0.00384)	(0.00294)	(0.00436)	(0.00774)
log(PopDensity)	0.00953***	0.18526***	-0.02158***	0.01132	0.01132
	(0.00118)	(0.01492)	(0.00828)	(0.01129)	(0.01490)
YearsOfEducation	0.16827***	0.36397***	0.20481***	0.02033*	0.02033
	(0.00463)	(0.00861)	(0.00973)	(0.01222)	(0.02000)
Observations	3,190	3,190	3,190	3,190	3,190
R-squared	0.48972	0.85157	0.96150	0.98449	0.98449
State FE	NO	YES	YES	YES	YES
Year FE	NO	NO	YES	YES	YES
State-specific Time-Trend	NO	NO	NO	YES	YES
Cluster	NO	NO	NO	NO	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

similar to the Swedes to those from less developed countries who have lower education levels and are culturally further away. The overall impact is negative on average.

We then explore the urban rural heterogeneity in Sweden. As we have seen from Figure 1, Sweden is sparsely populated and the labour market may behave very differently according to the population density. To assess this potential heterogeneity of states, we created an indicator variable $PopDense$ to show the effect of being in an urban area. Then, we interact this term with the measure of immigration density $log(ImmDensity)_{it}$. Equation 2 shows this regression:

$$\log\left(AverageIncome\right)_{it} = \alpha_t + \beta_i + \gamma \log\left(ImmDensity\right)_{it} + \delta_1 \log\left(PopDensity\right)_{it} + \delta_2 YearsOfEducation_{it} + \delta_3 PopDense + \delta_4 PopDense \times \log\left(ImmDensity\right) + \epsilon_{it} \tag{3}$$

$\gamma+\delta_1+\delta_4$ shows the impact of immigrant density in cities and $\delta_1+\delta_4$ is the total additional impact from being in an urban area rather than a rural area. As seen from table 4, all columns show that immigration density has a negative impact on income in urban regions, presumably due to less skilled migrants going to cities where they will have better economic prospects in the low-skill service sector. EU citizens display a clear positive coefficient in rural areas and a negative coefficient in urban areas. It is plausible to think that this is indicative of a selection bias of EU citizens going to different municipalities in Sweden. Furthermore, the native Swedish population is affected negatively in urban areas, perhaps indicating the results from Zimmerman that low skilled local population are affected by the competition from immigration. The Asian immigrant population is affected significantly more when they are in an urban area (-130% as opposed to -380%). This is likely due to the labour market supply increase being larger in cities, though the more than double the amount of drop in income is notable. It is evident that immigrants are the ones mainly affected by the surplus labour with the effect being especially large in cities.

However, there are several issues with our identification. The main one is endogeneity. To be specific, our estimates are likely to be affected by reverse causality. Immigrants tend to go to economically prosperous regions to find work and hence the local income levels will be correlated regardless of the effect from migration. This would mean that our estimate also includes the effect of local wage levels as well as the effect of migrants on income. This would certainly create a bias for our estimates. Furthermore, whilst

Table 3: Marginal Income FE models

	Dependent Variable: log Average Income					
	(1)	(2)	(3)	(4)	(5)	(6)
	Native Swedish	All immigrants	Scandinavian	EU	Asian	Refugees
log(ImmDensity)	0.01247***	-0.55149***	-0.04901	-0.04821	-1.65779***	-1.52349*
	(0.00467)	(0.08352)	(0.03691)	(0.09991)	(0.24308)	(0.78159)
log(PopDensity)	0.02123**	0.22054	0.07425	0.30643*	0.33120	-0.24722
	(0.01045)	(0.22081)	(0.11669)	(0.16019)	(0.36199)	(1.27390)
YearsOfEducation	0.01401	0.14352	0.05231	-0.19738	-0.71734	2.81428
	(0.01275)	(0.10494)	(0.08082)	(0.18430)	(0.56031)	(2.31864)
Observations	2,320	2,320	2,320	2,320	2,320	2,153
R-squared	0.99472	0.85499	0.86746	0.82379	0.62623	0.25971
Number of code	290	290	290	290	290	290
state FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
State-specific Time-Trend	YES	YES	YES	YES	YES	YES
Cluster	YES	YES	YES	YES	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Marginal Impact in cities

	Dependent Variable: log Average Income					
	(1)	(2)	(3)	(4)	(5)	(6)
	Native Swedish	All immigrants	Scandinavian	EU	Asian	Refugees
log(ImmDensity)	-0.04145***	0.01586***	-0.48030***	-0.01603	0.13691***	-1.27913***
	(0.00330)	(0.00291)	(0.01872)	(0.01272)	(0.02827)	(0.07734)
log(PopDensity)	-0.04187***	-0.04227***	-0.10529	-0.05504	-0.32002**	-1.80002***
	(0.01582)	(0.01393)	(0.08968)	(0.06094)	(0.13547)	(0.37059)
PopDense× log $(ImmDensity)$	-0.01813***	-0.01967***	-0.03742	-0.02757	-0.12858**	-0.76862***
	(0.00680)	(0.00599)	(0.03855)	(0.02620)	(0.05824)	(0.15932)
YearsOfEducation	0.15394***	0.10060***	0.17219***	-0.00220	-0.01463	-0.40918
	(0.01076)	(0.00947)	(0.06098)	(0.04144)	(0.09212)	(0.25199)
Observations	2,320	2,320	2,320	2,320	2,320	2,320
R-squared	0.97097	0.98869	0.67457	0.72946	0.66325	0.29878
Number of code	290	290	290	290	290	290
State FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

the use of clustered standard errors gets rid of serial correlation, we are not exploiting the additional information available.

Our first robustness check is using clustered standard errors. Though the coefficients remained significant, we saw that clustered standard errors were much larger than the original standard errors (0.00436 compared to 0.00774). This suggests the presence of serial correlation. To take this into account, we provide the First Differences estimates below.

The first-differences specification shows a dramatic change in estimate sizes for the average income. This is likely to mean that the two-way fixed effects model is not efficient compared to our first differences model due to time series issues. If we apply the first-differences specification to the subgroups of immigrants, we see that for all types of immigrants the coefficients change.

In table 6, Coefficients reduce by a noticeable margin for the First Differences estimate, providing further evidence of the presence of serial correlation. Swedish citizens are still unaffected by the increased immigration. The coefficients are both negative for Nordic and EU citizens. However, they are insignificant and relatively small. Most notably, the Asian population that have just arrived (Asian having been in Sweden for one to two years), which comprised of mostly refugees, receive a large hit in their income, with additional immigrant population in the region.

Overall, from the panel data analysis we see consistent results that the native Swedish population were not affected by the increase in immigration density. Rather, this negative income shock was absorbed by immigrants, especially by the Asian population, who have little bargaining power nor the cultural assimilation required to compete on the same wage level. However, in urban areas where low-skilled workers are concentrated, all groups were negatively affected by the additional immigration.

Table 5: Robustness check

	Dependent variable: log Average Income	
	Twoways FE vs First Differences	
	(1)	(2)
log(ImmDensity)	-0.038***	0.018***
	(0.003)	(0.006)
YearsOfEducation	0.139***	0.155***
	(0.011)	(0.016)
log(PopDensity)	0.00003***	0.00004**
	(0.00001)	(0.00002)
Observations	2,320	2,030
R^2	0.210	0.051
Adjusted R^2	0.094	0.049
F Statistic	179.402***	36.013***

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Marginal FD

	Dependent variable: log Average Income					
	(1)	(2)	(3)	(4)	(5)	(6)
	Native Swedish	All immigrants	Scandinavian	EU	Asian	Refugees
log(ImmDensity)	0.01397^***	-0.38451***	-0.02487	-0.00230	-1.04057***	-1.09082**
	(0.00510)	(0.02700)	(0.01988)	(0.04391)	(0.11560)	(0.48329)
log(PopDensity)	0.00005***	0.00011	0.00005	0.00006	0.00001	0.00046
	(0.00002)	(0.00008)	(0.00006)	(0.00014)	(0.00036)	(0.00173)
YearsOfEducation	-0.09042***	-0.26628***	-0.09097*	-0.44450***	-1.47839***	-0.37186
	(0.01327)	(0.07027)	(0.05175)	(0.11430)	(0.30094)	(1.33492)
Observations	2,030	2,030	2,030	2,030	2,030	1,863
R^2	0.03305	0.09308	0.00219	0.00776	0.04243	0.00286
Adjusted R^2	0.03162	0.09174	0.00071	0.00629	0.04101	0.00125
F Statistic	23.08180***	69.31258***	1.48369	5.28367***	29.92614***	1.77573

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4 Difference in Differences

Sweden and Denmark both follow the Nordic model, which is characterised in Alestalo et al. (2009) as having three qualities; a strong state, a commitment to equality and universal social rights. This, along with the similarities in GDP per capita, has led us to assess Denmark as a possible counterfactual to Sweden. The European refugee crisis occurred in 2014, where a large number of refugees arrived in various EU countries. However, the refugee influx did not affect every EU country symmetrically. In particular, Denmark was noticeably less affected by the inflow of refugees during this period of time compared to Sweden. Sweden accepted the largest number of asylum seekers per capita in the EU whilst Denmark on the other hand was significantly less liberal in its refugee policy. We believe that this could be the exogenous variation in refugees necessary to assess the impact of immigration. In Hernes et al. (2019), three hypotheses for cross-country differences in labour market outcomes of refugees are posited: differences in refugee population characteristics, integration programme measures and refugee settlement patterns. Sweden adopted an integration policy that focused more on educated refugees, as opposed to Denmark's approach of focusing on less educated refugees. Secondly, with regards to settlement models, Denmark adopted a "steered" settlement model, limiting possibilities of refugees to self-settle, which allowed a more dispersed settlement of refugees compared to Sweden. Hence, we seek to exploit the exogenous variation of refugee policy between Sweden and Denmark to compare the changes over time of local income levels between these two countries.

To ensure that Denmark is a valid counterfactual in our model, we ran a panel regression on the Danish data similar to the one done in the earlier panel data analysis.

$$\begin{aligned}\log\left(AverageIncome\right)_{it} = \alpha_t + \beta_i \log\left(ImmDensity\right)_{it} + \delta_1 \log\left(PopDensity\right)_{it} \\ +\delta_2 YearsOfEducation_{it} + \mu_{it}\end{aligned} \tag{4}$$

We can see from table 7 that as opposed to the significant results obtained in our Swedish panel data regression, the results from the Danish panel data are not statistically significant. From this, we can infer that Denmark had different labour market outcomes from the influx of refugees. This implies that Denmark is a possible valid counterfactual for a Difference-in-Differences model.

We run a regression of logarithmised average income levels, $\log\left(AverageIncome\right)_{it}$, against the treatment, a dummy variable with value 1 if the municipality is in Swe-

Table 7: Denmark

Dependent variable: log Average Income	
	(1)
	FE regression
log(ImmDensity)	-0.04688
	(0.02843)
log(PopDensity)	0.18969
	(0.19421)
YearsOfEducation	0.01716
	(0.04688)
Observations	784
R-squared	0.98842
State FE	YES
Year FE	YES
State specific Time-Trend	YES
Cluster	YES
Robust standard errors in parentheses	

den, and the post, another dummy variable with 1 if the observation was in post-2014, an interaction term between treatment and post and finally, two controls: population density and education levels. As differences between municipalities act as the source of variation, we use clustered standard errors at the municipality level.

$$\log\left(AverageIncome\right)_{it} = \alpha_t + \beta_1 Sweden_i + \beta_2 Post2014_i + \beta_3 Post2014 \times Sweden_i + \delta_1 \log\left(PopDensity\right)_i + \delta_2 YearsOfEducation_i + \mu_{it} \tag{5}$$

As seen from Table 8, we find a negative effect on Sweden on the average income levels. The magnitude of the impact, at -1.3%, is in line with the estimate which we have obtained in prior models to obtain the impact of immigration on average income levels. It remains significant when clustered standard errors are used and with all other controls in place.

In order to ensure the credibility of our difference-in-difference model, an important assumption is that the trends are parallel. With reference to Figure 3, we see that this assumption is largely satisfied in our comparison of the income growth between Sweden and Denmark. However, if the policy responses also varied over time, where policy was changed in the years following the refugee crisis, this would be a violation of our assumption. Further, labour markets are prone to idiosyncratic economic shocks, which may differ greatly over time and across countries. Hence, this would also make our estimate inconsistent.

The most important limitation to our estimation is that due to the absence of available data, it was not possible to compare marginal income of different ethnic groups. This means that though we may see the negative impact of the differences in immigration policy, we do not know which groups are impacted the most. Hence, it is difficult to deduce any theoretical mechanism in the labour markets from these results.

Whilst we can see that Denmark and Sweden are valid counterfactuals to each other, we require more micro-level data in order to assess the importance of this result. Furthermore, simple DiD estimation may undermine the endogenous policy making of each country. In other words, there are numerous adhoc adaptations of policies to the labour market situations, which would violate parallel trends across the time period. Hence, it is difficult to justify that the estimates are causal.

Table 8: Differnece-in-Differences

Dependent variable: log Average Income	
	(1)
	DiD
Sweden	-0.12829***
	(0.02950)
Post2014	0.13991***
	(0.00608)
Post2014×$Sweden$	-0.01319**
	(0.00610)
log ($PopDensity$)	-0.04406**
	(0.02049)
YearsOfEducation	0.24351***
	(0.02816)
Constant	31.43959***
	(4.33219)
Observations	3,974
R-squared	0.97979
State FE	YES
Year FE	YES
State specific Time-Trend	YES
Cluster	YES
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

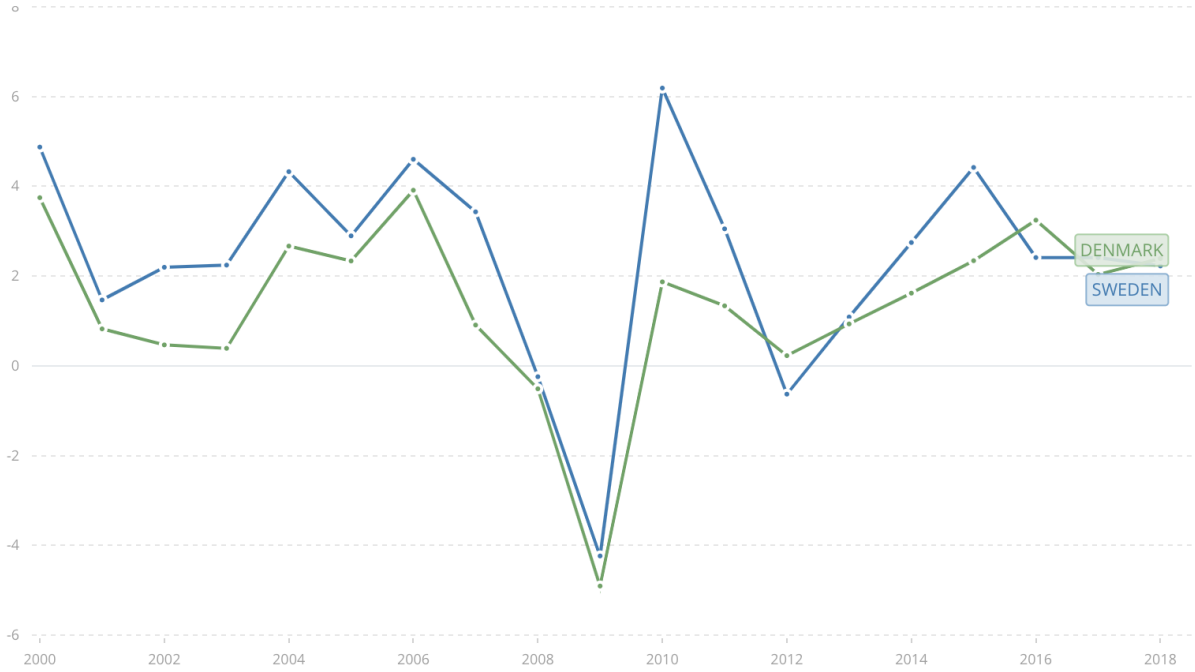

Figure 3: Plot of Economic growth against year, for Sweden and Denmark

5 IV-2SLS

The key limitation behind our DiD and First Differences estimates are that they are prone to reverse causality issues. Since Economic incentives primarily determine where migrants choose to settle, it is important to tackle this problem. Thus, we carry out an instrumental variable regression with 2011 municipal immigration density as an instrument. In a German paper concerning the moving patterns of immigrants (Tanis, 2018), it was found that immigrants are more likely to move to areas where there is already a significant co-ethnic immigrant presence. The purpose of this IV regression is to utilize the change in immigration patterns induced by this and capture any associated changes to average income in the municipality.

Our specifications are:

$$\log\left(ImmDensity\right)_{it} = \alpha_t + \gamma \log\left(InitialImmDen\right)_i + \delta_1 \log\left(PopDensity\right)_{it} + \delta_2 YearsOfEducation_{it} + \mu_{it} \tag{6}$$

$$\log\left(AverageIncome\right)_{it} = \alpha_t + \gamma \log\left(Immdensity\right)_{it} + \delta_1 \log\left(PopDensity\right)_{it} + \delta_2 YearsOfEducation_{it} + \epsilon_{it} \tag{7}$$

	(1)
	log Immigration Density
log(InitialImmDen)	0.928***
	(0.0121)
YearsOfEducation	-0.0732***
	(0.0145)
log (*PopDensity*)	-0.00473
	(0.00448)
Observations	2320

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Running the above first stage regression (Equation 6) shows that the coefficient is signifi-

cant at 0.93. The large correlation provides evidence for our hypothesis that immigrants move to municipalities with higher pre-existing levels of immigrants. It provides a strong first stage satisfying our relevance condition.

As seen from the IV-2SLS estimation below, the estimate is significant at negative 5%. However, it is crucial that we see the impact on differing geographical origin of the immigrant as well. For Nordics, there is a 3 to 4 percent decrease in average income when immigrant density increases by 1%. For other immigrants, the coefficient is insignificant at -0.3%. For Swedes, the coefficient value is significant at positive 0.8%. Most importantly, an increase of 1 percent in immigration density leads to 13% decrease in the income of recent settlers, who we identified as refugees. The overall impact of immigration density on municipal median income is negative, but the results suggest that the negative effect is captured by immigrants rather than by the Swedes. This is indicative of the theory that immigrants affect other immigrants' income rather than the natives' income.

In accordance with the Swedish law, immigrants able to arrange accommodation on their own are allowed to do so, whereas the rest are allocated quasi-randomly to municipalities across Sweden. The allocation of immigrants is based on the ability and to some degree the willingness of municipalities to accommodate them. This allocation process then raises three main concerns about the "as good as random" assignment of pre-existing levels of immigrants per municipality. Firstly, it is likely that richer immigrants, for example immigrants from Western countries, are more likely to arrange accommodation on their own as opposed to refugees and people from non-Western countries, which creates a selection bias in treatment status of the municipality. In order to address this, we control for education as well as providing the treatment effect on migrants of differing origins, which would address the heterogeneous group of immigrants.

Secondly, municipalities have some say in whether or not to accommodate refugees. Hence it is possible that there is a correlation between municipalities with higher economic growth and the change in immigration density. This is potentially true if larger right wing, anti-immigration voting behaviour developed over time and thus remain uncaptured by the initial levels of immigration density. This would create a bias in our estimates and we try to robustify our results by including year fixed effects in our regression to tackle the annual change independent of our internal instrument. Finally, a study on the movement patterns of immigrants in Sweden (Bevelander 2019), found that immigrants are more likely to settle in big cities like Malmo, Gothenburg and Stockholm, due to improved economic prospects. This could lead to inconsistent results if immi-

Table 9: IV-2SLS

	Dependent variable: log Average Income						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Overall Income	Native Swedish	All immigrants	Scandinavian	EU	Asian	Refugees
log(ImmDensity)	-0.01107***	0.04480***	0.06156***	-0.00489	0.06532***	0.02064	-0.13011**
	(0.00399)	(0.00372)	(0.00924)	(0.00783)	(0.01094)	(0.02336)	(0.05214)
log (*PopDensity*)	0.00000	0.00001***	-0.00001	0.00001	-0.00005***	0.00002	0.00027***
	(0.00000)	(0.00000)	(0.00001)	(0.00001)	(0.00001)	(0.00002)	(0.00004)
YearsOfEducation	0.18151***	0.17788***	0.26170***	0.22813***	0.32859***	0.56167***	0.08041
	(0.00431)	(0.00401)	(0.00996)	(0.00844)	(0.01179)	(0.02519)	(0.05663)
Observations	2,320	2,320	2,320	2,320	2,320	2,320	2,153
R-squared	0.59499	0.70250	0.33595	0.36246	0.38950	0.25931	0.05583
Year FE	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

grants display different "preference" for cities over time. In order to address this issue, the regression includes a control for municipal population density.

To satisfy the validity condition of our instrument, immigration density should affect average income only through immigration density induced by the initial immigration density. We address three possible alternative channels through which pre-existing immigration density can affect the average income. Firstly, it is possible that high levels of initial immigration density could indicate the municipal industry mixture, inducing a shift towards a larger low skill sector, negatively impacting the average income. However, it is difficult to think that past industrial composition independently impacts the future labour market outcomes since this cannot change in the period of 8 years. Secondly, unobservables underlying economic growth trends in municipalities might be correlated with initial levels of immigration density. This would be true if it is not accounted for by the controls and sequential exogeneity.

Finally, the increase in the supply of labour should be exogenously determined and the local labour force does not relocate due to the changed labour market circumstances (Borjas 1987). This is the stable unit treatment value assumption of our regression. That is, immigration does not adversely affect other municipalities. The plausible mechanism in which this may be the case is if the local population, who may be more mobile than the immigrants, relocate to another municipality where they can get the same wage level as their previous municipality. This would evidently bias our results on local income levels towards zero since this would essentially cause the wage level to fall into an equilibrium on the national level as opposed to the local level. However, there was no sign of large scale relocation of the native labour force relative to the size of the immigration. Furthermore, immigration rose in almost all municipalities during this time period hence it is unlikely that the effect of immigration is lost in the internal migration of the local population. Hence, we believe that the displacement effect is unlikely to be taking place in Sweden.

However according to Anderson-Hsiao (1982), the instrument of the first lag may result in weak instruments if it follows a random walk model. In other words, if the coefficient of the lag variable is close to 1, it is likely to cause inconsistency. Our model does not directly use the first lag as an instrument as it displays an average of the lags with 2011 as its base. However, 0.93 is close to violating this assumption. We would need to assume that this process is stationary for the IV-2SLS estimate to be a consistent estimator. It is likely to be satisfied since it is unlikely that immigrants do not discount past information over time when they are selecting future settlement locations. This

would guarantee that our process is not a random walk model and hence allow our estimate to be consistent.

$$\begin{aligned}\log\left(Immdensity\right)_{it} = \alpha_t + \beta_1 \log\left(initialimden\right)_i + \delta_1 \log\left(PopDensity\right)_{it} \\ +\delta_2 YearsOfEducation_{it} + \mu_{it}\end{aligned} \tag{8}$$

Assuming that our process of using an internal instrument is a stationary process (rather than a random walk model), there are a few issues in interpreting these estimates as causal estimates. Firstly, we are building upon the idea that immigrants are likely to settle where co-ethnic groups are located. Since we use the foreign share of population to measure immigration density, we cannot strongly establish causality in the first stage. We assume that the co-ethnic population movement is homogeneous throughout the country. This is a strong assumption to make and would require micro-level data to explore the impact of different immigrant groups. Secondly, since Tanis (2018) finds that the immigration behaviour is first determined most heavily by the economic incentives and their second relocation being more affected by the co-ethnic population, it is difficult to estimate the size of the lag present between the two processes. If the process of relocation from the initial settlement takes longer than 5 to 6 years, our "average" effect from the first stage is likely to have measurement error. Thirdly, our instrument only accounts for those that relocate themselves due to the co-ethnic preference. This perhaps limits our analysis to non-refugees since this was evidently not the case for the refugees that were received in Sweden, where refugees were allocated quasi-randomly according to the availability in each municipality. Due to this quasi-randomness of refugees, our first stage estimation may have a lot of "noise".

Whilst we recognise that the use of internal instruments could induce potential biases in our estimates, the theoretical issues have been addressed through appropriate controls and sufficiently explained in the context of Sweden. Furthermore, the results are largely consistent with our previous methodologies though differing in magnitude. Hence, we think that IV-2SLS estimates provide plausible evidence that migrant labour acts as a complement to native labour, whilst creating competition for pre-existing foreign labour.

6 Inequality and Political shift

We have so far explored how immigration density registers an overall negative impact on wages in Sweden and that the effect is largely concentrated on Asian, especially recently

arrived immigrants. In this section, we would like to explore the heterogeneity of this negative wage impact based on income groups.

In table 10, it is evident that there is a positive correlation between the Gini coefficient and immigration density. This means that as immigration rises, inequality increases. However, the outcome variable of the Gini coefficient does not display the overall picture of who is affected by the divergence of income.

Table 11 displays various income percentile ratios. We note that firstly, P50 (median income) denominated ratios are all negative and decrease as numerator percentile increases. Secondly, P20 denominated ratios are all highly significant and positive. This suggests that much of the increase in the Gini coefficient is the result of an increase in the number of people in the lower income percentiles, where immigrants are mostly situated, thus decreasing income ratio. In fact, the former results show that the upper/middle class gap in Sweden is unaffected, or even positively affected by the influx of immigrants. This mechanism would be consistent with the results from the previous sections if we assume that the native Swedish population in the middle class receive the positive complementary effect of immigrant labour on their income. However, we are limited in our analysis of inequality since the data set we use is aggregated at the municipal level. As such, we are unable to identify the exact interactive effect between ethnic groups and income groups.

To continue the societal analysis, we looked into the political aspect of immigration in Sweden. Sweden is a representative democracy and a constitutional monarchy, where seats in Parliament are assigned proportionally to the number of votes in the election, occurring every 4 years. We focus our analysis on the votes on Sweden Democrats, who are the furthest right leaning party in Sweden's Riksdag. The party became popular among those with anti-immigration sentiments and quickly rose to prominence, with support increasing from 5.7% in 2010 to roughly 24% in 2020 (the latter of which is an average of several opinion polls conducted in 2020).

Before 2010, Swedish politics had been characterized by "the left block": the Left Party, the Social Democrats and the Green Party, in contrast to the "the right block": the Center Party, the Liberal Party, the Moderates and the Christian Democrats. When the Sweden Democrats entered the Riksdag, it was to the dismay of all other parties. Due to the various issues surrounding the Sweden Democrats, in particular, the problematic origins, anti-immigrant rhetoric and multiple scandals of its party members, other political parties denounced and politically ostracized the Sweden Democrats.

Table 10: Inequality

	Dependent Variable: Gini coefficient				
	(1)	(2)	(3)	(4)	(5)
	OLS	FE regression	FE regression	FE regression	FE regression
log (*ImmDensity*)	0.03058***	0.05160***	0.02289***	0.00926	0.00926
	(0.00197)	(0.00299)	(0.00431)	(0.00945)	(0.01273)
log (*PopDensity*)	-0.00620***	0.04088***	0.02076	-0.02747	-0.02747*
	(0.00063)	(0.01273)	(0.01291)	(0.01782)	(0.01643)
YearsOfEducation	0.00244	0.08653***	-0.00633	-0.00436	-0.00436
	(0.00249)	(0.00815)	(0.01566)	(0.02461)	(0.02782)
Observations	2,030	2,030	2,030	2,030	2,030
R-squared	0.12252	0.53011	0.56258	0.71378	0.71378
State FE	NO	YES	YES	YES	YES
Year FE	NO	NO	YES	YES	YES
State-specific Time-Trend	NO	NO	NO	YES	YES
Cluster	NO	NO	NO	NO	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Inequality

	Dependent Variable: Marginal Inequality				
	(1)	(2)	(3)	(4)	(5)
	P80/P50	P90/P50	P95/P50	P80/P20	P50/P20
log (*ImmDensity*)	-0.04223	-0.10461**	-0.13382**	54.45424**	38.36791***
	(0.03187)	(0.04311)	(0.05933)	(24.91202)	(10.57695)
log (*PopDensity*)	-0.01357	0.00614	-0.07887	84.50105	12.51452
	(0.05373)	(0.05886)	(0.08107)	(52.45110)	(8.55628)
YearsOfEducation	-0.10829	-0.14615	-0.20969	136.71878	-26.73655
	(0.09545)	(0.14053)	(0.19375)	(150.21869)	(22.67291)
Observations	2,030	2,030	2,030	2,030	2,022
R-squared	0.71839	0.77274	0.79755	0.79510	0.80935
State FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
State-specific Time-Trend	YES	YES	YES	YES	YES
Cluster	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

However, restricting the Sweden Democrats' political influence proved difficult due to the parliamentary situation. For more than 50 years, elections tended to end with one block obtaining a majority seat in Parliament. However, during the 2010 and 2014 elections, due to the entry of the Sweden Democrats, neither block gained more than 50% of votes in Parliament, giving Sweden Democrats the balance of power in many votes. In the aftermath of the 2018 election, the rise of the Sweden Democrats led to the breakup of the historic Swedish "right" and "left" blocks and a center government was created, consisting of the Sweden Democrats and the Green Party, with support of the Left Party, The Center Party, and the Liberals. The center right parties supported the center left government, since they refused to be part of a right block government which would require active support of the Sweden Democrats. This clearly indicates that the traditional political parties failed to address the issue of immigration that rose up during this time.

Our analysis suggests that the economic impact of immigration on income is minimal to the Swedes and we continue to investigate the causes underlying the impact at the societal level, assessing the change in Sweden Democrats' voting share per municipality as the immigration density in that region changes. Our analysis suggests that there is a strong correlation between Sweden Democrats' voting share and immigration density, with high immigration being more likely to vote for Sweden Democrats. This is consistent with other empirical data and with the fact that Southern municipalities with high levels of immigration tend towards higher Sweden Democrats' voting share. Since the election cycle is 4 years, we use constant values in each election cycle. We include a two-year lag in the regression, giving voters an appropriate time lag to form opinions around this issue. The regression specification is as follows:

$$\begin{aligned} \text{VoteSD}_{it} = \beta \log\left(ImmDensity\right)_i + \beta_1 \log\left(ImmDensity\right)_{it-1} \\ +\beta_2 \log\left(ImmDensity\right)_{it-2} + \delta X_{it} + \epsilon_{it} \end{aligned} \tag{9}$$

Although fixed effects estimates are more efficient when we assume no serial correlation, from our panel data analysis it is clear that our dataset has time series issues. Hence we think that the using the First Differences estimation would display a more representative behaviour. From the table below, we see insignificant results for the immigration density during the year of voting, but highly significant results from the first and second lag: A one percent increase in immigration density in the previous year raises the vote of Sweden democrats in that region by 2 to 3 percent. This shows that the exposure to

immigrants builds anti-immigration sentiment over time, where it "trickles down" to the voting behaviour.

As seen from our previous results, Swedish citizens on average do not receive a negative income shock. Thus, it would be difficult to say that this voting behaviour shift is motivated by an economic incentive. In other words, the phrase "immigrants are taking our jobs" is likely not the only motive behind the Sweden Democrats' recent success. This is reinforced by the fact that the inequality of the upper income levels has not deteriorated and hence the middle-class community is unlikely to be economically damaged. Rather, we would need to delve deeper into voting behavior to identify the causes shifting voters away and creating the anti-immigrant sentiment, which is an area that needs further analysis.

Table 12: Sweden Democrats votes

	Dependent variable: SD Votes	
	Two ways FE	First differences
	(1)	(2)
$\log(ImmDensity)$	5.366***	-2.386
	(0.531)	(1.969)
$\log(ImmDensity)t-1$	0.018	2.470***
	(0.252)	(0.360)
$\log(ImmDensity)t-2$	0.215	2.609***
	(0.194)	(0.358)
$\log(PopDensity)$	-5.519***	-9.461***
	(1.501)	(3.669)
YearsOfEducation	-9.570***	12.282**
	(1.769)	(5.228)
Observations	2,316	2,026
R^2	0.105	0.048
Adjusted R^2	-0.028	0.045
F Statistic	47.399***	20.256***

Standard errors in brackets
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

7 Conclusion

There is much social and economic debate on the impact of immigration. Here, we present evidence that suggests immigrants are not substitutes for local labour but for other immigrants. This implies that the often-used rhetoric, that immigrants are taking local jobs, seems implausible. This is in line with the results found from Altonji, Borjas and Card that saw no effect of foreign share of population on local labour income levels. Hence, our findings contribute to the external validity of the results found in America on the immigrant and the local population.

Our first differences estimates and the IV-2SLS estimates provide consistent results that the impact of immigration density on local income is positive whilst the impact on immigrants, especially for the Asian population who have just come to Sweden, is negative. This supports the theoretical framework of complementary nature of immigrant labour to the local labour market. The magnitude of this impact is difficult to estimate due to the relatively short panel timeline from 2011 to 2018. Collecting from the evidence shown above, the impact of a 1 percentage increase in the immigration density is likely to lead to about 1% increase in Swedish income levels. Whilst the impact on Nordic income and the EU income is not clear, impact on Asian population in Sweden is significantly negative for those who have only been in the country for 1 to 2 years, where the 2SLS estimate predicts a roughly 13% decrease in income.

Analyses based on the shares of foreigners in either a locality or an industry are also subject to the criticism that natives may react to an increased inflow of foreigners by locating elsewhere, thus dissipating the adverse effects of increased migration (Chiswick (1992, 1993)). This will bias the estimated effects of immigration toward zero. Filer (1992) and Card (1991) find conflicting results in the US of this effect. In Sweden, whilst we have no quantitative data on internal migration, qualitative data suggests that this is unlikely to be the case.

However, there is room for further research on who is receiving the changes in income levels. Due to the limitations of the municipal level of the data, we are unable to identify the exact composition of those affected by immigration. For instance, the skill bias in the potential effect, as seen from the results of Zimmerman, would provide further categorisation that would allow us to distinguish the different levels of immigration. Whilst we predict from the inequality data as well as urban/rural analysis that low

skilled service sector workers suffer from the inflow of less educated immigrants, we have no quantitative data to back this hypothesis. Such data would unveil the causal mechanism behind the rise in right wing votes correlated to the increase in immigration density.

Whilst there are various limitations to assuming causality from our results, they provide important implications on the impact of immigration on the labour market. From our findings, it is difficult to pin-point the root of the anti-immigration sentiment prevalent in Europe. However, perhaps the most important evaluation from our paper is that the direct economic impact of income levels are on average rather insignificant on the local population. This reveals that there may be more sophisticated mechanisms behind such political direction. Furthermore, the negative impact on income that is entirely absorbed by the immigrants, especially those who have only recently arrived in the country, shows that concentrating immigrant population into one area could impoverish them further due to the oversupply of labour into certain sectors of the economy.

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