South–South migration and the labor market: Evidence from South Africa[*]

Giovanni Facchini[†] Anna Maria Mayda[‡] Mariapia Mendola[§]

April 13, 2013

Abstract

Using census data for 1996, 2001 and 2007 we study the labor market effect of immigration to South Africa. The paper contributes to a small but growing literature on the impact of South-South migration by looking at one of the most attractive destinations for migrant workers in Sub–Saharan Africa. We exploit the variation – both at the district level and at the national one – in the share of foreign–born male workers across schooling and experience groups over time. At the district level, we estimate that increased immigration has a negative and significant effect on natives' employment rates – and that this effect is more negative for skilled and white South African native workers – but not on total income. These results are robust to using an instrumental variable estimation strategy. At the national level, we find that increased immigration has a negative and significant effect on natives' total income but not on employment rates. Our results are consistent with outflows of natives to other districts as a consequence of migration, as in Borjas (2006).

JEL classification numbers: F22, J61 *Keywords:* Immigration, Labor market effects, South Africa.

[†]The University of Nottingham, Universitá degli Studi di Milano, Centro Studi Luca d'Agliano, CEPR and CES–Ifo; email: facchini@ese.eur.nl.

[‡]Georgetown University, Centro Studi Luca d'Agliano, CEPR and IZA; email: amm223@georgetown.edu.

[§]Universitá degli Studi di Milano Bicocca and Centro Studi Luca d'Agliano; email: mariapia.mendola@unimib.it.

"...They come from all over, and they are of all sorts, the new African migrants. There are the professionals – the doctors and academics, highly educated and hoping that in this country their skills can at last earn them a living wage. There are the traders, buying up what the shopping malls have to offer, and traveling home twice a month with bulging suitcases... There are the hawkers and the hustlers, who travel south out of desperation... And then there are the criminals; the drug dealers, the pimps and fraudsters." (Phillips 2002)

1   Introduction

Recent evidence suggests that South–South migration is a sizeable phenomenon. For instance, Ratha and Shaw (2007) estimate that 74 million, or nearly half, of the migrants from developing countries live and work in other developing countries. In other words, South–South migration is almost as important as South-North migration. As a result, it is likely to have a substantial impact on the economies of these low and middle income destination countries. However, most likely due to data unavailability, there are almost no systematic studies of the impact of South–South migration (Hatton and Williamson 2005).[1] In this paper we contribute to this literature by analyzing the specific case of South Africa, which is an important destination of migrants in the developing world and, in particular, in Sub–Saharan Africa (Ratha and Shaw 2007). We first show that migration flows to South Africa are substantial and increasing, especially from neighboring African countries. Next, we analyze the impact of migrant flows on South Africans' labor market opportunities.

Following the demise of the Apartheid regime, important political changes have swept South Africa, leading to the 1994 election of a democratic government. At the same time, the country's position as a regional economic superpower has made it an attractive destination for migrant workers from the surrounding areas in search of new employment opportunities. Until 2002, migration to South Africa was disciplined by the "Aliens Control Act" of 1991, a piece of legislation which was rooted in the "control and expulsion" mentality of the Apartheid era, inspired by a fundamentally racist and anti–semitic perspective (Peberdy and Crush 1998). After 2002, with the introduction of the new Immigration Act (Act 13), and its subsequent amendment in 2004, the policy stance changed substantially. Today the South African government sees the inflow of foreign workers (and especially of skilled ones) as a tool for economic growth. This is a significant break from the control–oriented framework of the past.

Still, xenophobic episodes against immigrants are common place (McDonald 2000 and Friebel,

---

[1]One interesting exception is represented by Gindling's (2009) study of the effect of Nicaraguan migration to Costa Rica in the early years of this century. For more details see section 2.

Gallego, and Mendola 2013) suggesting that natives often perceive immigrants as a threat. While several studies have provided a qualitative assessment of recent migration to South Africa, remarkably little systematic evidence exists on the labor market effect of foreign immigration to the country. The purpose of this paper is to shed light on this question and provide what is – to the best of our knowledge – the first systematic study of the labor market effect of immigration to this country.

In carrying out our analysis, we use three large datasets provided by Statistics South Africa covering 1996, 2001 and 2007.[2] We start by documenting the patterns of immigration. First, we find that the number of foreigners has increased substantially over the period we are considering. In 1996, about 2 percent of the population (or 4.6 percent of the male labor force) was made up by migrants, and that share had grown to almost 3 percent of the population (or 6.1 percent of the male labor force) in 2007. Second, and contrary to beliefs widely held in the country (Crush and Williams 2010), foreign male workers in South Africa are relatively highly educated. In particular, as of 2007, they are approximately two times more likely than native workers to have attained a college degree. The importance of foreign workers is even higher when we look at individuals at the very top of our skill classification, i.e. individuals who are not only highly educated, but also have a long labor market experience. Third, we find that other African countries are becoming an increasingly important source of immigrants to South Africa (note that we are able to observe this information only for the first two years of our sample). Thus, the overall picture that emerges is one in which South Africa has been able to turn itself into an attractive destination for highly skilled workers coming predominantly from the surrounding regions.

We next turn to the analysis of natives' labor market outcomes. We first follow the "spatial–correlation approach", i.e. we exploit the variation in the distribution of immigrants of different skills across geographic sub-units within the country and over the three years of our sample. Our rich dataset allows us to identify 56 districts. We follow Borjas (2003) to define a skill level as being characterized by both educational achievement and labor market experience, and allow for 32 possible alternatives. We use an empirical specification that accounts for fixed effects along the three main dimensions of the analysis (skill, district and time) as well as pairwise interaction terms of these fixed effects. In these district-level regressions we find that immigration has, on average, a large and negative impact on natives' employment rates. In our benchmark specification, a ten percentage points increase in the share of migrants of a skill group in a given district leads to a 7.2 percentage points decrease in natives' employment rate. For example, the average percentage

---

[2]While South Africa has high quality data compared to most other developing countries, its history limits the period over which our analysis can be carried out in a consistent way over time. In particular, the end of the Apartheid regime has determined a shift in fundamental characteristics of the South African economy. This shift prevents us from pooling data from before and after the end of the regime. At the same time, it provides exogenous variation which we exploit in the IV strategy, as explained in detail below.

point increase – between 1996 and 2007 – in migration rates of university–educated migrants with 31–35 years of labor market experience, which is equal to approximately four percentage points, implies a 2.9 percentage points (or 4.8 percent) decline in natives' employment rates. We investigate the robustness of this result to considering different types of workers and estimate a negative and significant coefficient for both employees and self-employed. Finally, in the district-level regressions, we do not find a significant effect of immigration on our monetary compensation measure, i.e. natives' total income.

One important caveat in interpreting the latter findings, though, is that the fixed effects estimates may suffer from endogeneity and, in particular, reverse causality. First, it is widely recognized that immigrants are not distributed randomly but instead tend to cluster in specific (e.g. economically stronger) locations. This reverse causality creates a bias towards zero in both employment–rates and total–income regressions. Alternatively, it might be that endogeneity arises because migration is itself caused by employed natives' outflows – due to better-paid labor market opportunities in other districts or abroad. In that case foreign workers would be hired to fill up vacancies left open by natives in the South African labor market. In other words, under the latter scenario, the estimated negative correlation in the employment–rates regressions would not be driven by the causal effect of immigration. Establishing the direction of causality has important policy implications. If, for instance, migration to South Africa were indeed caused by outflows of native workers to other districts or abroad, then the negative correlation of natives' employment rates with immigration to South Africa should not be of concern to policymakers. Our paper does not find results consistent with the latter scenario.

Thus, to uncover the causal effects, we implement an instrumental variable strategy. In particular, we follow Card (2001) and create a shift-share instrument which uses data on the distribution of immigrants across districts, by country of origin, during the Apartheid period (this data is from the 1991 South African Census). Our results suggest that this instrument is valid, i.e. the first stage is strong. In addition, the exclusion restriction is likely to be satisfied given that (both native and foreign) workers' movements during the Apartheid regime were highly regulated by the government. In particular, (black) migrant workers were not free to choose, according to economic incentives, where to locate within South Africa. Thus the pattern of migration in the Apartheid period is unlikely to be correlated with post-Apartheid economic conditions. The IV estimates are broadly comparable with our fixed-effect ones. Thus, reverse causality and endogeneity do not appear to drive our findings.

There are several possible channels through which immigration may exert its causal negative impact on natives' employment rates at the district level. First, the impact of immigration on natives' employment rates may be direct, i.e. the arrival and hiring of immigrants may lead natives to lose their jobs. Alternatively, immigration may affect natives' employment rates indirectly. For

3

example, immigration may have an impact on natives' formal labor–market participation (i.e., immigration may lead South African workers to move to the informal labor market which would amount, given the definition of employment rates, to a decline in natives' (formal) employment rates). Another indirect channel is through the impact of immigration on natives' location within the country (i.e., immigration may induce natives' outflows to other districts which would amount to a decline in natives' employment rates in the district considered). Fourth, immigration could encourage native workers to leave South Africa and relocate abroad (i.e., immigration may give rise to emigration to other countries which would amount to a decline in natives' employment rates in South African districts). A priori all these mechanisms are consistent with our main findings.

Hence, we carry out a national-level analysis a là Borjas (2003) to investigate the channels through which natives' employment rates are affected. We find, on average, no impact of immigration on natives' total employment rates and a negative and significant effect on total income. We also find asymmetric results for immigration across different types of workers (i.e. employees vs. self-employed): The impact of immigration on natives' self–employment rates – which had already become insignificant in the district-level IV regressions – is positive and significant in the national-level regressions. These results suggest that the observed reduction in natives' employment rates at the district level is likely to be the result of natives' outflows from high-immigration to low-immigration districts (as in Borjas (2006)) and of the relocation of natives from the formal to the informal labor market. We confirm that South African natives move across districts as a consequence of migration by estimating district-level regressions with, as the dependent variable, the size of the native population (both with OLS and IV). At the same time, we do not find evidence that South Africans respond to immigrant inflows by leaving the country (Glitz 2012).

Immigration to South Africa is heterogeneous both in terms of the skill composition of the migrants and in terms of their ethnic background. To investigate whether important differences exist along the skill and race dimensions, we repeat our district-level analysis focusing, respectively, on four separate education groups and four separate ethnic backgrounds. Interestingly, we find that the negative average employment effect we have documented at the district level is higher for the medium and highly skilled, a result which is consistent with the higher propensity to relocate of skilled native workers[3] (or higher elasticity of substitution between native and immigrant skilled workers). We also find some evidence of an heterogeneous impact of migration across ethnic groups, and in particular between white and blacks. Our results suggest that whites have been more adversely affected by immigrant arrivals.[4]

The remainder of the paper is organized as follows. Section 2 provides an overview of the related literature, whereas section 3 discusses the South African migration history. Section 4 introduces

---

[3]See Wozniak (2010) and Malamud and Wozniak (2012).

[4]This difference might be due to the affirmative action measures introduced by the South African government to empower blacks in the aftermath of the demise of the Apartheid regime (Ross 2008).

the data, whereas sections from 5 to 8 contain our empirical analysis. Section 9 concludes the paper.

2 Related literature

Our paper is related to two strands of the literature. First, it is a contribution to the large body of work which studies the labor market effect of immigration. Second, it represents one of the first systematic studies of the impact of South-South migration.

Two approaches have been traditionally followed to understand the labor market effect of immigration. The first, which is known as the "spatial correlation" methodology, exploits the variation in the number of immigrants across different geographical areas in the destination country. Among the early contributions to this literature, Card (1990) studies the impact of the 1980 Mariel boatlift on the Miami labor market. Notwithstanding the large immigration shock – the inflow of Cuban immigrants led to an increase in the labor force in the Miami metropolitan area of approximately 7% – he finds very little effect in terms of natives' labor market outcomes. Studies following a similar strategy have been carried out on a variety of other destination countries. They include the analysis of the forced repatriation of "pieds noirs" from the North African colonies to France (Hunt 1992), the analysis of Russian immigration to Israel in the 1990's (Friedberg 2001) etc. Most of these analyses find only a limited impact of immigration on labor market outcomes[5], with one exception being the recent study by Glitz (2012) which uses the exogenous variation of migration induced by the dispersion policy for ethnic Germans introduced in Germany in 1996. In particular, Glitz (2012) finds a sizeable employment effect of immigration.

A second approach has been instead pioneered by Borjas (2003) and has focused on a national–level analysis. The first idea behind this methodology is that the findings of spatial correlation studies might be biased because immigrants do not distribute themselves randomly across geographical regions in the destination country: they tend to cluster in areas in which the economy is stronger and where the demand for their services is higher. This potential source of bias leads to underestimate both the true wage effect and the true employment-rate effect of immigration in spatial correlation studies.[6] In addition, the inflow of immigrants in a certain area of the country might lead to a reaction by natives, who could decide to relocate elsewhere, i.e. in areas where the labor-market pressure is lower. Borjas (2006) points out that, as a consequence of this additional shift of the labor supply curve, spatial correlation studies cannot estimate the slope of the labor demand curve. As a result, he argues that a more appropriate setup is to carry out the analysis on the national labor market. The latter methodology picks up average labor market

---

[5]See Friedberg and Hunt (1995) for an excellent review of this literature.

[6]This is why we will carry out an IV strategy. See section 6.

5

effects which are not impacted by the location decisions of migrants across geographical areas, nor by natives' outflows to other districts. Borjas (2003) exploits the variation in the distribution of migrants across 32 different skill levels, each characterized by a given educational attainment and extent of labor market experience. Differently from the studies based on the spatial correlation approach, he finds a substantial negative impact of immigration on the wages of native workers. Mishra (2007) uses this methodology to study the experience of Mexico, an important source of emigrants, and finds that the changes in the supply of workers – brought about by emigration – have the expected impact on the labor market outcomes of Mexicans who have not moved.[7] A more recent study by Ottaviano and Peri (2011) has called into question some of the results of the national level regressions arguing that, even within the same skill cell, migrants and native workers are not perfect substitutes. Under this assumption, the authors find a much smaller adverse effect of immigration on native workers' wages.

The two approaches we have discussed can be linked, as has been shown by Borjas (2006). He uses 1960–2000 US census data to analyze the impact of migration on both natives' labor market outcomes and internal mobility. Interestingly, he finds that inflows of foreign workers in a US sub-national geographic unit (state or metropolitan area) are associated with lower in-migration rates, higher out-migration rates, and a decline in the growth rate of the native workforce. Importantly he also finds that, due to the outflow of natives to other sub-national units, the estimated coefficients in wage regressions become larger in absolute value when moving from the local to the national level, while the opposite is true in employment regressions. The analysis we carry out in this paper is related to both strands of the literature and in particular to Borjas (2006). Our findings mirror his results for the United States and are reinforced by the implementation of an instrumental variable strategy.

This paper is also related to the small literature which studies South–South labor flows. To the best of our knowledge the only systematic analysis of this type is Gindling (2009), who has investigated the effects of Nicaraguan migration to Costa Rica.[8] His work is based on five consecutive rounds of the Costa Rican Household Survey – carried out between 2000 and 2004 – and takes advantage of a small increase in the share of Nicaraguan migrants in the Costa Rican labor force, from 6.71% in 2000 to 7.75% in 2004. The empirical strategy follows Brojas' (2003) national level approach, distinguishing among five education groups and eight labor market-experience levels. Gindling (2009) finds evidence of only limited effects of Nicaraguan immigration on earnings of both male and female Costa Rican natives.

As for the specific case of South Africa, several contributions have investigated the main features of migration to this country. Crush and Williams (2010) and Landau and Segatti (2009)

---

[7]Aydemir and Borjas (2007) use the same methodology to compare the experience of two destination countries, i.e. Canada and the United States, with that of an origin country, Mexico, and find consistent results.

[8]For a broad overview of South–South migration and remittance flows, see also Ratha and Shaw (2007).

provide a broad overview of the phenomenon, with some interesting insights on the evolution of the recent migration policy. McDonald (2000) is instead a collection of essays looking at the evolution of migration in the early post–Apartheid era, drawing on a series of original individual level surveys. Bhorat, Meyer, and Mlatsheni (2002) focuses, on the other hand, on the emigration of skilled workers from the Southern African region. To the best of our knowledge, to this date there has been no systematic study of the effect of labor migration on natives' labor market outcomes. The purpose of this paper is to fill this important gap.

3 Migration to South Africa

South Africa has been the destination of large cross border labor flows at least since the mid of the nineteenth century, when migrants from Lesotho, Malawi, Mozambique and Zimbabwe came to work in the sugar cane fields of Natal and the recently opened diamond mines in Kimberly (Crush 2000). Ever since, migration and the debate around migration have been a mainstay of the public policy arena in the country. Systematic, reliable data on the size of the immigrant population for the pre-Apartheid period are difficult to obtain, but we can distinguish four main channels through which workers have entered the country: as contract laborers, especially in the mining sector; as informal migrants, to work mainly in the construction, service and agricultural industries; as refugees, following the eruption of civil conflicts in neighboring states and, finally, as the result of a "white flight", brought about by the creation of new post–colonial governments in neighboring countries starting in the sixties.

Public policies towards immigrants and immigration have greatly varied over time. Contract migration in the mining sector has been introduced right after the discovery of the gold fields in the Witwaterstrand area in the 1880s, and has long been perceived as a critical input in the industry. Fierce competition among employers has prevailed up until the 1920s, when a central recruiting agency (the Mine Labour Organisation) became the only gate for migrants into the mining industry. Recruitment offices were established in the countries surrounding South Africa, and modern transportation networks were also introduced to ferry migrant workers to the mining regions. This type of inflows was mainly temporary, and agreements were reached with the neighboring nations to insure that workers would return home. As a result of these efforts, the number of contract workers employed in the sector rose quickly. By the 1920s, approximately 100 thousand foreign workers were employed in the South African gold mines (Crush 2000). By 1940, the figure had reached 170 thousand and, by 1960, 233 thousand. Immigrant contract employment peaked in 1970 at approximately 265 thousand workers. Similarly, informal immigrants employed in the construction, service and agricultural sectors have also been welcomed throughout this period.

In the last two decades of the Apartheid regime, growing racial tensions, coupled with a more

active role played by labor unions in the domestic labor market, led the South African government to perceive black migration as a source of political threat. As a result, starting from the early seventies, black immigration – both legal and illegal – decreased substantially, thanks both to a reduction in the demand for foreign workers by domestic businesses and also to the stricter border enforcement policies, which were put in place by the government (Crush 2000). At the same time, up until the end of Apartheid, white immigrants have been welcomed to the country, and policies have even been put in place to facilitate their arrival (for instance, free passage was offered to European immigrants during the sixties and seventies). Finally, the general stance towards refugees has been one of limited tolerance, especially in the case of the Mozambicans, who fled their country in large numbers following the civil conflict which saw South Africa as one of the main players.

In the post 1994 period, census data show that migration to South Africa has been characterized by a steady increase in the number of foreign residents in the country and by a change in the composition by source country. Interestingly, the flow of foreign workers has been remarkably less volatile than in other parts of the continent (Lucas 2006), even though in many cases it has remained temporary in nature. According to our data, over the period 1996-2007 the overall number of foreign born in South Africa has grown from approximately seven hundred thousand to one million two hundred thousand,[9] i.e. an increase of approximately 72 percent. As a result, in 1996 migrants represented 2.1 percent of the total population, whereas in 2007 they made up 2.94 percent of the total (see Figure 1). The importance of foreign workers is even greater. If we focus on males in the labor force (i.e. those who are either working or seeking work), the share of immigrants over the period grew from 4.6 percent in 1996 to 6.1 percent in 2007 (see Figure 2). Finally, note that these average figures hide substantial variation in the migration share across different locations within the country. For example, in 1996 in the Lejweleputsa district, the foreign born population represented about 20% of the total population, whereas in the case of Johannesburg it represented in the same year less than 9% (see figure 4).

Table 1 uses information on country of birth of migrants, which was collected in the 1996 and 2001 censuses (unfortunately the same information is not available for 2007), to produce a picture of the evolution of the sources of South African migrants. What is immediately apparent is the growing importance of Africa. Between 1996 and 2001 the share of foreigners originating in the continent increased by 3.1 percentage points, from 67.6 to 70.7 percent of the total. Particularly significant is the role played by Mozambique: by 2001, well over a quarter of the total stock of

---

[9]These figures suggest that the South African census, as is also true for the US census, includes information not only on "legal" migrants, but also on individuals who are in the country illegally. In fact, recent estimates by Crush and Williams (2010) suggest that, between 1990 and 2004, only approximately 110 thousand legal immigrants have arrived in South Africa, i.e. a much smaller figure than the one implied by our data, which suggests an increase by 500 thousand.

migrants to South Africa came from that country, the result of years of civil wars and persisting economic difficulties which the transition to democracy did not completely solve. The second most important country of origin is Zimbabwe and, over the five years included in our sample, the number of migrants originating from this country has increased by over twenty five percent. Restricting our sample to males in the labor force, the importance of Africa as the main source of migrants further increases. In fact, by 2001 almost four out of five migrant males in the labor force originated from other African countries.

The second element which emerges from Table 1 is the slight decline in the importance of Europe as a source. In 1996, individuals born in the European continent represented approximately 23 percent of the total migrants, whereas by 2001 that share had declined to 22.3 percent. Looking at the male labor force, the importance of European migrants declines even more, and by 2001 they represented only 15% of foreign male workers. Interestingly, there has been a significant decline in the relative importance of the UK as a source country.

This trend has resulted in important changes in the racial composition of the immigrant population relative to the native one. As shown in Table 2, in 1996 74.1 percent of the working age natives in the labor force were Blacks, 11.7 percent were Whites, 10.6 percent Coloured people, and only 2.9 percent Asians. Whites were substantially over-represented among immigrants, making up approximately 37 percent of the total. Blacks were clearly under-represented at 59.7 percent of the total, whereas the share of Asians and Coloured people were remarkably low, at only 1.9 and 0.7 percent respectively. In 2007, in the presence of an essentially stable racial composition of the native population, the share of whites in the immigrant population declined substantially, to approximately 26.4 percent of the total – a reduction of 10.6 percentage points – whereas the share of blacks increased to 68.2 percent – an increase of 8.6 percentage points. The share of Asians among migrants also saw a steep rise, more than doubling to 4.4 percent of the total, whereas the number of Coloured people continued to be very low at 1.1 percent of the total.

These changes in the origin-country and racial composition of migrants, as well as the outflow of skilled workers from South Africa, have been the subject of much concern both in the academic debate (see Bhorat, Meyer, and Mlatsheni 2002 and Waller 2006) and among the public. However, even if skill shortages have been important in some sectors of the economy (in particular in healthcare, see Bhargava and Docquier 2008), immigration and emigration have been overemphasized as potential causes. First, as discussed in Section 4 below, the skill level of immigrants to South Africa has increased over the period considered. Second, the brain drain problem in the case of South Africa is likely to have been overstated. In fact, as of 2000, only 7.5% of the tertiary educated South Africans were living outside their country of origin (Docquier and Marfouk 2006). This figure is very low by middle income country standards and it is just "average" in relation to

advanced economies.[10]

It is not clear how much of the evolution of South African migration by size, source country and racial composition is due to changes in migration policy. As has been argued by many observers, even in the aftermath of Apartheid's demise, the South African migration policy stance has continued to be rather restrictive (Peberdy 2001). In fact the 1991 Aliens Control Act, which has been nicknamed 'Apartheid's last act' (Landau and Segatti 2009), remained the cornerstone of South African immigration policy throughout the nineties. Drafted to simplify all the previous immigration laws enacted after 1937, the Aliens Control Act became increasingly controversial after the transition to the democratic regime, and was ultimately declared unconstitutional. Following this decision, a lengthy process was started to substantially reform the existing policy framework, which culminated in the Immigration Act of 2002 and in the subsequent Immigration Amendment Act of 2004. The two pieces of legislation are oriented towards favoring highly skilled immigration and investors. In particular, four different categories of work permit (quota, general, exceptional skills and intra-company transfers) have been introduced, together with business permits and a wide variety of other entry categories, which in general do not allow foreigners to work. The initial quota allocation, as presented in February 2003, allowed for approximately 740,000 yearly permits. Since then, there has been a dramatic revision of the system and, in 2011, only 35,000 work permits were allocated through the quota system, covering 53 occupations (skills) deemed 'scarce and critical'. An explicit goal of the Immigration Act of 2002 and its amendment of 2004 was also the uprooting of the widespread xenophobic feelings (see for instance Klotz 2000) even though, as some observers have pointed out, no specific tools to this end have been introduced in the legislation.

Besides this important reform, which had mainly a multilateral character, another important recent development in migration policy has been the result of the active role played by South Africa in the new South African Development Community protocol. Even though the agreement has been substantially watered down in comparison to the original proposal made by the SADC secretariat in 1995, it still contains important provisions calling for the facilitation of the trans–border movement of people among member countries. As a result, new bilateral agreements have been signed with Mozambique (2004) and Lesotho (2007), that are aimed at progressively lifting border controls with these countries.

---

[10]The corresponding figure for Italy in 2000 is 10%, for the Netherlands 9.6%, for Germany 5.2% etc.

4 Data

For our main analysis we use three surveys carried out by the Statistical Office of the Republic of South Africa,[11] which are available through the International IPUMS website.[12] The 1996 and 2001 data are a ten percent sample from the population census and cover approximately 3.6 and 3.7 million individuals, respectively. The 2007 data are instead taken from the South African Community Survey and cover approximately 2.2 percent of the population or 1.1 million individuals.[13] A wealth of information is collected in these data sets, including labor market outcomes and important individual-level characteristics. We restrict our analysis to men in the 16-65 age group, who participate in the civilian labor force (i.e., are either working or seeking work).[14] Furthermore, the large size of the samples allows us to fully exploit the spatial dimension of migration, taking advantage of the heterogeneity in the distribution of foreign workers across localities. In particular, we are able to use information at the district level (there are 56 districts in South Africa). An individual is defined to be an immigrant if he is foreign born.

As for measures of labor market outcomes, we have information on each individual's employment status (i.e., whether he is working or seeking work), type of employment (i.e., whether a person is self-employed or works for someone else)[15] and total income. The latter is defined as the total personal income in local currency (Rand) from all sources of income in the previous twelve months. In all the three samples, the data on income are recoded to the midpoints of the broad intervals given in the original data. The data suffer from the standard "top coding" problem, as the top interval is coded to its lowest possible value (e.g, code 360,001 for 360,001+). Unfortunately the data do not allow us to measure labor income (separately from other sources of income) nor wages (separately from the number of hours worked).

One of the individual-level characteristics we consider is educational attainment, which is measured according to the following four categories: less than primary (the individual has completed less than 5 years of primary education), less than secondary (the individual has received between 5 and 11 years of education), secondary completed plus some college (the individual has at least 12 years of education, but has not completed college) and college completed (the individual has at least completed 16 years of education).[16]

---

[11]For our IV estimation, we also use data from the 1991 Census. See section 6 for more details.

[12]See https://international.ipums.org/international/.

[13]The 1996 and 2001 census data undercount the total population by, respectively, 10.7 percent and 18 percent.

[14]One reason we exclude women from the sample is that there is more uncertainty for women on the time they enter and exit the labor market, thus our measure of labor-market experience would be very noisy.

[15]According to the classification adopted by Statistics South Africa, an "employee" is defined as a "person who works for someone else or a company for a wage or salary, or for commissions from sales or bonuses, or for payment in kind such as food, housing or training", whereas "self-employed" is a "person who has his or her own business or enterprise but does not employ other persons except for unpaid family workers".

[16]Notice that the definition of educational categories adopted in the South African census is slightly different from the one used in the U.S. Census. In particular, "secondary completed" and "some college" are combined into

Figure 3 reports histograms for the three years in our sample, where we compare native and immigrant men in the labor force. Several interesting patterns emerge. First, the share of individuals who have not completed a primary education has fallen for both groups: for natives, from 26.8 percent in 1996 to 15.4 percent in 2007, whereas for immigrants the decline has been from 31.7 percent in 1996 to 19.2 percent in 2007. Second, highly skilled workers are becoming more common both among foreign born and natives. Among natives, between 1996 and 2007 the share of males in the labor force with a college degree has increased from 2.8 percent to 5.3 percent. Among the foreign born, the increase has been even more substantial: from 6.5 percent to 11.1 percent. In other words, in 2007 more than one out of ten foreign born males in the labor force had a college education, compared to one out of twenty natives. Considering also the intermediate categories, the pattern that emerges from the data is one in which on average today's South African immigrants are at least as educated as their domestic counterparts, and their presence is particularly strong at the very top of the educational attainment scale.

As has been forcefully argued by Borjas (2003) and Borjas (2006), skills are acquired both before and after an individual enters the labor market and, as a result, workers who have the same level of education, but different levels of experience, are imperfect substitutes in production.[17] For this reason, to be able to assess the impact of foreign workers on natives' labor market opportunities, we need to take into account not only the formal schooling received by them, but also how long these workers have been active in the labor market.

To do this, we follow Borjas (2003) and define a skill group in terms of both schooling and labor market experience. The latter is identified as the number of years that have elapsed since the individual has completed school. We assume that the age of entry into the labor force is 16 for a worker in the "less than primary completed" category and 17 for a worker in the "less than secondary completed" category. We assume instead that the typical individual with a high school education or some college enters the labor force at 21, whereas the typical college graduate enters the labor force at 23.[18] Our measure is necessarily rough, though, as individuals might take for instance longer than the statutory number of years (we use four) to complete a college education or might decide not to immediately enter the labor market. Furthermore, this measure is particularly problematic for immigrants as it does not distinguish between experience which has been acquired working in the destination country and experience which has been acquired elsewhere.

To carry out our analysis, we assume that the maximum number of years of labor market experience is 40, and we follow the literature and create eight broad categories of labor market

one category and, as a result, we cannot distinguish the two.

[17]See also Ottaviano and Peri (2011) for an even finer distinction.

[18]This definition reflects the assumption that individuals enter the South African labor force at the legal working age of 15 years old and there is possibly a one year lag between the end of school and the entry into the labor force.

experience, based on five–year intervals.[19] Tables 2 and 3 report summary statistics on the distribution of natives and immigrants by skill category. What is immediately apparent is that in all the three years in our sample, immigrants are over–represented at the very top of the skill distribution. For instance, in 1996, an immigrant is more than four times as likely as a native to have a college degree and 36-40 years of labor market experience. In 2007, this likelihood has further increased to five times. Immigrants are only slightly more likely than natives to be at the bottom of the skill distribution, i.e. not to have completed a primary education and have very limited labor market experience. These results reinforce our initial findings that today's educated immigrants are an important component of South Africa's foreign workers population, and that immigrants play a particularly important role in the supply of very high skills.

Our rich dataset also allows us to capture the distribution of immigrants across different localities within South Africa. Figure 4 illustrates the dynamic of immigration in three districts which have been particularly affected by the phenomenon in the period we are considering: the City of Johannesburg metropolitan municipality in Gauteng, the district of Lejweleputsa in the Free State, and the district of Ehlanzeni in Mpumalanga.[20] The Johannesburg metropolitan area has seen the number of foreign born male workers almost treble between 1996 and 2007 from 50 thousand to 136 thousand and, as of 2007, immigrants made up 12.6% of the total. The immigration dynamic in the Lejweleputsa district has been instead more volatile, mirroring the fortunes and the demand for foreign workers of the dominant mining sector. In 1996 there were slightly more than 40 thousand male foreign born workers in the province, representing about 20% of the total. The number had decreased to approximately 12 thousand in 2001, whereas by 2007 it had edged back to approximately 22 thousand, or 14.6% of the total. Finally, the Ehlanzeni district, at the border with Mozambique's Limpopo province, has seen its immigrant population peak in 2001 at approximately 25 thousand (13% of the total), whereas by 2007 it had declined to 19 thousand or 10.5% of the total.

We will exploit this rich variation in the data to carry out our empirical analysis. Our main measure of immigration in local labor markets is given by p_{ijt}, i.e. the share of foreign born in the male labor force of a particular skill group i in district j at time t, which is defined as:

$$p_{ijt} = M_{ijt}/(M_{ijt} + N_{ijt})$$

where M_{ijt} is the number of male foreign born workers in skill group i in district j at time t and N_{ijt} represents the corresponding number of natives.

---

[19]Borjas (2006) has showed that using alternative intervals to define experience does not affect qualitatively the analysis.

[20]As administrative boundaries have changed over the sample period included in our study, we have put special care to insure that the geographic area included in each district is kept constant over time by using information collected for finer geographical partitions.

We can examine the general patterns in the data in Figure 5, which presents two scatter plots linking the inter-censual change in the immigrant share and the changes in native individuals' employment rate and (log) income. The first picture suggests that natives' employment rate in a given cell (defined as a skill profile in a given district) is negatively correlated with changes in the immigrant share in that cell (the coefficient of the fitted line is -0.65 and is statistically significant). The second picture, on the other hand, suggests the lack of a significant correlation between native income and the immigrant share (the coefficient of the fitted line is 0.12 and is not statistically significant). However, the figures also show that not all districts characterized by large inflows of immigrants saw a deterioration of natives' employment outcomes and, similarly, the income of native workers in several districts appears inversely related to the size of the inflow of foreign workers. This highlights the importance of controlling for additional observable and non–observable characteristics, and we will do so in the analysis carried out in the next section.

5   Empirical specification

In the first part of our empirical analysis, we assess the labor market effect of immigration in South Africa following the approach of "spatial–correlation" studies. In other words, we exploit the variation in the distribution of foreign workers – of different skill levels – across local labor markets within South Africa and over time. Following the literature (Borjas 2006), we estimate the following specification:

$$L_{ijt} = s_i + r_j + q_t + (s_i * r_j) + (s_i * q_t) + (q_t * r_j) + \beta_p p_{ijt} + \beta_x X_{ijt} + \varepsilon_{ijt} \qquad (1)$$

where the dependent variable L_{ijt} is a labor market outcome for male native workers in skill group i (32 education by experience groups), district j (56 districts), and Census year t (3 years); p_{ijt} is the main variable of interest. Controls include a vector of fixed effects s_i, indicating the skill level; a vector of fixed effects r_j indicating the district of residence, and a vector of fixed effects q_t indicating the time of the observation. These fixed effects control for differences in labor market outcomes across skill groups, local labor markets and over time. The interaction terms $s_i * q_t$ and $q_t * r_j$ control, respectively, for changes in the labor market outcomes of each skill group and of each district over the period we are considering in our sample, i.e. 1996-2007. The interaction $s_i * r_j$ indicates instead that we are identifying the coefficient of interest, β_p, from changes in natives' labor market outcomes and immigration rates that occur over time within a district/skill cell.

We carry out two sets of regressions, focusing on men in the working age group (16-65) in the labor force. The first examines the effect of immigration on native workers' employment rates; the

results are reported in Table 5. The second considers instead the effect of immigration on native workers' total income; the results are reported in Table 6. In all our specifications, standard errors are clustered at the skill-district level.

In Table 5 we consider three different measures of natives' employment rates: the total employment rate, the employment rate of employees (*Employees rate*) and the employment rate of the self-employed (*Self-employment rate*). They are all constructed as the ratio of native male workers employed in the relevant group (total, employees and self-employed) over the total number of male workers (natives and migrants) in the labor force. Thus natives' total employment rate is defined as the share of employed natives in the total male labor force. Natives' employees rate is defined as the share of native employees in the total male labor force. Finally, natives' self–employment rate is defined as the share of native self–employed in the total male labor force.

All specifications suggest that immigration has a negative impact on natives' total employment rate, as well as on the employment rate of native employees and self–employed. In column 1 we present the estimate of the impact of immigration on natives' total employment rate. The estimated coefficient β_p is -0.716, with a standard error of 0.048, i.e. statistically significant at the one percent level. In other words, an increase by 10 percentage points in the labor supply of a skill group, brought about by immigration in a given district, leads to a 7.2 percentage points decrease in natives' total employment rate. For example, the average percentage point increase – between 1996 and 2007 – in migration rates of university–educated migrants with 31–35 years of labor market experience, which is equal to approximately four percentage points, implies a 2.9 percentage points decline in natives' employment rates. In columns (2) and (3) we look instead at the employees rate and at the self-employment rate. We do so in order to explore whether the labor market impact of immigration is heterogenous across forms of employment that entail a different degree of formality. In particular, according to the survey definition of self-employment, we use the latter as a proxy for informal employment.[21] The results suggest that much of the adverse labor market impact of immigration is due to the negative effect on native employees.[22] In columns (4) through (6) we repeat the analysis carried out in columns (1) through (3) including the size of the total male labor force in each cell, in order to control for the scaling factor. The sign and significance level of our initial findings are unaffected, and the size of the coefficient of our key explanatory variable is also remarkably stable.

In Table 6 we turn to consider the effect of immigration on natives' income levels. It should

---

[21]While not all self-employed, especially in developed countries, are likely to be informal, existing evidence suggests that rates of tax and social security evasion among the self-employed in developing or middle-income countries are much higher than for employees (e.g. ILO (2002)).

[22]We also estimate the impact of the regressors on, respectively, the numerator and denominator of the dependent variable separately and find that the negative impact in regressions (1)-(3) is for the most part driven by a reduction in the numerator (results not shown). In other words, the significant results on natives' employment rates are not driven by changes in the scaling variable in the denominator.

be noted, though, that our data only provides information on individuals' *total* personal income from all sources. As a result, it is not possible for us to disentangle changes in labor earnings from changes in other sources of income and, within labor earnings, changes in wages from changes in the number of hours worked. We start by examining the impact on the total income earned by male workers in the labor force (column 1), whereas in columns 2-4 we consider different subgroups of employed natives, i.e. all those in employment (column 2), the employees (column 3), and the self–employed (column 4). As can be seen from columns 1 and 2, the effect of immigration on the total income of individuals in the labor force and on employed individuals is not significant. The same holds true when we only consider the employees in column 3 and the self employed in column 4. Summarizing, our fixed effect estimations highlight the existence of a negative relationship between immigration and natives' employment rates, which is more pronounced for native employees. At the same time, we do not find a significant effect of immigration on the total income of natives.

An immediate concern, though, is that the fixed effects estimates may suffer from endogeneity bias due, in particular to reverse causality. First, it is widely recognized that immigrants are not distributed randomly but instead tend to cluster in specific (e.g. economically stronger) locations. This reverse causality creates a bias towards zero in both employment–rates and total–income regressions. Alternatively, it might be that endogeneity arises because migration is itself caused by employed natives' outflows – due to better-paid labor market opportunities in other districts or abroad. In that case foreign workers would be hired to fill up vacancies left open by natives in the South African labor market. Thus, in order to assess the broader implications of our analysis, it is important to establish the direction of causality of the relationship we have uncovered, and to isolate the mechanisms at work in the South African labor market. We turn next to tackle these questions.

6   IV results at the local-level

So far our results have highlighted the existence of a negative correlation, at the district-skill-year level, between the share of immigrants in the male labor force and natives' employment rates. To establish whether this relationship is causal, we employ an instrumental–variable methodology based on Card (2001).

It is well known that immigrants tend to settle in geographic areas where earlier migrants from the same origin country have established themselves (Bartel 1989). Assume that the total number of immigrants in South Africa from a given origin country is independent from the labor–demand conditions prevailing in any particular district of the country. Then we can decompose the actual inflow of immigrants from a given source country to a given district into an exogenous supply

component – based on the total number of immigrants in South Africa from the given source country and the share of earlier immigrants from that country that live in that district[23]– and a residual component – that reflects short term fluctuations from the long term patterns. Card's shift-share instrument is based on the idea that the exogenous supply component represents the supply shifter that can be used as an instrumental variable.

More precisely, let M_{ot} be the number of immigrants from source country o that entered South Africa at time t. Furthermore, let λ_{oj} be the share of immigrants from country o who were observed living in district j in a previous period. Finally, let τ_{oit} be the fraction of immigrants from origin country o that in year t belong to skill group i. Our shift–share instrument is then defined as

$$SS_{ijt} = \sum_o M_{ot}\lambda_{oj}\tau_{oit} \tag{2}$$

To construct λ_{oj} we use information from the last population count conducted during the Apartheid period, i.e. the 1991 Census. This data set is available from Statistics South Africa.[24] Given the changes that have taken place in the administrative subdivision of the country after the end of the Apartheid regime, we have devoted considerable effort to insure that the definition of our geographic unit of reference is stable over time.

To understand the distribution of λ_{oj} it is important to remember that, during the Apartheid period, the Group Areas Act of 1950 zoned the country into "white only" areas and "black" areas, and led to the forced relocation of about 3.5 million individuals, mostly blacks, colored or asians, who happened to be living in the "wrong" part of the country (Ross 2008). At the time, this represented approximately 10 percent of the total population of the country, which often ended up carted off from city suburbs to the adjacent Bantustans that had been recently established. Subsequent pieces of legislation[25] also severely limited the ability of non–whites to relocate from the rural areas to the cities to look for employment, and these measures continued to be enforced until the very end of the Apartheid period. Thus, under the Apartheid regime, (black) migrant workers were not free to choose, according to economic incentives, where to locate within South Africa. This makes us confident that the distribution of migrants in South Africa's districts in 1991 is not correlated with the economic conditions prevailing in those districts in 1996 or 2001. The construction of both M_{ot} and τ_{oit} requires information on the country of origin of the immigrant, which in our data is only available for 1996 and 2001. This forced us to restrict our IV analysis to only these two years.

---

[23]See below for an argument for why this share is likely to be exogenous.

[24]See http://interactive.statssa.gov.za:8282/webview/.

[25]In particular the "Abolition of Passes and Consolidation of Documents Act" and the "Native Laws Amendment Act" of 1952. See also footnote 27 for more details.

We start by replicating, in Tables 7 and 8, the fixed effects estimates we have carried out in Tables 5 and 6, but using only two years of data, i.e. 1996 and 2001. We do so to have a benchmark for our IV estimates. Comparing the results reported in columns 1-6 of Tables 5 and 7, we can see that sign, significance levels and actual magnitudes of the estimated impact of immigration on native employment are hardly affected when we focus on only two years of data, rather than on the full sample. A similar pattern also emerges when we compare columns 1-4 of Tables 6 and 8: immigration does not seem to have a significant impact on natives' income when we restrict our sample to only two years.

We turn next to implement our IV strategy. Table 9 reports the results of our first-stage regression, which shows that our shift-share instrument is a strongly significant predictor of the distribution of immigrants in South Africa in 1996 and 2001. The F-statistics is 16.57 and suggests that our instrument is strong. Our results for the effect of immigration on natives' employment rates are reported in Table 10, whereas Table 11 contains our findings for income. The patterns that emerge broadly confirm what we have already identified in our fixed effect estimations. Larger inflows of immigrants tend to reduce natives' employment rates, whereas there is no statistically significant effect on income. Comparing the findings in Tables 7 and 10, the sign and magnitudes of the coefficients are similar, with the only exceptions being the results in columns (3) and (6) concerning the impact of immigration on the self–employment rate of natives, which in the IV regressions is no longer significant. The IV results for the impact of immigration on income in Table 11 continue to be not significant, as was true for our fixed effect estimates in Table 8.

The important message that emerges from our IV analysis is that the negative effect of immigration on natives' employment rates is causal, whereas there is no causal effect of immigration on income. Moreover, the average negative effect on natives' employment rates is driven by a reduction in the employment rate of employees, while self-employed natives are not significantly affected by immigration.

7   Estimates at the national-level

The analysis we have carried out so far does not yet allow us to identify the precise channel through which natives react to the arrival of immigrants. First, the impact of immigration on natives' employment rates may be direct, i.e. the arrival and hiring of immigrants may lead natives to lose their jobs. A second possible mechanism is represented by the indirect effect of immigration on native workers' employment rates through their displacement from the formal to the informal labor market. A third possibility is represented by the indirect effect of immigration through the relocation of natives from high-immigration districts to low-immigration ones. A last explanation would suggest instead that immigration could cause native workers to leave South

Africa, and relocate abroad. A priori all these mechanisms are compatible with our main findings.

In order to disentangle the several possible channels, we use the approach recently developed by Borjas (2006) to link the local and national labor market effects of immigration. Borjas (2006) builds a simple theoretical model to investigate whether the reaction of natives to the arrival of immigrants in a local labor market could help explain the contrasting results which have been obtained in the literature, namely that the wage effect of immigration is very small or nil in most spatial correlation studies, whereas in several national-level studies these effects have been found to be negative and significant. The main idea of the model is that, by depressing local wages, the arrival of immigrants in a particular labor market will induce an outflow of native workers to other labor markets, less affected by the phenomenon. Under the model's assumptions, this reaction will tend to dampen the negative impact of immigration on local native wages, while at the same time reducing native employment in the local labor market. Importantly, the structure of the model also allows us to establish a precise link between the size of the effect of immigration that should be observed at the local and at the national level. In particular, in the case of wages, the estimated effect of immigration at the local level should be smaller in absolute value than at the national level, the more so the larger are natives' outflows from the district affected by migration. The opposite is instead true when considering the effect of immigration on employment at the local vs. national level. The larger is the outflow of natives from a district as a result of the arrival of new immigrants, the smaller (in absolute value) will be the effect of immigration on natives' employment at the national level compared to the local one.

Building on Borjas' insights, we have repeated our fixed effect estimates focusing on the national labor market. Using three years, and retaining our definition of skill, we now have a total of 96 observations (3 x 32). The results on employment are reported in Table 12, whereas those on income appear in Table 13. Comparing the effect of migration on employment at the district level in Table 5 to those at the national level in Table 12, we see that the coefficient of interest is systematically smaller when we consider the national labor market than when we consider the local one. Furthermore, while at the local level the impact of immigration on employment is always significant, this is no longer the case at the national level, with the exception of the impact on the native self-employment rate which is significant but positive. Looking at the effect of migration on income, comparing Table 6 and Table 13 we observe the opposite pattern. While at the local level we did not uncover a significant impact of immigration on incomes, when the analysis is carried out at the national level we find a large negative effect. No significant effect, though, is found with respect to income levels of self-employed natives. In light of Borjas (2006) theoretical analysis, these findings suggest then that native workers have reacted to the arrival of immigrants in their district by relocating to the informal self-employment sector and to different geographic areas less affected by the phenomenon. We find evidence for the latter effect when we run both OLS and

IV district-level regressions with, as the dependent variable, the size of the native population.[26] At the same time, the insignificant findings at the national level suggest that natives' emigration abroad is not likely to be a channel through which the causal impact of immigration works at the district level.

8 Extensions

So far we have carried out our analysis looking at the average effect of immigration in the South African labor market. While this gives us important insights, as we have already discussed in section 4 immigrants to South Africa have a wide variety of backgrounds and differ along several dimensions from the native population. Two specific sources of heterogeneity deserve particular attention: skill and ethnicity. Migrants are considerably more likely than natives to be highly skilled – i.e. to have a university education and to have substantial labor market experience. At the same time, they are also slightly over-represented in the least skilled subgroups of the population, for example among those with less than primary school completed and little workplace experience.

In addition, ethnicity and race have played an important role in South African history and, in particular, in the functioning of the country's labor market, at least since the introduction in the early fifties of measures that formally limited the ability of non-white citizens to move freely across the country in search for employment.[27] The fall of Apartheid and the subsequent introduction of the affirmative action measures – contained in the Employment Equity policy promoted by the Mandela government – completely changed the opportunities of the different racial groups within the labor market. In addition, the racial composition in South Africa has been affected by immigration since immigrants and natives differ substantially from a racial point of view. In particular, as mentioned before, during the post–Apartheid period, the growing attractiveness of South Africa as a destination for South–South migrants has led to a substantial decline in the relative importance of whites among the foreign born. The goal of this section is to investigate how the effect of immigration varies when we focus on different segments of the labor market. We estimate OLS regressions since our previous analysis shows that the IV estimation gives the same qualitative results as the OLS one. Finally, the variation we exploit is at the district level, i.e. we do not estimate national-level regressions.

---

[26]These results are available from the authors upon request.

[27]The two most important measures are the cynically entitled "Abolition of Passes and Consolidation of Documents Act" of 1952 and the "Native Laws Amendment Act" of the same year. To enjoy the right of permanent residence in a city – the notorious Section 10 right – a man had to have been born in the town or had worked continuously for the same employer for the past ten years, or for different employers for the past fifteen years. Those who violated this measure could be "endorsed out" of the urban area to the reserves which had been designated for them by court order. See Ross (2008).

In Table 14, we use the same observations as in the pooled regressions presented in Table 5, but we partition the sample into four subsamples, corresponding to each of the four education levels. In column 1 we focus on natives with less than primary education completed, whereas in columns 2–4 we look at those who have completed, respectively, less than a secondary education, a secondary education plus some college or a university degree and above. The pattern that clearly emerges from the table is that the effect of immigration on the employment rate of native skilled workers is substantially larger than for unskilled workers. A ten percentage points increase in the share of migrants with less than a primary education in a given district leads to a 5.2 percentage points decrease in the employment rate of natives with that level of education. On the other hand, a ten percentage points increase in the share of migrants with a university degree or above leads to a 8.9 percentage points decline in the employment rate of natives with that level of education.[28] The estimates for individuals with, respectively, less than a primary education and individuals with a university degree or above are statistically different at the 95% level. These findings highlight the presence of important differences in the labor market adjustment process for different education groups. One possible explanation for this finding is that native skilled workers might be more mobile than unskilled ones across South Africa and are thus more likely to react to the inflow of foreign migrants by relocating to other districts less impacted by the phenomenon.[29]

In Table 15 we explore whether there is instead a heterogeneous effect of immigration on the total income of natives of different education levels. As for our benchmark results in Table 5, we do not find a significant impact of immigration on natives' total income levels, no matter what educational segment of the labor market we consider.

Finally, in our last two sets of specifications, reported in Tables 16 and 17, we investigate whether the impact of immigration varies when we focus on different racial groups, as classified in the South African Census, i.e. white, black, asian and colored.[30] The regressions in these two tables use different observations than the pooled regressions, as both the dependent and independent variables are now constructed using data for each racial group at a time. In Table 16 we look at the effect of immigration on natives' employment rates, whereas in Table 17 we focus on total income.

---

[28] As mentioned above, for a developing country like South Africa, incomplete coverage in the data set of the migration population, due to illegal migration, might be a concern. The estimates we obtain when we focus on skilled migration are thus especially important since they show that a negative and significant effect of migration takes place in a sample where illegal migration, and thus measurement error, should not be an issue – given that skilled migrants are unlikely to be illegal.

[29] An alternative explanation is that the data on unskilled migration is affected by more measurement error than the data on skilled migration, to the extent that we miss an important fraction of (unskilled) illegal migrants. If this was the case, then the regression corresponding to unskilled migration would be characterized by a greater attenuation bias than the regression corresponding to skilled migration.

[30] This ethnic classification, based on race, is inherited from the Apartheid era and has been retained by the South African Statistical Office for historical comparison purposes. Yet, we are aware that South Africa is a setting with a more complex social cleavage structure that goes beyond racial traits.

Our findings in Table 16 suggest that immigration has a larger impact on the employment rates of whites than on the employment rates of blacks and that the difference is quantitatively large and significant at the ten percent level. The effect of immigration on the employment rate of native asians and colored people is not dissimilar from the effect on whites. Finally, the results in Table 17 confirm once again that, at the district level, immigration does not have a significant effect on natives' incomes for any of the South African racial groups.

9   Conclusions

In this paper we carry out what is, to the best of our knowledge, the first systematic study of the labor market effect of immigration to South Africa in the post–Apartheid era. We start by documenting how immigration is becoming more and more important for the country and highlight that, as a share of the population, immigration has increased by about 50% over the period considered in our analysis. Next, we show that immigrants to South Africa are at least as educated as natives and that highly educated foreign individuals are especially important at the very top of the skill distribution.

We then turn to consider the labor market effect of immigration, looking at its impact on both natives' employment rates and incomes. Our district–level analysis suggests that, while the employment rates of natives have been adversely affected by the arrival of foreign workers, this is not true for wages. We take advantage of a quasi–experimental setting brought about by the fall of the Apartheid regime to construct an instrument for migration rates and show that what we are estimating is not a simple correlation but is rather capturing the causal effect of immigration. Given the unique history of South Africa, we also explore the effect of migration on different segments of the population, defined on the basis of both skill and race. Our findings suggest that skilled South Africans have been the most negatively impacted education subgroup and that white South Africans have been more adversely affected than their black counterparts.

We follow up on the district-level analysis with an investigation at the national level, just as in Borjas (2006). At the national level, we find that increased immigration has a negative and significant effect on natives' total income but not on their employment rates. These national results are the mirror image of the district-level ones and are consistent with outflows of natives across districts as a consequence of migration. In other words, we find evidence that the mechanism through which immigration plays out its effect on natives' employment rates, at the district level, is through a flow of natives from high-immigration to low-immigration districts. On the other hand, immigration does not appear to have been an important push factor on natives' decision to leave South Africa.

Thus, to conclude, we find evidence of an adverse causal impact of migration to South Africa

on natives' labor-market opportunities. This adverse impact manifests itself through a decrease in natives' employment rates, at the district level, and a decrease in natives' total income, at the national level. However, we also find that migration hurts the most those native workers who are supposedly the least vulnerable, namely white and skilled South African native workers.

References

Aydemir, A. and G. J. Borjas (2007). Cross-country variation in the impact of international migration: Canada, mexico, and the united states. *Journal of the European Economic Association 5*, 663–708.

Bartel, A. P. (1989). Where do the new u.s. immigrants live? *Journal of Labor Economics 7*, 371–391.

Bhargava, A. and F. Docquier (2008). Hiv prevalence and migration of healthcare staff in africa. *World Bank Economic Review 22*, 345–366.

Bhorat, H., J.-B. Meyer, and C. Mlatsheni (2002). Skilled labor migration from developing countries: Study on South and Southern Africa. International Migration Papers 52.

Borjas, G. J. (2003). The labor demand curve is downward sloping: Reexamining the impact of immigration on the labor market. *The Quarterly Journal of Economics 40*, 1335–1374.

Borjas, G. J. (2006). Native international migration and the labor market impact of immigration. *Journal of Human Resources 41*, 221–258.

Card, D. (1990). The impact of the Mariel boatlift on the Miami labor market. *Industrial and Labor Relations Review 43*, 245–257.

Card, D. (2001). Immigrant inflows, native outflows, and the local labor market impacts of higher immigration. *Journal of Labor Economics 19*, 22–64.

Crush, J. (2000). Migrations past: An historical overview of cross–border movement in Southern Africa. In D. McDonald (Ed.), *On borders: Perspectives on international migration in southern Africa*, pp. 12–24. New York: St. Martin's Press.

Crush, J. and V. Williams (2010). Labor mmigration trends and policies in southern africa. Policy Brief 23.

Docquier, F. and A. Marfouk (2006). International migration by educational attainment (1990-2000) - release 1.1. In C. Ozden and M. Schiff (Eds.), *International Migration, Remittances and Development*, pp. 151–199. New York: Palgrave Macmillan.

Friebel, G., J. Gallego, and M. Mendola (2013). Xenophobic attacks, migration intentions and networks: Evidence from the South of Africa. *Journal of Population Economics 26*, 555–591.

Friedberg, R. (2001). The impcat of mass migration on the Israeli labor market. *Quarterly Journal of Economics 114*, 1373–1408.

Friedberg, R. and J. Hunt (1995). The impact of immigrants on host country wages, employment and growth. *Journal of Economic Perspectives 9*, 23–44.

Gindling, T. (2009). South-south migration: The impact of nicaraguan immigrants on earnings, inequality and poverty in costa rica. *World Development 37*, 116–126.

Glitz, A. (2012). The labor market impact of immigration: A quasi–experiment exploiting immigrant location rules in germany. *Journal of Labor Economics 30*, 175–213.

Hatton, T. J. and J. Williamson (2005). What fundamentals drive world migration? In G. Borjas and J. Crisp (Eds.), *Poverty, International Migration and Asylulm*, pp. 15–38. Hampshire, United Kingdom: Palgrave–MacMillan.

Hunt, J. (1992). The impact of the 1962 repatriates from Algeria on the French labor market. *Industrial and Labor Relations Review 45*, 556–572.

ILO (2002). Women and men in the informal economy: a statistical picture. Geneva.

Klotz, A. (2000). migration after apartheid: deracializing South African foreign policy. *Thirld World Quarterly 21*, 831–847.

Landau, L. B. and A. W. K. Segatti (2009). Humand development impacts of migration: South Africa case study. Working Paper 2009/05.

Lucas, R. E. B. (2006). Migration and economic development in Africa: A review of evidence. *Journal of African Economies 15*, 337–395.

Malamud, O. and A. Wozniak (2012). The impact of college education on geographic mobility. *Journal of Human Resources 47*, 913–950.

McDonald, D. A. (2000). *On borders*. New York: St. Martin's Press.

Mishra, P. (2007). Emigration and wages in source countries: Evidence from mexico. *Journal of Development Economics 82*, 180–199.

Ottaviano, G. I. and G. Peri (2011). Rethinking the effects of immigration on wages. *Journal of the European Economic Association*. forthcoming.

Peberdy, S. (2001). Imagining immigration: Inclusive identities and exclusive policies in post-1994 South Africa. *Africa Today 48*, 15–32.

Peberdy, S. and J. Crush (1998). Rooted in racism: The origin of the Aliens Contriol Act. In J. Crush (Ed.), *Beyond control: Immigration and human rights in a democratic South Africa*, pp. 18–36. Cape Town: Idasa.

Phillips, B. (2002). Out of Lagos. In H. Holland and A. Roberts (Eds.), *From Jo'Burg to Jozi, Stories about Africa's Infamous City*, pp. 203–206. London: Penguin Books.

Ratha, D. and W. Shaw (2007). South–south migration and remittances. World Bank WP 102.

Ross, R. (2008). *A Concise History of South Africa* (Second ed.). Cambridge: Cambridge University Press.

Waller, L. (2006). Migration of skilled in south africa: patterns, trends and challenges. Migration Policy Brief 20.

Wozniak, A. (2010). Are college graduates more responsive to distant labor market opportunities? *Journal of Human Resources 45*, 944–970.

Figure 1: Stock of foreign born in the total population, 1996-2007
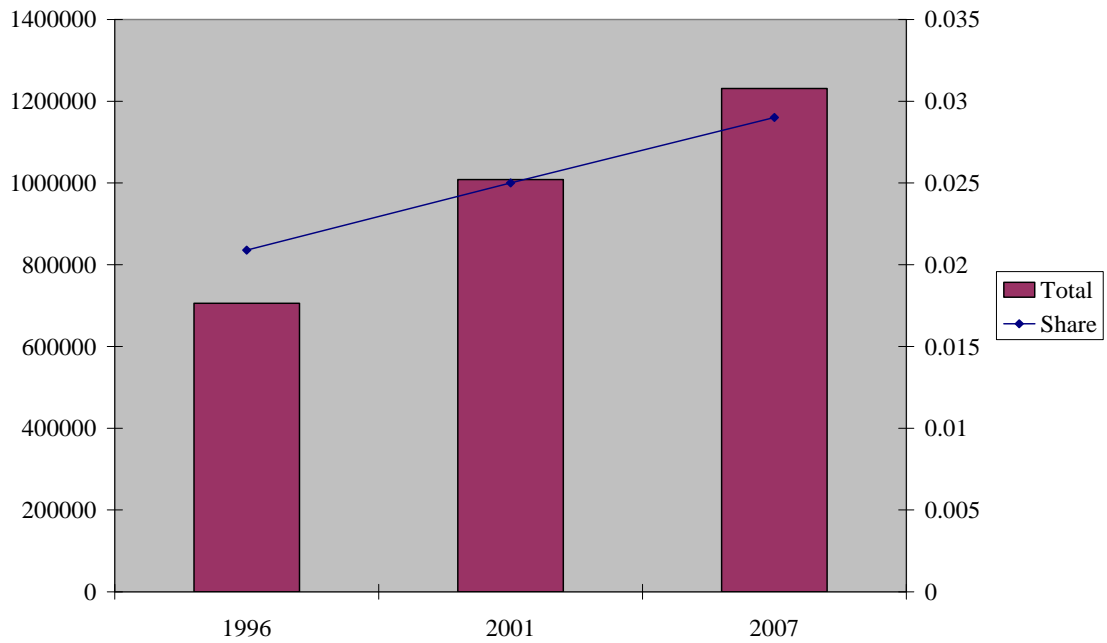
Figure 2: Stock of foreign born in the male labor force

Figure 3a: Educational Attainment of natives and foreign born, 1996
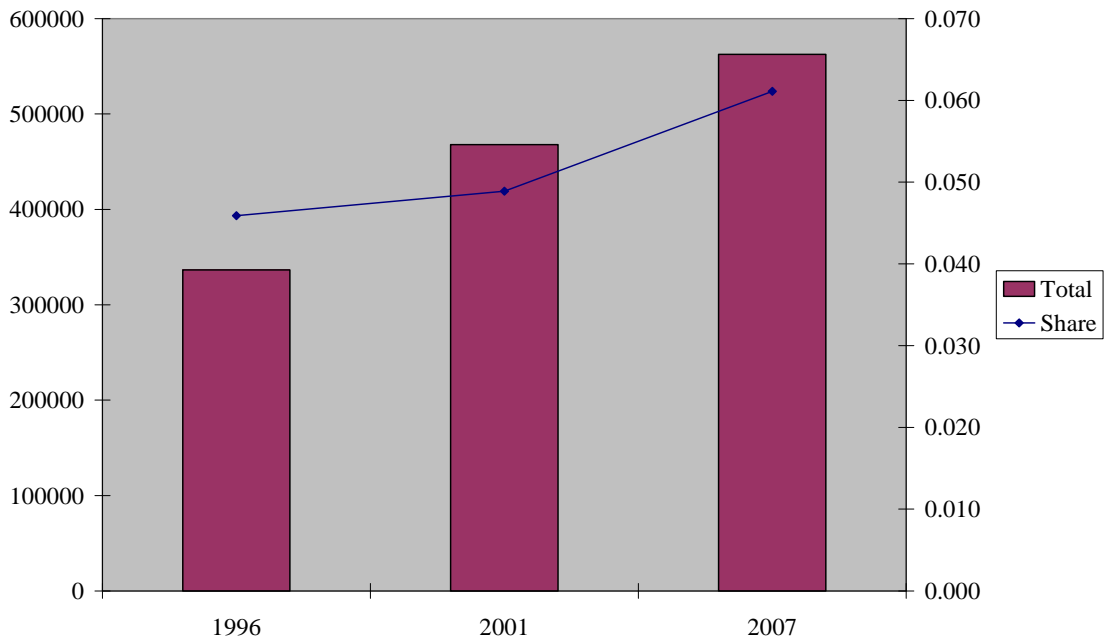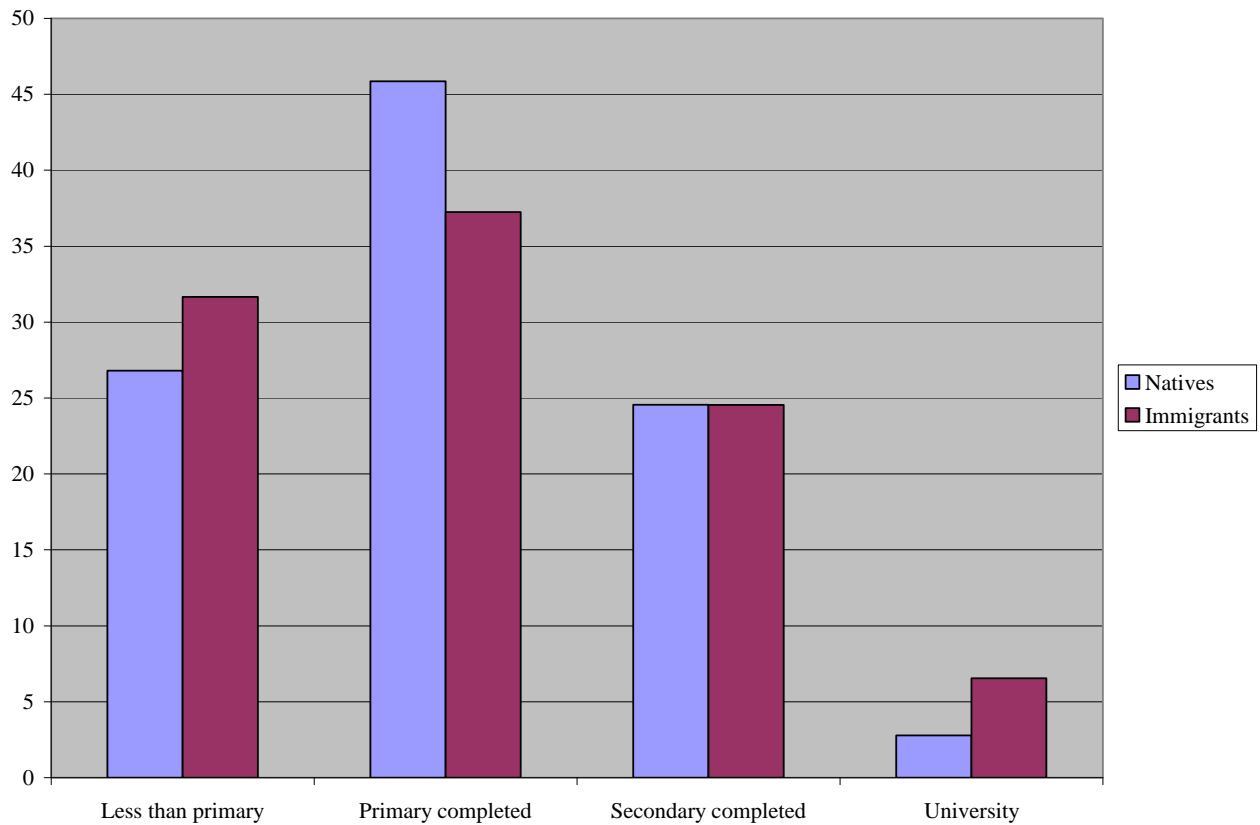

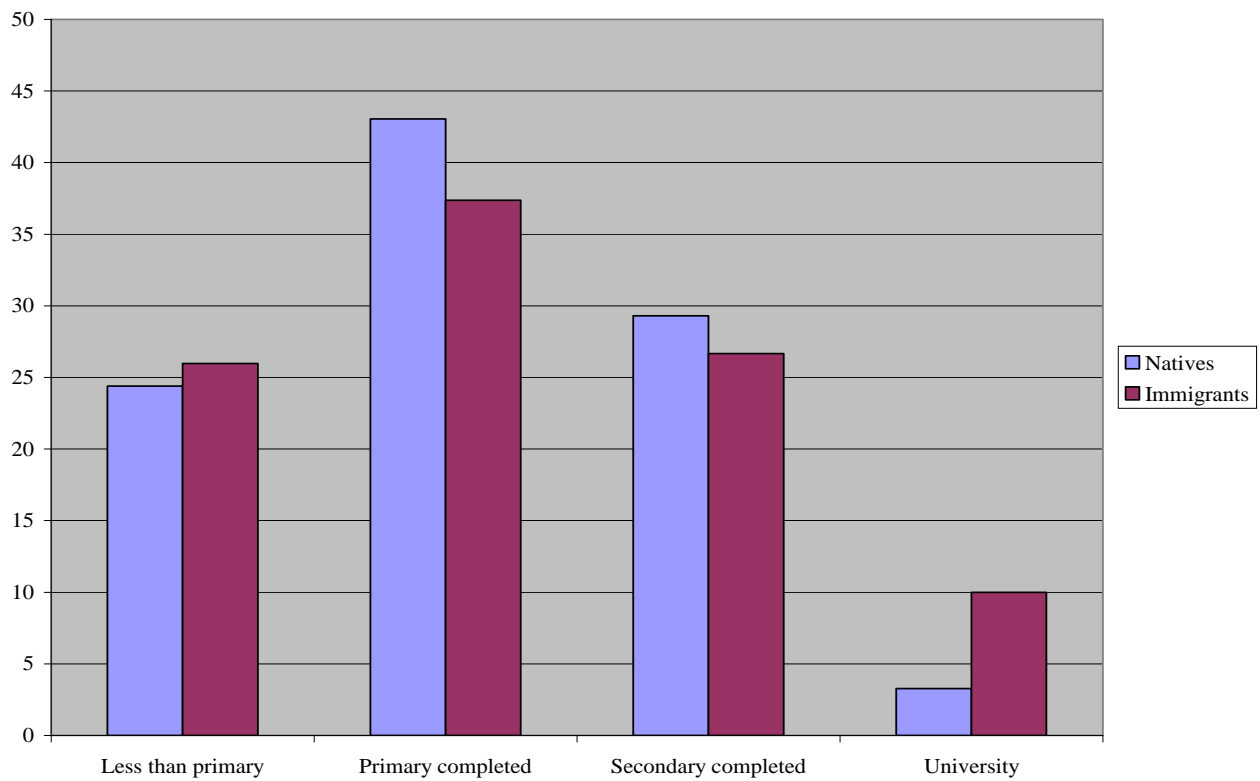# Figure 3b: Educational Attainment of natives and foreign born, 2001

Figure 3c: Educational Attainment of natives and foreign born, 2007
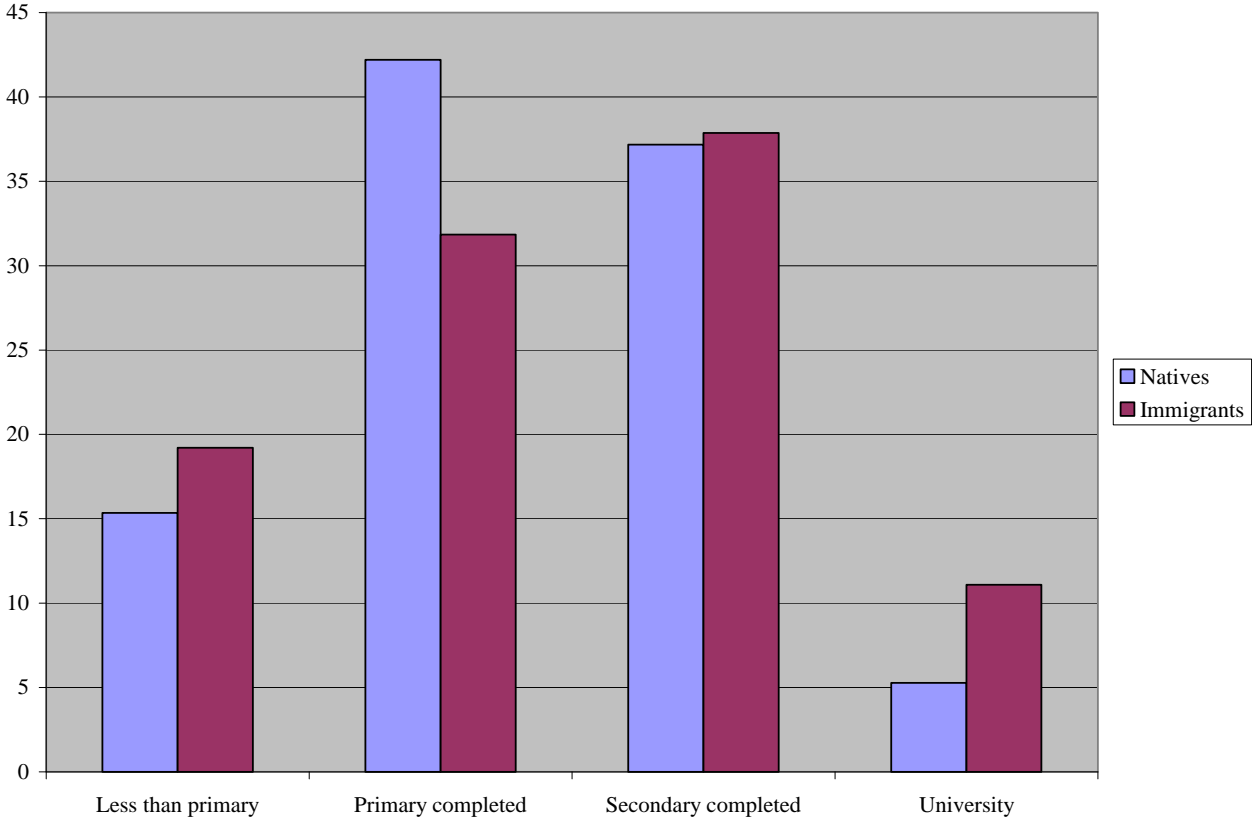
Figure 4: Main immigrant receiving districts

City of Johannesburg
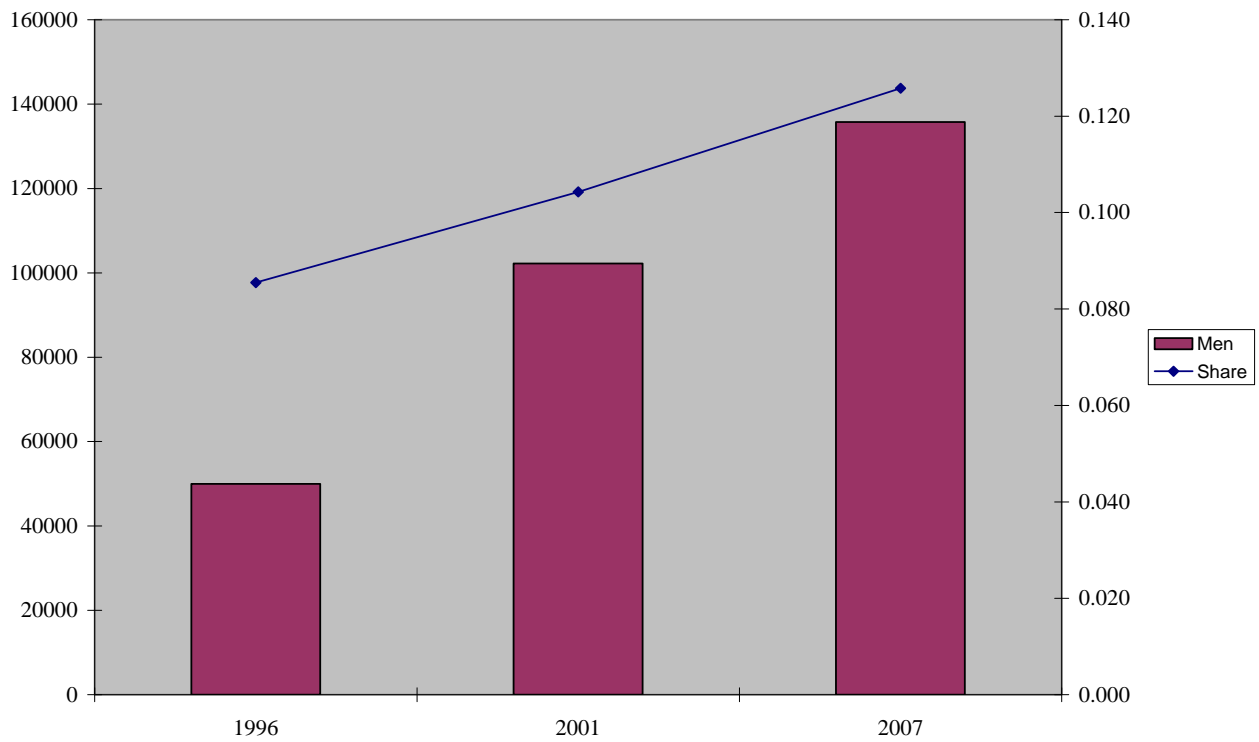
Lejweleputswa District
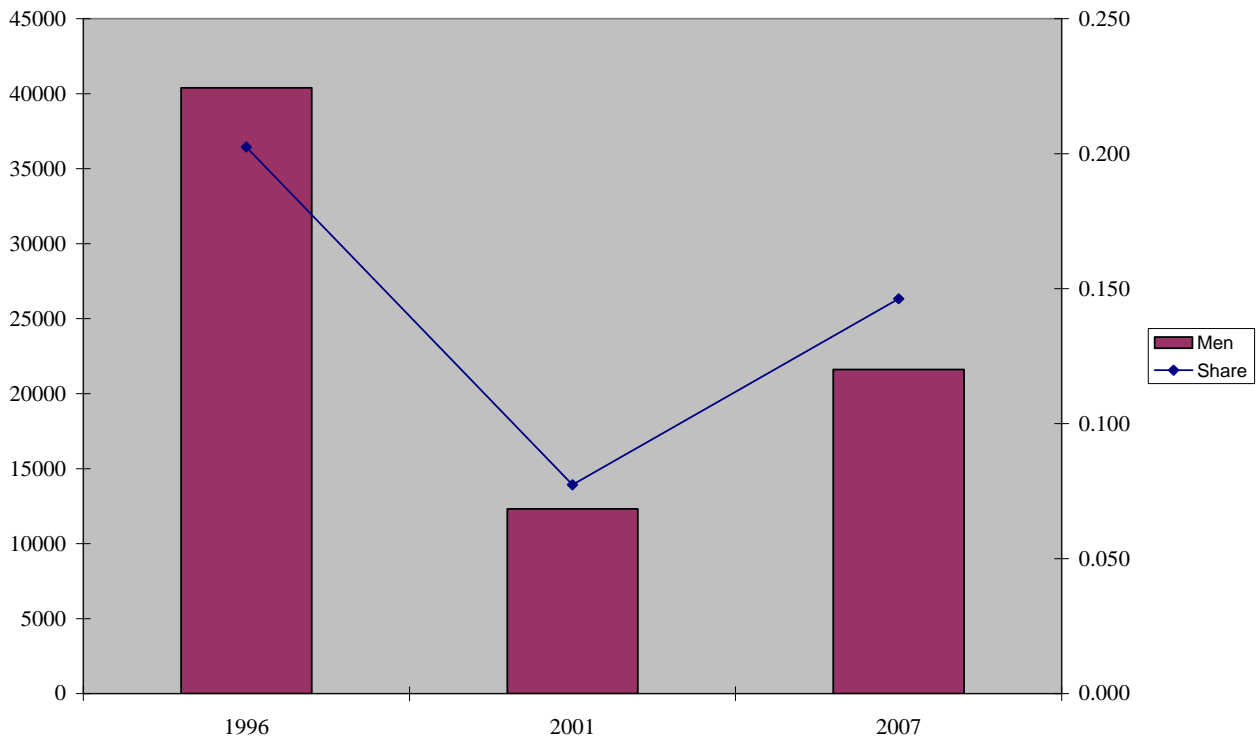
Ehlanzeni District
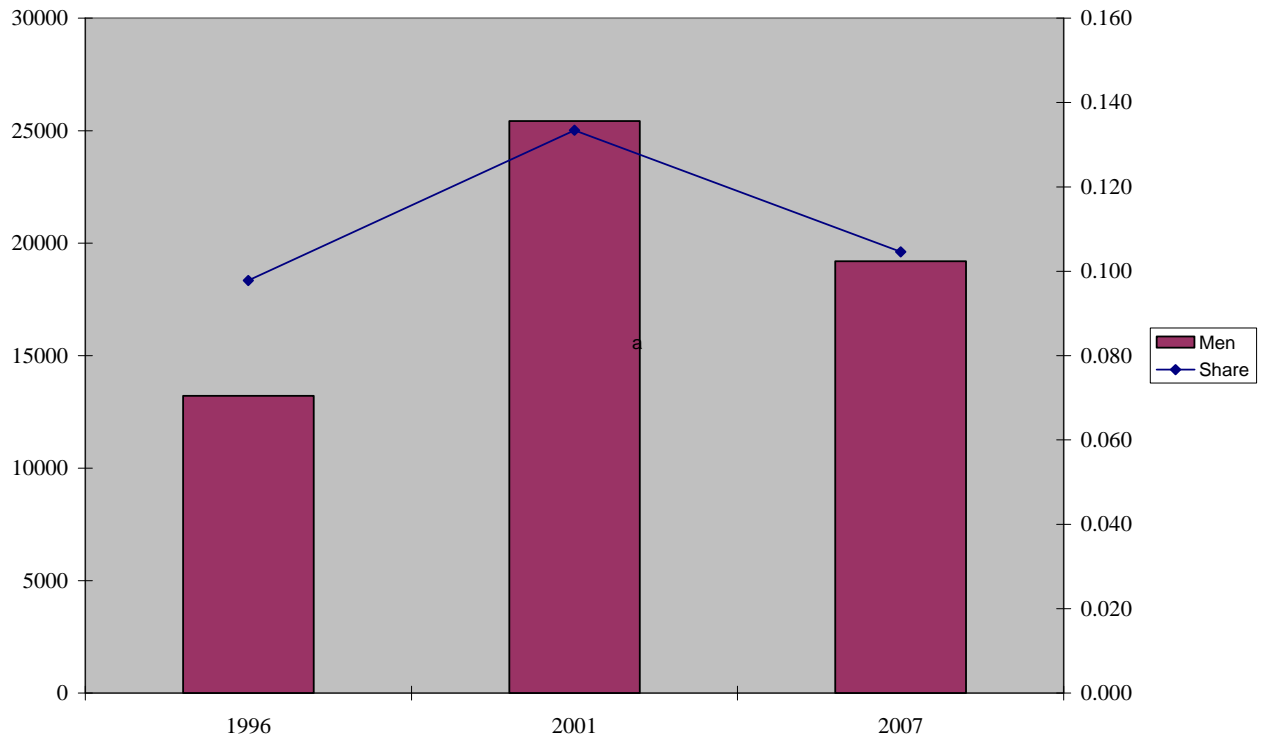
Figure 5: Scatter plots immigration and native's labor market outcomes
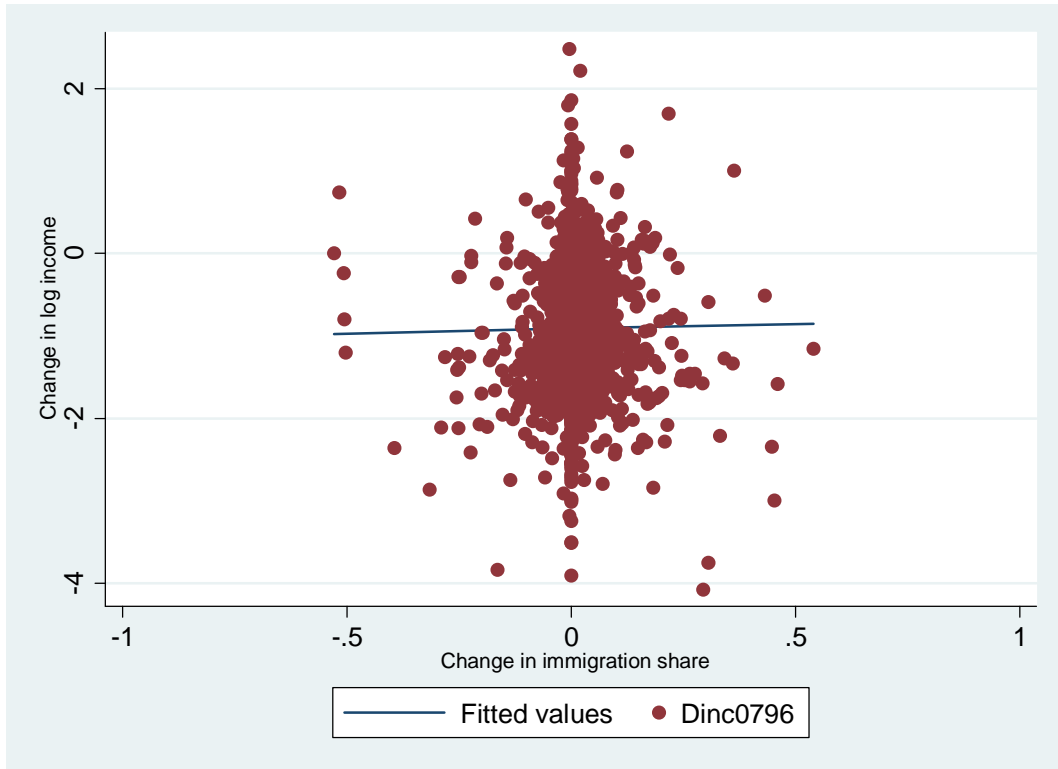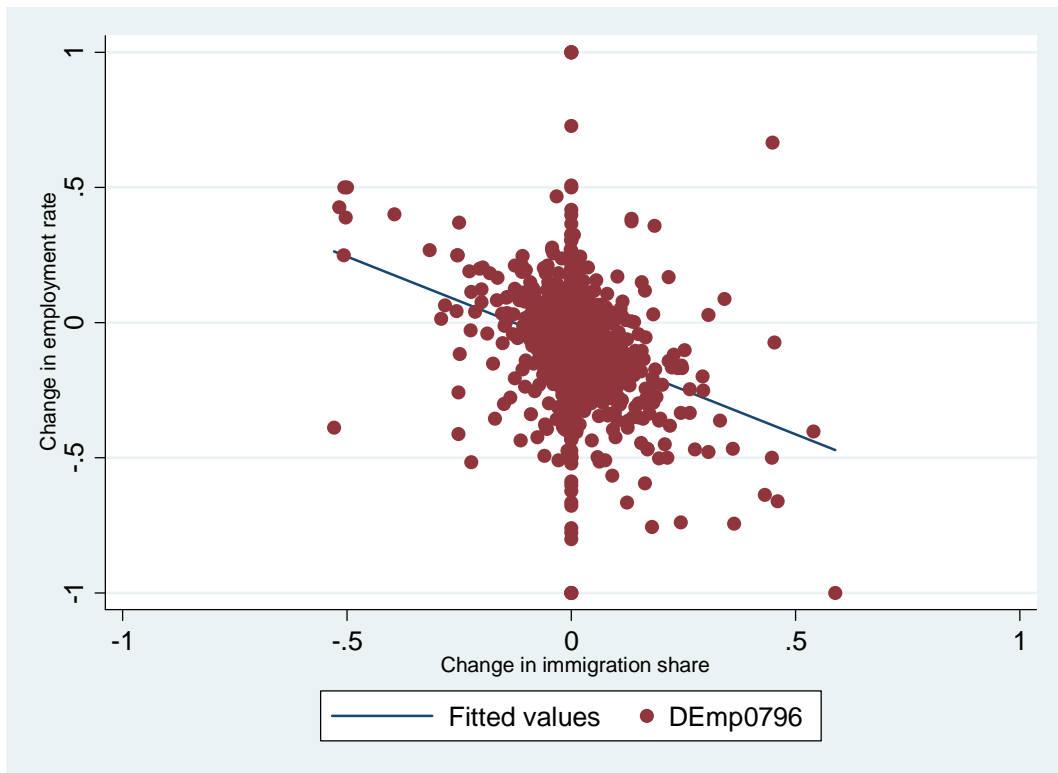
Table 1: Migrants by country of origin

	1996				2001			
	All migrants		Male 16-65 labor force pop.		All migrants		Male 16-65 labor force	
	stock	rates	stock	rates	stock	rates	stock	rates
AFRICA	**466935**	**0.676**	**259162**	**0.770**	**713298**	**0.707**	**372689**	**0.797**
Eastern Africa	290302	0.411	158558	0.471	466640	0.463	263634	0.564
Malawi	*10152*	*0.014*	*5089*	*0.015*	*26054*	*0.026*	*15610*	*0.033*
Mozambique	*183597*	*0.260*	*110301*	*0.328*	*265176*	*0.263*	*167953*	*0.359*
Zambia	*12990*	*0.018*	*4972*	*0.015*	*23493*	*0.023*	*8345*	*0.018*
Zimbabwe	*73042*	*0.103*	*34549*	*0.103*	*130090*	*0.129*	*63196*	*0.135*
Middle Africa	10377	0.015	4139	0.012	23974	0.024	10569	0.023
Nothern Africa	1652	0.002	498	0.001	3853	0.004	1500	0.003
Southern Africa	154692	0.219	91250	0.271	206760	0.205	88913	0.190
Botswana	*10480*	*0.015*	*6767*	*0.020*	*17518*	*0.017*	*6705*	*0.014*
Lesotho	*95062*	*0.135*	*64745*	*0.192*	*113020*	*0.112*	*53434*	*0.114*
Nambia	*28850*	*0.041*	*8549*	*0.025*	*44798*	*0.044*	*14945*	*0.032*
Swaziland	*20300*	*0.029*	*11189*	*0.033*	*31425*	*0.031*	*13830*	*0.030*
Western Afrcia	9911	0.014	4717	0.014	12070	0.012	8073	0.017
AMERICA	**11606**	**0.016**	**3638**	**0.011**	**21938**	**0.022**	**5622**	**0.012**
ASIA	**23807**	**0.034**	**7552**	**0.022**	**43540**	**0.043**	**16441**	**0.035**
EUROPE	**173345**	**0.230**	**55386**	**0.165**	**225223**	**0.223**	**71543**	**0.153**
United Kingdom	*97290*	*0.138*	*30392*	*0.090*	*127820*	*0.127*	*39778*	*0.085*
Germany	*14427*	*0.020*	*4424*	*0.013*	*24216*	*0.024*	*6627*	*0.014*
Portugal	*12667*	*0.018*	*5451*	*0.016*	*19490*	*0.019*	*7714*	*0.016*
OCEANIA	**3586**	**0.005**	*1097*	**0.003**	**4393**	**0.004**	**1535**	**0.003**
NS/NR	**26522**	**0.038**	**9756**	**0.029**	**10**	**0.000**	**10**	**0.000**

Table 2: Racial composition

	Natives						Migrants					
	Total		Men		Women		Total		Men		Women	
	Stock	Rate*	Stock	Rate*	Stock	Rate*	Stock	Rate*	Stock	Rate*	Stock	Rate*
1996												
White	1560266	11.66	871530	12.45	688736	10.79	174340	36.96	99234	29.48	75106	55.58
Black	9921068	74.14	5074680	72.52	4846388	75.92	281572	59.69	226273	67.22	55300	40.92
Asian	385680	2.88	241832	3.46	143848	2.25	8847	1.88	6597	1.96	2251	1.67
Coloured (SA)	1413842	10.57	757661	10.83	656181	10.28	3256	0.69	1763	0.52	1494	1.11
Unknown	100219	0.75	51948	0.74	48271	0.76	3708	0.79	2724	0.81	984	0.73
Total	**13381075**	**100**	**6997652**	**100**	**6383424**	**100**	**471725**	**100**	**336590**	**100**	**135135**	**100**
2001												
White	1798264	10.13	995084	10.93	803179	9.29	227165	33.4	131446	28.1	95719	45.08
Black	13724954	77.3	6890534	75.68	6834420	79.01	427944	62.92	318431	68.06	109513	51.58
Asian	477451	2.69	289201	3.18	188250	2.18	17758	2.61	13424	2.87	4333	2.04
Coloured (SA)	1754043	9.88	929653	10.21	824390	9.53	7285	1.07	4539	0.97	2747	1.29
Total	**17754712**	**100**	**9104472**	**100**	**8650240**	**100**	**680152**	**100**	**467840**	**100**	**212312**	**100**
2007												
White	1873765	11.01	1004436	11.62	869330	10.37	214755	26.36	122066	21.7	92689	36.73
Black	12946279	76.04	6469338	74.87	6476941	77.24	555218	68.15	407200	72.4	148018	58.66
Asian	502271	2.95	290742	3.36	211529	2.52	35521	4.36	27908	4.96	7612	3.02
Coloured (SA)	1703748	10.01	876451	10.14	827297	9.87	9263	1.14	5231	0.93	4032	1.6
Total	**17026064**	**100**	**8640967**	**100**	**8385097**	**100**	**814757**	**100**	**562406**	**100**	**252351**	**100**

Note: the reference sample is the weighted working age population (16-65) in the labour force

Table 3: Migration share by education and experience (skill cell) (15-65 male lab force pop)				
Education	**Years of experience**	**1996**	**2001**	**2007**
Less than primary	**1 - 5**	0.0485	0.0517	0.0584
	6 - 10	0.0543	0.0781	0.0983
	11 - 15	0.0573	0.0717	0.1241
	16 - 20	0.052	0.0565	0.1027
	21 - 25	0.0584	0.0466	0.0869
	26 - 30	0.0615	0.0461	0.0717
	31 - 35	0.0589	0.0455	0.0831
	36 - 40	0.0484	0.0417	0.0724
Primary completed	**1 - 5**	0.0461	0.039	0.0384
	6 - 10	0.0379	0.0532	0.0568
	11 - 15	0.0405	0.0497	0.07
	16 - 20	0.0365	0.0445	0.0688
	21 - 25	0.0347	0.0392	0.0647
	26 - 30	0.0346	0.0356	0.0539
	31 - 35	0.0336	0.0311	0.0498
	36 - 40	0.0305	0.0342	0.0486
Secondary completed	**1 - 5**	0.023	0.0226	0.0246
	6 - 10	0.0294	0.0319	0.0421
	11 - 15	0.0431	0.0403	0.0448
	16 - 20	0.0526	0.0535	0.0459
	21 - 25	0.0671	0.0623	0.0634
	26 - 30	0.096	0.0864	0.069
	31 - 35	0.1307	0.1361	0.0953
	36 - 40	0.1458	0.1836	0.137
University completed	**1 - 5**	0.0689	0.0731	0.0977
	6 - 10	0.0872	0.0902	0.099
	11 - 15	0.0918	0.1238	0.1092
	16 - 20	0.1056	0.1358	0.1218
	21 - 25	0.1182	0.1629	0.1378
	26 - 30	0.1407	0.1852	0.1597
	31 - 35	0.1398	0.2413	0.1813
	36 - 40	0.176	0.2613	0.2543

Education	Years of experience	1996	2001	2007
Table 4: Natives' share by education and experience (skill cell)				
(15-65 male lab force pop)				
Less than primary	**1 - 5**	0.9515	0.9483	0.9416
	6 - 10	0.9457	0.9219	0.9017
	11 - 15	0.9427	0.9283	0.8759
	16 - 20	0.948	0.9435	0.8973
	21 - 25	0.9416	0.9534	0.9131
	26 - 30	0.9385	0.9539	0.9283
	31 - 35	0.9411	0.9545	0.9169
	36 - 40	0.9516	0.9583	0.9276
Primary completed	**1 - 5**	0.9539	0.961	0.9616
	6 - 10	0.9621	0.9468	0.9432
	11 - 15	0.9595	0.9503	0.93
	16 - 20	0.9635	0.9555	0.9312
	21 - 25	0.9653	0.9608	0.9353
	26 - 30	0.9654	0.9644	0.9461
	31 - 35	0.9664	0.9689	0.9502
	36 - 40	0.9695	0.9658	0.9514
Secondary completed	**1 - 5**	0.977	0.9774	0.9754
	6 - 10	0.9706	0.9681	0.9579
	11 - 15	0.9569	0.9597	0.9552
	16 - 20	0.9474	0.9465	0.9541
	21 - 25	0.9329	0.9377	0.9366
	26 - 30	0.904	0.9136	0.931
	31 - 35	0.8693	0.8639	0.9047
	36 - 40	0.8542	0.8164	0.863
University completed	**1 - 5**	0.9311	0.9269	0.9023
	6 - 10	0.9128	0.9098	0.901
	11 - 15	0.9082	0.8762	0.8908
	16 - 20	0.8944	0.8642	0.8782
	21 - 25	0.8818	0.8371	0.8622
	26 - 30	0.8593	0.8148	0.8403
	31 - 35	0.8602	0.7587	0.8187
	36 - 40	0.824	0.7387	0.7457

Table 5: The labor market effect of immigration on natives employment (district level, 1996, 2001, 2007)

	DEPENDENT VARIABLE					
	(1)	(2)	(3)	(4)	(5)	(6)
	Native Employment Rate	**Native Employees Rate**	**Native Self-employment Rate**	**Native Employment Rate**	**Native Employees Rate**	**Native Self-employment Rate**
Migration share	-0.716***	-0.543***	-0.103***	-0.725***	-0.553***	-0.102***
	(0.048)	(0.047)	(0.027)	(0.048)	(0.047)	(0.027)
Education, experience, year and any two-way interactions FE	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Log total labor force	*no*	*no*	*no*	*yes*	*yes*	*yes*
Constant	1.116***	1.518***	-0.548***	1.003***	0.808***	0.100***
	(0.049)	(0.050)	(0.032)	(0.053)	(0.054)	(0.030)
Observations	5,330	5,330	5,330	5,330	5,330	5,330
R-squared	0.971	0.966	0.924	0.971	0.966	0.924

Standard errors clustered at the skill-district-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Notes: The estimation sample includes the working age (18-65) male labor force population. Both employment and migration shares are measured over total labor force population (natives and migrants). Columns 4-6 include the logarithm of the total labor force as a further control.

Table 6: The labor market effect of immigration on natives income (district level, 1996, 2001, 2007)

	DEPENDENT VARIABLE			
	(1)	(2)	(3)	(4)
	Log tot income (lab force)	**Log tot income (employed)**	**Log tot income of employees**	**Log tot income of self-employed**
Migration share	-0.072	0.067	0.157	-0.282
	(0.283)	(0.241)	(0.268)	(1.681)
Education, experience, year and any two-way interactions FE	*yes*	*yes*	*yes*	*yes*
Constant	15.284***	13.389***	21.234***	-6.817***
	(0.442)	(0.308)	(0.276)	(1.782)
Observations	5,330	5,330	5,330	5,330
R-squared	0.981	0.979	0.970	0.830

Standard errors clustered at the skill-district-year level in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: The estimation sample includes the working age (18-65) male labor force population. Migration share is measured over total labor force population (natives and migrants).

Table 7: The labor market effect of immigration on natives employment (district level, 1996, 2001)

	(1) **Native Employment Rate**	(2) **Native Employees Rate**	(3) **Native Self-employment Rate**	(4) **Native Employment Rate**	(5) **Native Employees Rate**	(6) **Native Self-employment Rate**
Migration share	-0.727***	-0.538***	-0.100***	-0.731***	-0.542***	-0.099***
	(0.068)	(0.065)	(0.030)	(0.068)	(0.066)	(0.030)
Education, experience, year and any two-way interactions FE	yes	yes	yes	yes	yes	yes
Log total labour force	no	no	no	yes	yes	yes
Constant	1.052***	-0.376***	1.402***	1.013***	-0.411***	1.407***
	(0.027)	(0.047)	(0.035)	(0.032)	(0.050)	(0.036)
Observations	3,559	3,559	3,559	3,559	3,559	3,559
R-squared	0.990	0.983	0.956	0.990	0.983	0.956

Standard errors clustered at the skill-district-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Notes: The estimation sample includes the working age (18-65) male labor force population. Both employment and migration shares are measured over total labor force population (natives and migrants). Columns 4-6 include the logarithm of the total labor for

Table 8: The labor market effect of immigration on natives income (district level, 1996, 2001)

	(1) Log tot income (lab force)	(2) Log tot income (employed)	(3) Log tot income of employees	(4) Log tot income of self-employed
Migration share	-0.310	-0.162	0.107	-1.061
	(0.481)	(0.418)	(0.477)	(1.721)
Education, experience, year and any				
two-way interactions FE	yes	yes	yes	yes
Constant	6.331***	6.324***	-8.260***	13.643***
	(0.207)	(0.184)	(0.523)	(1.558)
Observations	3,559	3,559	3,559	3,559
R-squared	0.987	0.987	0.983	0.886

Standard errors clustered at the skill-district-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Notes: The estimation sample includes the working age (18-65) male labor force population by educational level. The dependent variable is native employment rate. Both employment and migration shares are measured over total labor force

Table 9: First stage IV estimate

	Migration Share
IV	0.0155***
	(0.004)
F-test instrument	16.57
P-value	[0.000]
Education, experience, year and any two-way interactions FE	yes
Observations	3,559
Standard errors clustered at the skill-district-year level in parentheses. P-values in square brackets.	
*** p<0.01, ** p<0.05, * p<0.1	
Notes: The estimation sample includes the working age (18-65) male labor force population. Migration share is measured over total labor force population (natives and migrants). The IV is based on the distribution across districts of ealier cohort of immigrants (from 1991) by country of origin.	

Table 10: The labor market effect of immigration on natives employment, IV estimates (district level, 1996, 2001)

	(1)	(2)	(3)	(4)	(5)	(6)
	Native Employment Rate	Native Employees Rate	Native Self-employment Rate	Native Employment Rate	Native Employees Rate	Native Self-employment Rate
Migration share	-0.636***	-0.705***	-0.008	-0.600***	-0.672***	-0.013
	(0.175)	(0.157)	(0.054)	(0.179)	(0.160)	(0.053)
Education, experience, year and any two-way interactions FE	yes	yes	yes	yes	yes	yes
Log total labour force	no	no	no	yes	yes	yes
Observations	3,559	3,559	3,559	3,559	3,559	3,559

Standard errors clustered at the skill-district-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Notes: The estimation sample includes the working age (18-65) male labor force population. Columns 4-6 control for the log of the total labor force.

Table 11: The labor market effect of immigration on natives income, IV estimates (district level, 1996, 2001)

	(1) Log tot income (lab force)	(2) Log tot income (employed)	(3) Log tot income of employees	(4) Log tot income of self- employed
Migration share	-1.232	-1.365	-1.649	1.565
	(1.297)	(1.117)	(1.183)	(5.716)
Education, experience, year and any two-way interactions FE	yes	yes	yes	yes
Observations	3,559	3,559	3,559	3,559
Standard errors clustered at the skill-district-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1				
Notes: The estimation sample includes the working age (18-65) male labor force population.				

Table 12: The labor market effect of immigration on natives employment (national level, 1996, 2001, 2007)

	DEPENDENT VARIABLE					
	(1)	(2)	(3)	(4)	(5)	(6)
	Native Employment Rate	Native Employees Rate	Native Self-employment Rate	Native Employment Rate	Native Employees Rate	Native Self-employment Rate
Migration share	-0.317	-0.473	0.495***	-0.185	-0.425	0.524***
	(0.301)	(0.291)	(0.163)	(0.300)	(0.302)	(0.145)
Education, experience, year and any two-way interactions FE	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Log total labor force	*no*	*no*	*no*	*yes*	*yes*	*yes*
Constant	0.892***	0.572***	0.175***	0.560***	0.362	0.174
	(0.076)	(0.076)	(0.039)	(0.183)	(0.220)	(0.142)
Observations	96	96	96	96	96	96
R-squared	0.998	0.997	0.992	0.998	0.997	0.992

Standard errors clustered at the skill-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Notes: The estimation sample includes the working age (18-65) male labor force population. Both employment and migration shares are measured over total labor force population (natives and migrants). Columns 4-6 include the logarithm of the total labor force as a further control.

Table 13: The labor market effect of immigration on natives income (national level, 1996, 2001, 2007)

	DEPENDENT VARIABLE			
	(1)	(2)	(3)	(4)
	Log tot income (lab force)	**Log tot income (employed)**	**Log tot income of employees**	**Log tot income of self-employed**
	-2.739***	-2.019**	-2.626***	-2.396
Migration share	(0.765)	(0.913)	(0.940)	(3.488)
Education, experience, year and any two-way interactions FE	*yes*	*yes*	*yes*	*yes*
Constant	14.173***	13.902***	13.987***	14.076***
	(0.167)	(0.220)	(0.230)	(0.865)
Observations	96	96	96	96
R-squared	1.000	0.999	0.999	0.994
Standard errors clustered at the skill-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1				
Notes: The estimation sample includes the working age (18-65) male labor force population. Both employment shares and migration share are measured over total labor force population (natives and migrants).				

Table 14: The labor market effect of immigration on natives employment by education (district level, 1996, 2001, 2007)

	(1) Less than primary education	(2) Less than secondary education completed	(3) Secondary education completed	(4) University education and above
Migration share	-0.518***	-0.590***	-0.752***	-0.888***
	(0.101)	(0.095)	(0.129)	(0.063)
Education, experience, year and any two-way interactions FE	yes	yes	yes	yes
Log total labor force	yes	yes	yes	yes
Constant	0.777***	0.576***	1.243***	1.429***
	(0.098)	(0.091)	(0.101)	(0.179)
Observations	1,343	1,344	1,344	1,299
R-squared	0.961	0.984	0.975	0.953

Standard errors clustered at the skill-district-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Notes: The estimation sample includes the working age (18-65) male labor force population by educational level. The dependent variable is native employment rate. Both employment and migration shares are measured over total labor force population (natives and migrants).

Table 15: The labor market effect of immigration on natives income by education (district level, 1996, 2001, 2007)

	ESTIMATION SAMPLE			
	(1)	(2)	(3)	(4)
	Less than primary education	**Less than secondary education completed**	**Secondary education completed**	**University education and above**
Migration share	0.362	0.145	-0.290	0.215
	(0.502)	(0.745)	(0.583)	(0.333)
Education, experience, year and any two-way interactions FE	*yes*	*yes*	*yes*	*yes*
Constant	9.453***	10.161***	13.377***	14.730***
	(0.831)	(0.427)	(0.443)	(0.418)
Observations	1,343	1,344	1,344	1,299
R-squared	0.909	0.966	0.988	0.943

Standard errors clustered at the skill-district-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Notes: The estimation sample includes the working age (18-65) male labor force population by educational level. The dependent variable is the (log) income of natives. Migration share is measured over total labor force population (natives and migrants).

Table 16: The labor market effect of immigration on natives employment by race (district level, 1996, 2001, 2007)

	(1)	(2)	(3)	(4)
	White	**Black**	**Asian**	**Coloured (SA)**
Migration share	-0.854***	-0.665***	-0.739***	-0.826***
	(0.045)	(0.056)	(0.095)	(0.239)
Education, experience, year and any two-way interactions FE	*yes*	*yes*	*yes*	*yes*
Log total labor force	yes	yes	yes	yes
Constant	0.853***	0.952***	1.962***	-0.361
	(0.109)	(0.059)	(0.711)	(1.041)
Observations	4,154	5,003	1,996	3,531
R-squared	0.906	0.967	0.916	0.911

Standard errors clustered at the skill-district-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Notes: The estimation sample includes the working age (18-65) male labor force population by ethnicity. The dependent variable is native employment rate. Both employment and migration shares are measured over total labor force population (natives and migrants).

Table 17: The labor market effect of immigration on natives income by race (district level, 1996, 2001, 2007)

	(1)	(2)	(3)	(4)
	White	**Black**	**Asian**	**Coloured (SA)**
Migration share	-0.498	0.305	0.188	-0.043
	(0.375)	(0.366)	(0.972)	(1.318)
Education, experience, year and any two-way interactions FE	*yes*	*yes*	*yes*	*yes*
Constant	3.692***	17.686***	-4.193	26.781***
	(1.143)	(1.239)	(7.441)	(6.871)
Observations	4,154	5,003	1,996	3,531
R-squared	0.912	0.958	0.909	0.897

Standard errors clustered at the skill-district-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Notes: The estimation sample includes the working age (18-65) male labor force population by ethnicity. The dependent variable is the (log) income of natives. Migration share is measured over total labor force population (natives and migrants).