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# Unemployment of immigrants and natives over the business cycle: evidence from the Austrian labor market*

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**Abstract**

We analyze differences in unemployment between natives and immigrants over the business cycle. Using matched employer-employee data for Austria, we find that immigrants' unemployment rate and flows into and out of unemployment are significantly more sensitive to labor market shocks than those of comparable natives. This is particularly true for immigrants from outside the European Economic Area. According to existing theory, a greater variability in the employment of immigrants can be due to a selection of immigrant workers into specific industries or temporary jobs. However, we do not find this confirmed in our data.

*JEL classification:* J64, J61

*Keywords:* Unemployment rate; Immigration, Guestworker, Immigrant Labor

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# 1 Introduction

The share of immigrants in the workforce has increased considerably in many OECD countries during the last decades. The available empirical evidence suggests little impact from immigration on the native workforce in the host countries (Pischke and Velling, 1997; Card, 1990; Borjas et al., 1997; Borjas, 2003; D'Amuri et al., 2010), but the large differences in labor market outcomes between natives and immigrants are striking. Overall, immigrants seem to perform poorly in the host countries' labor markets compared to natives. In many European countries the aggregate unemployment rate of immigrants is more than double the natives' rate (Appendix Table A.1; OECD, 2010). At the same time, immigrants constitute an important part of (future) labor supply in OECD countries due to the aging of host country populations (OECD, 2010). Given that the welfare costs of unemployment are high, it is thus very important to understand the differences in labor market outcomes between natives and immigrants.

The employment pattern of immigrants is typically different from that of native workers (OECD, 2009). In most OECD countries immigrants are over-represented in temporary jobs. According to contract theories that attribute unemployment to periodic temporary employment reductions in response to demand fluctuations (e.g. Lilien, 1980) immigrants may be more often unemployed than natives, if they are more likely to work in temporary jobs. An alternative view relates cyclical unemployment movements primarily to aggregate demand shocks (e.g. Abraham and Katz, 1986). In an economy in which industries have different cyclical sensitivities, immigrants might be more prone to unemployment fluctuations if they work disproportionately in industries with higher cyclical sensitivity.[1] According to dual labor market models (e.g. Doeringer and Piore, 1971), immigrants may be unemployed more often, if they are disproportionately confined to jobs with poor wages and little job security.

In this paper, we analyze unemployment fluctuations of native and immigrant workers over the

[1]Indeed, immigrants tend to be over-represented in industries that are more prone to business cycle fluctuations such as construction or hotels and restaurants (OECD, 2009).

business cycle, putting special emphasis on the industry affiliation of workers and differences in temporary employment. Detailed information from matched employer-employee data for Austria during 1995-2009 allows us to control for the fact that the immigrant and native workforce might not be randomly distributed over industries and (immigrant) workers may be selected into industries with unstable employment patterns. Also, we can identify and control for temporary employment and the seasonal in- and outmigration of immigrant workers.

Previous studies have found significant evidence for immigrants' unemployment to be tied more tightly to the business cycle than that of natives. For example, Chiswick et al. (1997) find that the unemployment rate of male immigrants in the U.S. is more sensitive to changes in the national unemployment rate than that of male natives. Orrenius and Zavodny (2010) provide recent evidence that the unemployment of Mexican immigrants in the U.S. displayed the greatest sensitivity to the worsening in the state-level macroeconomic conditions in the course of the global financial crisis overall and also within most education groups. Looking at a broader range of labor market outcomes Hoynes (2000) shows for the U.S. that individuals with lower education levels, non-whites and women experience greater cyclical fluctuations in their labor market outcomes than high-skilled men. Dustmann et al. (2010) show for the United Kingdom and Germany that the unemployment response to labor market-specific shocks is significantly larger for low-skilled workers than high-skilled workers and for immigrants than natives, even within skill groups. Barth et al. (2004, 2006) highlight the differential wage responsiveness of immigrants and natives to changes in macroeconomic conditions in Norway and the U.S. In contrast, Borjas (2006) finds that the employment of workers tends to be less cyclically sensitive among immigrants than among natives. We contribute to this literature by taking into account that differences in the cyclical employment patterns of immigrants and natives may be due to a potential selection of immigrants into industries that are disproportionately prone to cyclical fluctuations or into temporary jobs. Our results consistently suggest that immigrants' unemployment rates are significantly more sensitive to changes in the macroeconomic conditions than comparable natives'. This is particularly true

for immigrants from non-EEA countries.[2] Looking at the underlying worker flows into and out of unemployment we similarly find a higher volatility of the in-and outflows over the business cycle among non-EEA immigrants. Thus, they loose jobs faster in economic downturns but also gain jobs faster in upturns. Even though non-EEA immigrants are more mobile and find alternative employment more quickly than natives and immigrants from the EEA, they experience on average higher unemployment rates.

The paper is structured as follows. Section 2 sketches important characteristics of immigrant employment policy in Austria and section 3 introduces the data and the sample of our analysis. Sections 4 to 6 report our results on unemployment rate and worker flow rate differentials among different groups of native and immigrant workers. Section 7 offers an interpretation of our findings and concludes.

## 2 Employment of immigrants in Austria

Immigration on a larger scale started in Austria in the 1960s and 1970s with so-called 'guest workers' coming mainly from Turkey and Former Yugoslavia. During the late 1980s and early 1990s there was a dramatic increase in the employment of immigrants in the course of the collapse of the Soviet Union and the Balkan Wars. In large parts, these immigrants have become permanent residents. With its accession to the European Union in 1995 and the two EU enlargement rounds in 2004 and 2007, Austria has attracted increasing numbers of migrants from the EU15 and the enlargement countries, many of them on a more temporary basis. The foreign share in the total population in Austria rose steadily from 1.4% in 1961 to more than 8% in the early 1990s and topped the 10% mark for the first time in 2008.[3] Today, Austria ranks among the EU15 countries[4] with the highest share of foreigners in the population (see Appendix Table A.2). Accordingly, the

[2]That is, third-country citizens from countries outside the European Economic Area (EEA).

[3]Census data, Statistik Austria.

[4]Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom.

share of foreigners in the Austrian labor force rose from 8.7% in 1991 to 13.4% in 2008 (that of the foreign-born was 16.3% in 2008; figure for 1991 not available) (OECD, 2002, 2010). Unemployment is typically higher among immigrant than among native workers in Austria (see Figure 1a). It fluctuated between 7.5% and 10.6% during 1995-2009, compared with a mean of 6.4% for natives in the same period.[5] Figure 2 shows that immigrants in Austria are over-represented in labor-intensive service sectors such as hotels and restaurants, industrial cleaning, security services, provision of personnel[6] or private household services. Immigrants are also over-represented in construction, some manufacturing sectors like textiles and food processing and in agriculture (see Appendix section B.1 for details on the classification of industries). Among the foreign labor force in 2007 roughly 13% were employed in construction, 19% in manufacturing, 34% in hotels and restaurants, 20% in other services and 3% in agriculture.[7]

Employment of immigrants (that is, non-Austrian citizens) is handled quite restrictively in Austria. In principle, an employer may only employ immigrants if they hold an appropriate work permit. Citizens from the European Economic Area (EEA) obtained free access to the labor market with Austria's accession to the European Union in 1995. Citizens of the countries that joined the EU (and the EEA) in 2004 and 2007[8] did not automatically gain free access to the Austrian labor market, as Austria negotiated a transition period until May 2011 (except for Malta and Cyprus). For immigrants subject to a work permit, the employer may apply for a "restricted work permit" (Beschäftigungsbewilligung), which is valid for one year and only for a specific worker, firm and workplace within the firm. After one year the worker may apply for a "general work permit" (Arbeitserlaubnis), which is valid for two years within a given federal state. Finally, immigrants

[5]Statistik Austria, national definition of unemployment, based on the number of unemployed registered at the Public Employment Service Austria (AMS). Rates based on this definition are higher as compared to the international definition based on the Labor-Force-Concept, as it also comprises for example workers who are in job market training. We report these figures because we will rely on a similar definition of unemployment in our analysis.

[6]Provision of personnel ("Arbeitskräfteüberlassung") has experienced large employment growth in the last decade. This sector comprises workers hired by temporary employment agencies and "leased" out to other firms on a temporary basis, often for manual jobs in manufacturing. These workers are, however, registered within the service sector.

[7]Biffl (2008).

[8]Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, Cyprus, Malta; Bulgaria, and Romania

who have been working for three years are entitled to an "exemption certificate" (Befreiungsschein), which is valid for five years throughout Austria. Under the current regime, which became effective in 2003, immigrants with a "settlement permit" that is issued after five years of residence have unrestricted access to the labor market. Workers from the new EU member states could get a "confirmation of free movement" (Freizügigkeitsbestätigung) that entailed a work permit after one year of legal employment or five years of uninterrupted settlement in a federal state. The number of immigrants who are subject to a work permit and seek to work in Austria is regulated via the issue of temporary permits, in particular first-entry permits. These permits are subject to annual quota and an employment test according to which the respective job vacancy cannot be filled by a (native or migrant) unemployed resident. The quota for unskilled workers was de facto set to zero in 2001; the law amendments in 2003 regulated that only high-skilled immigrants (so-called "key workers") may settle in Austria. Key workers must possess special skills that are in particular demand on the labor market. In addition, their monthly gross earnings must be equal to at least 60% of the social security contribution ceiling (EUR 2.466 in 2010). They obtain unrestricted access to the labor market after one year of employment. Immigrants with lower skills are restricted to temporary work contracts in only two sectors, agriculture and hotels and restaurants. These permits are granted for six to nine months to cover temporary increases in labor demand in the two sectors. Permits for harvesters are only granted for up to six weeks. Workers with a temporary work contract cannot become unemployed by definition, as their permits do not allow for the uninterrupted employment that is required to be entitled to unemployment benefits.

The number of temporary settlement permits increased from 2003 onwards, whereas that of permanent work permits declined (Biffl, 2008). Currently, however, the majority of new immigrants enter Austria on the basis of family migration or free-movement migration.[9] They do not face restrictions on the labor market. In 2007 only 1.5% of the total migration inflow was based on work

[9]That is migration from countries whose citizens are not subject to work permits (Switzerland and EEA countries with the exception of the new EU member states).

permits, but 30% was based on family reunion and more than 50% on free-movement migration (OECD, 2010).

Finally, note that wages in Austria are typically set by collective bargaining agreements, in particular for low-skilled workers. For this reason, we restrict our analysis to unemployment in the following.

# 3 Data and sample

We use a unique individual-level data set from the social security records of the Austrian Social Security Database (ASSD).[10] The data set contains matched employer-employee data that cover the universe of private sector workers in Austria from 1972 onwards. It is constantly updated and contains complete and precise information on individuals' employment histories, annual earnings, and key demographic characteristics such as sex, citizenship, birth year, and occupation. Individuals can be tracked over time via a personal identifier and, if employed, linked to firms that provide further information on industry affiliation and firm (and thus worker) location.

## 3.1 Sample

We take advantage of the individual panel information in the data in order to identify different types of jobs and, thus, of unemployment (each unemployment spell can be linked to the preceding employment spell of a worker). Hence, we can disaggregate the unemployment rate down to the level of industries and occupations, and a third layer which is citizenship.[11] The unit of observation in our analysis below is group-specific unemployment rates, with groups defined by industry, occupation and citizenship. The rate for each group is defined as the number of individuals recorded unemployed divided by the number of unemployed plus employees. See Appendix section B.2 for more details.

[10] See Zweimüller et al. (2009) for a detailed description of this data set.

[11] Citizenship refers to the most recent status of a worker. Unfortunately, changes in citizenship are not reliably tracked in the ASSD records. Thus, it is possible that naturalized citizens are sometimes counted as natives.

We focus on the period 1995–2008 and thereby avoid structural breaks in the foreign workforce induced by the influx of Balkan-War refugees in the early 1990s and by Austria's EU accession in 1995, which triggered free-movement migration mainly from EU15 countries. Furthermore, we look at male unemployment only as we do not have information on the extent of part-time employment in the ASSD. We consider this less problematic for male workers, as according to official statistics the share of male part-time employment in Austria was not above 7.3% even in the "crisis years" 2009/10 (as compared to up to 44% for females in 2010)[12]. Finally, we restrict the analysis to the rather homogeneous groups of white- and blue-collar workers ("Angestellte" and "Arbeiter"). Among other groups (that is, civil servants, marginal workers, and apprentices) the number of individuals is too small to calculate reliable unemployment rates for all citizenship groups. We distinguish between workers who are natives, immigrants from the European Economic Area (EEA)[13], and immigrants from non-EEA countries (third-country citizens). In 2010 the majority of immigrants from the EEA were Germans followed by immigrants from Poland, Romania, Hungary, Slovakia and Italy. Immigrants from non-EEA countries were mainly from Turkey and Former Yugoslavia and to a smaller extent from Russia and China.[14]

Table 1 provides summary statistics from our data on the distribution of occupations among natives and immigrants, averaged over the period 1995–2008. It reveals large differences in particular between natives and immigrants from non-EEA countries. For example, white- and blue-collar jobs are almost evenly spread among natives, whereas almost 90% of non-EEA immigrants work in blue-collar jobs (and almost 70% of immigrants from the EEA). In comparison to the large disparities in the distribution of white- and blue-collar jobs among immigrants and natives, differences in the sectoral structure of employment are less important. For blue-collar workers, the distribution over industries is comparable for all three groups of natives, immigrants from the EEA and non-EEA countries. Two notable exceptions are agriculture and hotels and restaurants. The proportion of

[12]Statistik Austria.

[13]That is, countries from the European Union (EU), Iceland, Norway, and Switzerland.

[14]Statistik Austria.

workers in these industries is far higher among both groups of immigrants than among natives. This reflects Austrian legislation since 2003 when unskilled workers not only from non-EEA countries, but also from the new EU member states[15] (except Cyprus and Malta) could only work in these two industries. In addition, they were only allowed to work under temporary contracts that would not make them eligible for unemployment benefits. Therefore, the unemployment rate for blue-collar workers from the EEA (and also from non-EEA countries) in these two industries is very low as reported in the middle part of the Table (see section 2 for a more detailed description of Austrian immigration policy). On average, non-EEA workers experience higher levels of unemployment than natives and workers from the EEA, even after controlling for occupation and industry affiliation.

Another prominent feature that characterizes the Austrian labor market is seasonal employment. Rather strong seasonal fluctuations are to be found throughout most industries (Del Bono and Weber, 2008). The individual panel data information in the ASSD allows us to identify seasonal workers: that is, workers in jobs that show a repeated seasonal employment pattern over time (see section B.2.1 for details). Among these seasonal workers, about two thirds are temporarily laid off and return to the same employer. The remainder may change the employer but returns to the same type of job in a repeated pattern from one year to the next.[16] In the lower part of Table 1 we provide information on the average share of seasonal workers within citizenship groups and by industry. Overall, the highest share of seasonal employment can be found among blue-collar workers from the EEA, consistent with immigration legislation that limits unskilled workers from the new EU member states (and third-country citizens) to temporary contracts (see above). Not surprisingly, we find the highest seasonal shares for all groups of workers among blue-collar workers in hotels and restaurants, construction, and agriculture.

A drawback of the ASSD data is the lack of information on education, which usually serves as a

[15]Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia

[16]Thus defined seasonal employment does not comprise any other form of short-term employment (such as fixed-term contracts in order to replace workers who are on parental or any other form of leave, voluntary or involuntary job exits, and so forth. Also note, that in the ASSD data we only observe the length of an employment spell ex-post but not the type of contract. Hence, we cannot distinguish fixed-term contracts from permanent contracts that have been dissolved after a short period of time.

proxy for skill. Instead, we use occupation as a proxy, as workers in white-collar jobs typically have a higher skill level than workers in blue-collar jobs. Hence, in the remainder of the text we refer to white-collar workers as the higher skilled group and to blue-collar workers as the lower skilled group.

# 4 Unemployment differentials between immigrants and natives

As described above, the average unemployment rates of immigrant and native workers in Austria show large differences over the period 1995–2009 (see figure 1a).[17] Figure 1b plots the change in immigrants' and natives' unemployment rates from $t-1$ to $t$ (with $t$ indicating years) and yearly GDP growth. It shows an on average (not conditional on any control variables) much sharper rise of immigrants' unemployment in economic downturns but also a sharper fall in unemployment in economic upturns. In the following, we analyze more formally whether immigrants' unemployment outcomes are more sensitive to business cycle fluctuations than those of natives.

## 4.1 The empirical model

We exploit variation across industries in the timing and severity of economic shocks, following an econometric approach also used in Hoynes (2000) and Dustmann et al. (2010). The unit of analysis is group- and industry–specific unemployment rates (sub- and superscripts $g$ and $i$), with groups formed according to six skill $\times$ citizenship groups[18]. Unemployment rates are expressed as a function of a group fixed effect ($D^g$), a group-specific time trend ($D^gT$), a industry and time-specific business cycle measure which is interacted with the group dummy variables ($D^gX_{it}$),

[17] Note, that (native and immigrant) unemployment is higher in our sample compared to the official statistics because it is based on white- and blue-collar workers only and excludes civil servants with typically low unemployment (together with apprentices, marginal workers, freelancers and workers in parental (or some other form of) leave).

[18] Two skill groups and three citizenship groups.

industry fixed effects ($D_i$), a set of further control variables, and a random error term ($\epsilon^g_{it}$):

$$y^g_{it} = \alpha^g D^g + \beta^g D^g T + \gamma^g D^g X_{it} + \nu_i D_i + \sum_{n=2}^{4} \psi_n A^g_{it} + \rho U^g_{it} + \phi V^g_{it} + \tau W^g_{it} + \epsilon^g_{it}$$

The control variables comprise four age group shares ($A^g_{it}$) to allow for differences in the age composition of the groups, mean tenure ($U^g_{it}$) and unemployment duration ($V^g_{it}$), and the share of labor market entrants within cells ($W^g_{it}$), defined as the number of workers who have recently[19] entered the social security records for the first time over the total labor force in the respective cell.[20] To control for unobserved fixed group and industry effects, the model is estimated in first-differences, with $\Delta y_t = y_t - y_{t-1}$ (dropping group sub- and superscripts for simplicity):

$$\Delta y^g_{it} = \beta^g D^g + \gamma^g D^g \Delta X_{it} + \sum_{n=2}^{4} \psi_n \Delta A^g_{it} + \rho \Delta U^g_{it} + \phi \Delta V^g_{it} + \tau \Delta W^g_{it} + \Delta \epsilon^g_{it}$$

The key parameters of interest are the $\gamma^g$: they capture the response of the various groups to the industry- and time–specific common business cycle measure, $X_{it}$. Business cycle measures such as regional GDP growth or the capacity utilization ratio provided by the OECD would be natural candidates to approximate the $X_{it}$; however, there are several problems. First, the measures might be endogenous to unemployment. Second, they are difficult to observe at the disaggregated level of industries. And third, as Dustmann et al. (2010) point out, it is not clear whether an appropriate measure of the business cycle that leads to changes of the unemployment rate are current or past changes, or combinations thereof. Hence, the preferred approach here is to treat the industry-specific shocks[21] as additional unobserved parameters to be estimated. That is, we use the parameters $\delta_{it}$ for the set of industry-time interaction dummies ($D_{it}$) to approximate the

[19] That is, no longer than one year before the time of observation.

[20] Note, that the share of labor market entrants might be endogenous to the unemployment rate as we will typically observe a high share of labor market entrants in those industries with higher labor demand and lower unemployment rates. However, we find that our main results are not sensitive to the inclusion of this variable.

[21] "Shock" is not to be confounded with the connotation in time series analyses where a shock enters through the innovation of a process; see also below.

shocks: the term $\delta_{it}D_{it}$ simply captures fluctuations in the outcome variable and, thus, provides a proxy for shocks that impact the labor market in industry $i$ in time $t$:

$$\Delta y_{it}^{g} = \beta^{g} D^{g} + \gamma^{g} D^{g} \delta_{it} D_{it} + \sum_{n=2}^{4} \psi_{n} \Delta A_{it}^{g} + \rho \Delta U_{it}^{g} + \phi \Delta V_{it}^{g} + \tau \Delta W_{it}^{g} + \Delta \epsilon_{it}^{g} \quad (1)$$

This model is very flexible in terms of leaving the exact nature of the shock open. The industry-year dummies capture any shock that shifts the demand for (or supply of) labor and leads to changes in the industry-specific unemployment rates.[22] Equation (1) can be solved using non-linear weighted[23] least squares and is estimable because of the multiple skill- and citizenship groups for each industry–year observation. The identifying assumption is thus that the shocks are common to all groups within a particular industry, but we allow the groups to respond differently to that common shock. We exploit variation over nine industries and 13 years and thus obtain 117 unobserved $\delta_{it}$ (common to all groups) to be estimated. With six skill groups we have a total of $117 * 6 = 702$ observations, which is enough to estimate the model. Non-linear least squares further allows one to impose a constraint on one of the $\gamma^{g}$ parameters (Poi, 2008). We set $\gamma^{g} = 1$ for native high-skilled workers; we can thus interpret the $\gamma^{g}$ parameters for groups $k \neq g$ in terms of whether their unemployment rate fluctuates more ($\gamma^{k} > 1$) or less ($\gamma^{k} < 1$) strongly over the business cycle than that of natives. For example, a parameter $\gamma^{hs\_EEA} = 2$ indicates a twice as strong response in the unemployment rate of high-skilled workers from the EEA (increasing or decreasing) compared to the unemployment response of the reference group (that is, high-skilled natives).

To check for robustness, we also use conventional business cycle measures to approximate the labor market-specific shocks. At the level of industries we have information on yearly regional and industry-specific Gross Value Added (GVA) over the period 1995–2008 from Statistik Austria. The

[22] This does not compare to (structural) vector autoregressive (VAR) models where the innovations are explicitly modeled as monetary, fiscal or output shocks. Here, interest lies in the *relative* performance of different demographic groups over the business cycle. *Given* that a (not further specified) shock impacts the labor market, the model set out in equation (1) allows us to determine whether different groups of workers respond differently to that shock.

[23] The size of the labor force in each cell (defined by industry, skill, and citizenship) is used as a weight.

short length of the series does not allow a proper filtering of GVA into its trend and a cyclical component (at least not for the earliest and most recent years); thus we use the change in the logged GVA series (growth rate) to approximate industry-specific shocks. Alternatively, we also use national GDP data for the overall Austrian economy. At the cost of loosing the industry-specific dimension of the shock we gain more reliable data on the macroeconomic conditions, and the model is still flexible in terms of allowing the unemployment rate within a particular industry to respond more or less strongly than in other industries to a change in the macroeconomic conditions. Appendix Figure A.1 shows how the different measures are related. It plots estimates for the industry-time interactions dummies ($\delta_{it}$), an estimate of simple year dummies ($\delta_t$) instead of the industry-year dummies in equation (1), and national GDP growth. We can see that national GDP growth is approximately the inverse of the estimated overall $\delta_t$; thus, the two measures similarly capture the ups and downs of the business cycle. The figure also reveals that we gain from looking at industry-specific shocks captured by the $\delta_{it}$ as some industries show stronger fluctuations over the business cycle than others.

### 4.2 Results

We estimate unemployment rate differentials for private sector dependent male blue- and white-collar workers during 1996–2008.[24] The dependent variable is the change in unemployment rates for each cell defined by industry, skill, and citizenship (native, EEA, non-EEA). We aggregate the data into nine groups of industries: manufacturing, constructions, sales, hotel and restaurants, transport, private services, civil services, health and social work, and other services (see appendix B.1 for details).

Table 2 reports results on the $\gamma^g$ parameters from equation (1), that is the relative responsiveness of the groups' unemployment rates to changes in the macroeconomic conditions (positive or negative shocks that hit the labor market). For native high-skilled workers $\gamma^g$ is normalized to one. In

[24]The differential response across groups tends to increase if we include 2009, the year when the Austrian economy was hit by the global financial crisis. Total unemployment rose from 5.8% in 2008 to 7.2% in 2009 (Statistik Austria).

column 1 we use the set of industry-time interaction dummies ($\delta_{it}$) as a proxy for the shocks; in columns 2–4 the change in GVA or GDP, thus the non-linear term in equation (1) becomes a simple linear term ($\gamma^g \Delta X_{it}$, or $\gamma^g \Delta X_t$). Our results consistently show that the unemployment rate of immigrants, in particular from non-EEA countries, is significantly more sensitive to changes in the macroeconomic conditions than that of natives, even within skill groups (significant in three out of four specifications; denoted by an asterisk $^{(*)}$). The unemployment rate of non-EEA immigrants is also more responsive than that of immigrants from the EEA, in particular among low skilled workers (denoted by a $^{(+)}$). In particular, when the unemployment rate of high-skilled natives increases (decreases) by one percentage point the unemployment rate of high-skilled non-EEA immigrants increases by 2.66 percentage points, and the unemployment rate of low-skilled non-EEA immigrants increases by 3.68 percentage points (column 1). Using the change in industry-specific real GVA ($dGVA_{it}$) as a proxy for the labor market-specific shocks (column 2) leads to similar results; the standard errors are higher, though, and the differences between groups therefore turn insignificant.[25] In column 3, we use the change in the overall Austrian real GDP ($dGDP_t$), and in column 4 the cyclical component of the real GDP series ($cycGDP_t$).[26] Using national GDP (growth or the cyclical component) instead of industry-specific GVA growth as a proxy for the shocks yields a better model fit, lower standard errors, and significant results on the groups' relative responsiveness to changes in the business cycle.[27] In sum, our results consistently suggest a greater responsiveness of immigrants from non-EEA countries relative to natives or EEA-immigrants in terms of unemployment to a change in macroeconomic conditions. Importantly, this differential response does not seem to be driven by the industry composition of the native and immigrant workforce but persists even when accounting for the selection of immigrant and native workers into industries.

[25] Results basically do not change if we use lagged (by one year) GVA growth.

[26] We decompose the long-run series (from 1976 to 2010) into its trend and a cyclical component using the Hodrick-Prescott filter with smoothing parameter $\lambda = 6.25$ which is typically chosen for yearly data (see Ravn and Uhlig (2002)). For estimation we interact the cyclical component for the years 1996–2008 with the group dummy variables.

[27] The higher adjusted R-squared in the $\delta_{it}$-model (column 1) compared to the other models can be explained by the inclusion of the set of industry-time interaction dummies in the $\delta_{it}$ specification.

### 4.2.1 Industry-specific robustness checks

Workers in agriculture (including forestry, hunting and fishery, horticulture) are excluded from the above estimations due to a lack in observations. While jobs in agriculture are important for (low-skilled) foreign employment, the share of the total labor force in agriculture and the share of the Austrian GDP generated in this sector is small.[28] Furthermore, our results are not sensitive to including the observations for those groups in agriculture where we have reliable figures (results available upon request). In another sensitivity check we exclude the sector of hotels and restaurants, which is characterized by an important number of mostly low-skilled immigrants, often in seasonal jobs which might respond more strongly to cyclical fluctuations (see also summary statistics in Table 1).[29] Results are very robust to this check. Note, that our results are also robust to excluding construction and the public sector from estimation (results available upon request).[30]

# 5 Extensions

## 5.1 Symmetric response in economic up- and downturns

So far, we have implicitly assumed that any differential response between natives and immigrants is symmetric in times of economic expansion and contraction. We now relax this assumption and allow the group-specific responses to be different in economic downturns and upturns. The estimating model is:

$$\Delta y_{it}^{g} = \beta^{g} D^{g} + (\gamma^{g} D^{g} + \hat{\gamma}^{g} D^{g} * DOWN)\delta_{it} D_{it} + control\_variables + \Delta\epsilon_{it}^{g} \qquad (2)$$

where $DOWN$ is a dummy variable indicating years of economic contraction, which is interacted

[28] 4.7% and 1.5% in 2009, respectively; among the 4.7% only a minority (of about 20%) was in dependent employment; Grüner Bericht 2007, Statistik Austria, Bundesanstalt für Agrarwirtschaft.

[29] Note, however, that while employment in hotels and restaurants is certainly sensitive to the business cycle, this might not be reflected in the unemployment rate to this extent as these workers contribute only to the pool of employees, but not to the pool of unemployed (see section 3).

[30] Tenured sector workers - that is, civil servants - are excluded throughout the analysis.

with the group dummy variables $D^g$. The differential effect of group-specific responses in downturns is thus captured by $\hat{\gamma}^g$. Further *control_variables* are the same as in equation (1). We again capture the labor market-specific shocks by the set of industry–time interaction dummies ($\delta_{it}$) and define years of economic contraction according to the GDP movements in the period of observation.[31] Equation (2) is estimated by non-linear weighted least squares. Results are presented in Table 3. In column 1a we report the overall group-specific effects, $\gamma^g$ (normalized to one for native high-skilled workers) and in (1b) the change in the response between up- and downturns, $\hat{\gamma}^g$ (normalized to zero for the reference group). We do not find significant evidence for a different unemployment response in economic up- or downturns. None of the $\hat{\gamma}^g$ parameters of the immigrant groups is significantly different from the parameter of comparable native workers. Dustmann et al. (2010) report a similar finding for Germany in the period 1982–2002 but not for the U.K. where immigrants' unemployment tends to respond more strongly than that of natives during economic upturns and less strongly during downturns. Note, that our results are not sensitive to defining downturn periods differently, for example when looking at years with a (sharp) increase in unemployment.[32]

### 5.2 Impact of immigration policies over time

In a similar way as in section 5.1 we test whether there is a break over time in the differential unemployment response of worker groups linked to changes in Austrian immigration policies. Two major policy changes can be identified in the observation period that directly affected immigrants with restricted access to the labor market (see section 2). In 2001, the quota for unskilled workers was set to zero. The second major change was induced by the EU accession of South- and Eastern European countries in May 2004. Immigrants from these countries were given preferential treatment compared to (newly arriving) third-country citizens even though they were still facing labor market entry restrictions until May 2011. Noteworthy, immigrants from the EEA (which includes the new EU member states) experienced the largest employment growth over the sample period. In this

[31] We define the years 1996–1997, 2001–2003, and 2008 as downturn periods; see Figure 1.

[32] That is, the years 1996 and 2001–2005; results available upon request).

group the share of labor market entrants[33] increased from 15.2% in 1998 to 17.6% in 2005 among high-skilled (white collar) workers and from 7.6% to 18.1% among low-skilled (blue collar) workers. For comparison, in the group of non-EEA immigrants the share rose in the same period from 6.1% to 6.5% among high-skilled, and from 3.0% to 5.6% among low-skilled workers (ASSD, own calculations; see also Appendix figure A.2 on the share of labor market entrants in the respective immigrant groups).

In order to capture possible effects from the above mentioned policy changes we reestimate equation (2) including a dummy variable for the period 2001–2008 (*POST '01*) instead of *DOWN*.[34] Results are shown in column 2 of Table 3. The $\hat{\gamma}^g$ now denotes differences in the cyclical response of immigrants in the pre- and post period relative to the reference group (high-skilled natives). The results suggest a significant change in the cyclical response in the post 2001 period as all $\hat{\gamma}^g$ parameters are positive and significantly different from the reference group (for all but one group, that is, high-skilled immigrants from the EEA); column 2b. The unemployment rate of low-skilled immigrants from non-EEA countries has become more sensitive to changes in the macroeconomic conditions in the second period (+2.581), and significantly more so (at the 5% level) than the unemployment response of low-skilled natives (+1.52). Thus, the gap in the cyclical response between non-EEA immigrants and natives widened over time. Low-skilled immigrants from the EEA also experience a slightly higher responsiveness in the second period (+0.68), but this effect is significantly smaller than the one for low-skilled natives. Thus, the weaker responsiveness in the second period of immigrants from the EEA – compared to low-skilled natives – offsets the higher responsiveness in the first period such that we do not find a significantly different cyclical response of low-skilled EEA workers in the overall specification (Table 2, column 1). A plausible explanation for this finding is a stronger (positive) selection of EEA immigrants in the second period due to the above mentioned policy changes, in the course of which these immigrants entered the country

[33]Note, that labor market entrants are defined as such when they enter the Austrian labor force for the first time; we do not consider migrants re-entering the country in this share.

[34]The short time series does not allow to test for both policy changes separately, thus, we subsume both policy changes in the second half of our period of observation. See below for a different timing of the break.

either as key workers[35] ("Facharbeiter"), on the basis of short-term contracts (relevant in particular for immigrants from the new EU member states) or on the basis of free access to the labor market (EU-15 countries). In consequence, immigrants from the EEA are on average more likely than immigrants from non-EEA countries to enter the Austrian labor force with a job (and also to leave the country again, thus contributing less to the pool of unemployed). Among high-skilled workers the cyclical response is rather similar for EEA immigrants and natives in both periods whereas the gap between natives and non-EEA immigrants has also risen over time. Our results thus suggest that both policy changes have impacted the cyclical behavior of immigrants' unemployment relative to natives, amplifying the relative responsiveness of non-EEA workers and diminishing that of EEA workers.[36]

### 5.3 Seasonal employment and cyclical in- and out–migration

According to our results in sections 4.2, 5.1, and 5.2 immigrants in particular from non-EEA countries exhibit greater fluctuations in the unemployment rate over the business cycle than comparable natives. These differentials cannot be explained with the selection of workers into industries or differences in their group characteristics alone (such as skill- and age composition, mean tenure and unemployment duration and the share of labor market entrants). In this section, we analyze to what extent this result is driven by differences in the seasonal employment of immigrants and natives. We also address the question of cyclical in- and out-migration of migrants.

Previous studies have shown that temporary layoffs[37] in between seasonal jobs make up a large part of total unemployment[38] and that the ratio of temporary layoffs to all layoffs exhibits sub-

[35]Key workers are workers who possess special skills that are in particular demand on the labor market (not restricted to white-collar jobs).

[36]Alternatively, we include a dummy variable in equation (2) for the period after 2004, when the EU enlargement took place (*POST '04*). In this case, the marginal effect in the second period tends to get smaller but results do not change otherwise (not shown).

[37]That is, layoffs with a recall to work date.

[38]Feldstein (1975) and Lilien (1980), for example, estimate that rehires amount to over 70% of the laid-off workers in US manufacturing. For Austria, Fischer and Pichelmann (1991) derive roughly the same estimate for the proportion of temporary layoff unemployment in total unemployment.

stantial cyclical variation (see Feldstein, 1975, for evidence for the U.S. in the 1970s). Thus, the differential unemployment response of immigrants and natives over the business cycle might stem from differences in temporary unemployment if immigrants work disproportionately in seasonal jobs. We do not have direct information on temporary layoffs; however, the panel structure of our matched employer-employee data allows us to identify workers in seasonal jobs if they show a repeated seasonal employment pattern from one year to the next (see section 3.1 and B.2 for details). Seasonal jobs play an important role throughout most industries in Austria, and immigrants are on average more often in seasonal jobs than natives (Table 1). The vast majority of seasonal workers returns to the same employer in the next season,[39] thus we should capture temporary layoffs quite well. If temporary layoffs served to accommodate business cycle fluctuations (Lilien, 1980), the employment rate of immigrants might respond more strongly to cyclical changes than that of natives. We can easily test this by excluding the seasonal workforce[40] from the sample, recalculating the unemployment rates and re-estimating equation (1). Results are shown in Table 4. Column 1 restates our baseline results (from Table 2, column 1) and column 2 the results after excluding the seasonal workforce from the sample. While the standard errors tend to increase slightly the main result does not change: the unemployment rate of non-EEA immigrants is significantly more sensitive to labor market-specific shocks than that of natives and immigrants from the EEA. Interestingly, the gap in the unemployment response among natives and immigrants from non-EEA countries (shown in the last two rows of Table 4) tends to increase when the seasonal workforce is excluded from estimation, in particular among blue collar workers (where the vast majority of seasonal workers is to be found). This suggests that the typical (immigrant) seasonal worker has pursued a "stable" working career within a single firm for a substantial period of time even though the worker may have experienced frequent spells of temporary unemployment.[41] Typically, immi-

[39] 80% among native and 70% among immigrant seasonal workers return to the same employer; ASSD, own calculations.

[40] That is, workers in seasonal employment or "seasonally unemployed" workers. Workers are defined as "seasonally unemployed", if the employment spell preceding the unemployment spell was identified as a seasonal job in the sense described above.

[41] In these periods, however, the worker is protected by a comparably generous unemployment compensation system

grants from non-EEA countries ("guest workers") have been employed in low-skilled manual, and often seasonal, jobs. The general decline in the demand for such jobs over the sample period might also explain why the group of non-EEA immigrants performs worse[42] in the the period after 2001 relative to the pre–2001 period and to natives and immigrants from the EEA (see section 5.2).

Note that the above definition of seasonal employment also includes "temporary migrants" who leave the Austrian labor force after their seasonal employment and only return for another seasonal job in the following year. The size of the inflow of temporary migrants will be subject to cyclical changes in labor demand. In boom times they will reduce the unemployment rate of their respective group by adding to the pool of employees without adding to the pool of unemployed. In a further robustness check we therefore control for the cyclical in–migration of temporary migrants by excluding them from the sample.[43] Again, the differences in the cyclical unemployment response between natives and (non-EEA) immigrants remain highly significant, however, the gap in the unemployment response now tends to slightly decrease (results available upon request).

More generally, we can control for the cyclical in–migration of migrants by looking at a balanced panel[44] of immigrants who were already in the country at some reference date; that is, we look at the group of immigrants that entered the Austrian labor force at latest in 1995. Again, results are very robust to this check (column 3 of Table 4). Whereas standard errors slightly increase, the differential response between natives and non-EEA immigrants remains highly significant.

Overall, our results are thus not driven by differences in the temporary employment structure of immigrants relative to natives, or by the cyclical in–migration of migrants during our period of observation.

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in Austria

[42]That is, their employment has become more sensitive to the ups and downs of the business cycle.

[43]Specifically, we exclude those immigrants from the sample who work in Austria for up to six months, leave the labor force and possibly come back for the next year's season; that is, migrants in (repeated) temporary employment who never show up in the unemployment records.

[44]The panel is balanced for immigrants in the sense that we exclude immigrants entering the labor force after 1995. We do not control for (cyclical) out–migration (or movements out of labor force), however, as the subset of immigrant workers who are in the panel throughout the entire period of observation represents a too small and too strongly selected sample.

# 6 Immigrants' and natives' worker flow rates

The aggregate measure of the unemployment rate is silent about the underlying worker flows between the states of employment, unemployment, and out of labor force. The cyclical behavior of the unemployment rate, however, is determined by these flows (Darby et al., 1986; Blanchard et al., 1990; Merz, 1999). In this section we have a closer look at the worker flows into and out of unemployment among natives and immigrants over the business cycle.

Exploiting the individual-level panel data information we construct monthly gross worker flows into and out of unemployment, based on the relationship between total unemployment next month ($U_{t+1}$), total unemployment this month ($U_t$), and inflows into and outflows from unemployment (see also Dixon et al., 2011). Dropping groups' sub- and superscripts for simplicity and letting $t$ denote months, the following equality must hold:[45]

$$U_{t+1} = U_t + IN - OUT$$

that is, unemployment next month equals the sum of unemployment this month plus unemployment inflows minus outflows between $t$ and $t+1$. In order to capture changes in the labor force we allow for flows between all three states; that is, inflows into unemployment are the sum of flows from employment and out of labor force, and outflows are the sum of flows to employment or out of labor force.[46] We seasonally adjust the flows by regressing them on monthly dummies and adding the residuals back to the series' mean.[47] Dividing the flows by the (seasonally adjusted) labor force in $t$ gives a monthly *inflow* and *outflow* rate.

[45] We rely on administrative records and not on survey data; thus, we are confident that the computed gross flows are accurate and, in particular, do not suffer from missing observations (rotation group bias) or from classification (interview or coding) errors.

[46] Out of labor force is not directly coded in the ASSD; however, we can define gaps within a worker's career, that is, spells where the worker is neither employed nor unemployed, as out of labor force.

[47] Results are robust to a different smoothing of the data; that is, by creating a uniformly weighted moving average of the respective time series. For the blue-collar series, which show a very strong seasonal pattern, we include 12 lagged and 12 leading terms, for the white-collar series we include 5 lagged, 5 leading terms and the current observation.

### 6.1 Estimating worker flow rate differentials

To estimate group-specific worker flow rates, we express the monthly *inflow* and *outflow* rates as yearly averages. Figure 3 plots the group-specific unemployment flows in yearly averages for blue- and white collar workers. Generally, inflows are slightly leading outflows, and immigrants within both skill groups experience on average higher flow rates than comparable natives.

We reestimate equation (1) with the (yearly averaged) group and industry-specific worker flow rates as outcome variables. We exploit variation in the worker flows over the same set of industries as before, with the exception that civil services and public health are now grouped together.[48] Shocks are approximated by the set of industry-time interaction dummies, $\delta_{it}$ (see section 4.1). Results are reported in Table 5. We find that both, the inflow rate (column 1) and the outflow rate (column 2) of non-EEA immigrants respond significantly more strongly to the ups and downs of the business cycle compared to natives and also immigrants from the EEA, in particular among low-skilled workers. A one percentage point increase (decrease) in the inflow rate of high-skilled native workers is associated with a 2.73 percentage point increase (decrease) in the inflow rate of high-skilled non-EEA immigrants (not significantly different from natives, though) and a 6.54 percentage point increase in the inflow rate of low-skilled non-EEA immigrants. The mirror image holds true for the outflow rate.[49] Summing up, we find that immigrants in particular from non-EEA countries lose jobs faster in economic downturns but also gain jobs faster in upturns.

## 7 Conclusion

The economic up- and downturns in the course of the business cycle affect the prospects of workers in the labor market. Different groups of workers are, however, affected differently. We use matched employer-employee data for Austria in the period 1995–2008 to analyze the differential impact of

[48] The observed number of inflows and outflows is too small when looking at these two industries separately. See Appendix B.1 for details on industries.

[49] Results are not sensitive to the exclusion of flows from and into out of labor force.

a change in macroeconomic conditions on the unemployment prospects of immigrants and natives. We distinguish workers by citizenship, skill, and their industry affiliation. We find that, first, the unemployment rate of low-skilled workers is more responsive to changes in macroeconomic conditions than that of high-skilled workers, and that, second, immigrants are more responsive than natives, even within skill- and industry groups. In the analysis we put special emphasis on the possible selection of immigrants into specific industries or into temporary jobs in explaining this result. Even though immigrants and natives differ substantially in their likelihood to work in occupations and industries particularly prone to business cycle fluctuations or in temporary jobs we do not find evidence for our results to be driven by such selection, nor can they be explained with the cyclical in–migration of (temporary) migrants.

It is possible that the greater cyclical fluctuation of (non-EEA) immigrant employment is due to those immigrants' lower skill levels even within our groups of low-skill (blue-collar) and high-skill (white-collar) workers. As pointed out in Orrenius and Zavodny (2010), firms tend to fire workers with the least skill levels first during economic downturns, for example because their sunk cost in the form of training is lowest. In turn, immigrants may be more mobile and find alternative employment more quickly than natives. Indeed, we find that inflow and outflow rates of immigrants from non-EEA countries fluctuate significantly more strongly over the cycle than those of comparable natives and immigrants from the EEA. Immigrants from outside the EEA lose jobs faster in economic downturns but also gain jobs faster in upturns. However, the groups of workers that exhibit the highest mobility in the labor market—low skilled workers and immigrants from non-EEA countries—also experience the highest rates of unemployment, indicating that a greater variance in employment does not promote average employment rates.

# Figures and Tables

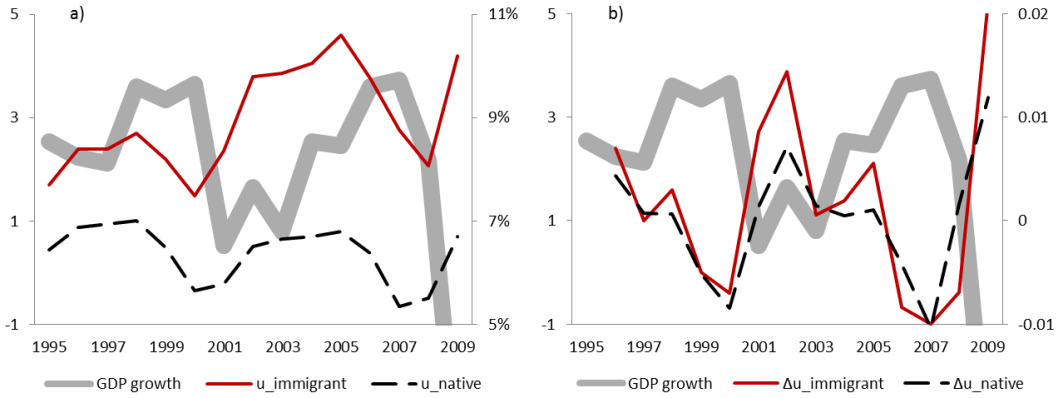


Figure 1: Unemployment over the business cycle in Austria
Left axes: real GDP growth rate.
Right axes: panel a) Unemployment rates (native and immigrant),
panel b) change in unemployment rate from $t$ to $t-1$.
Data source: Statistik Austria.

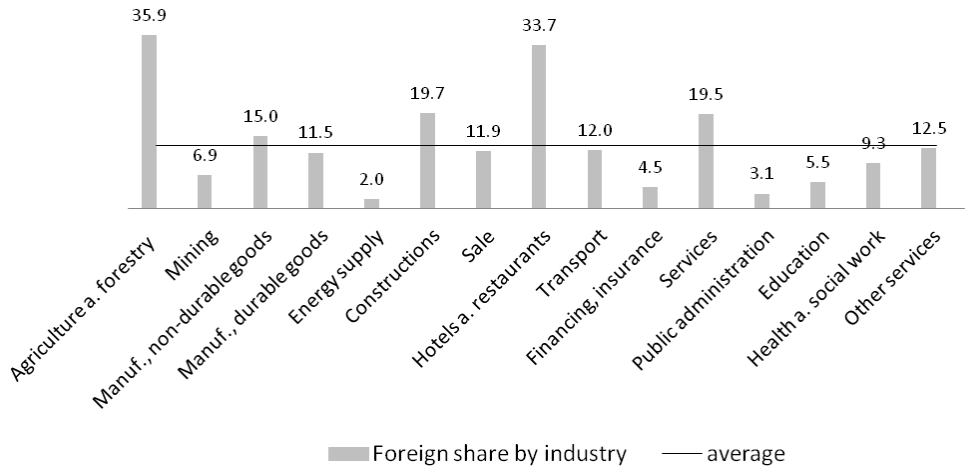


Figure 2: Foreign share of workers in Austria, by industry (2007)
Data source: Biffl (2008).

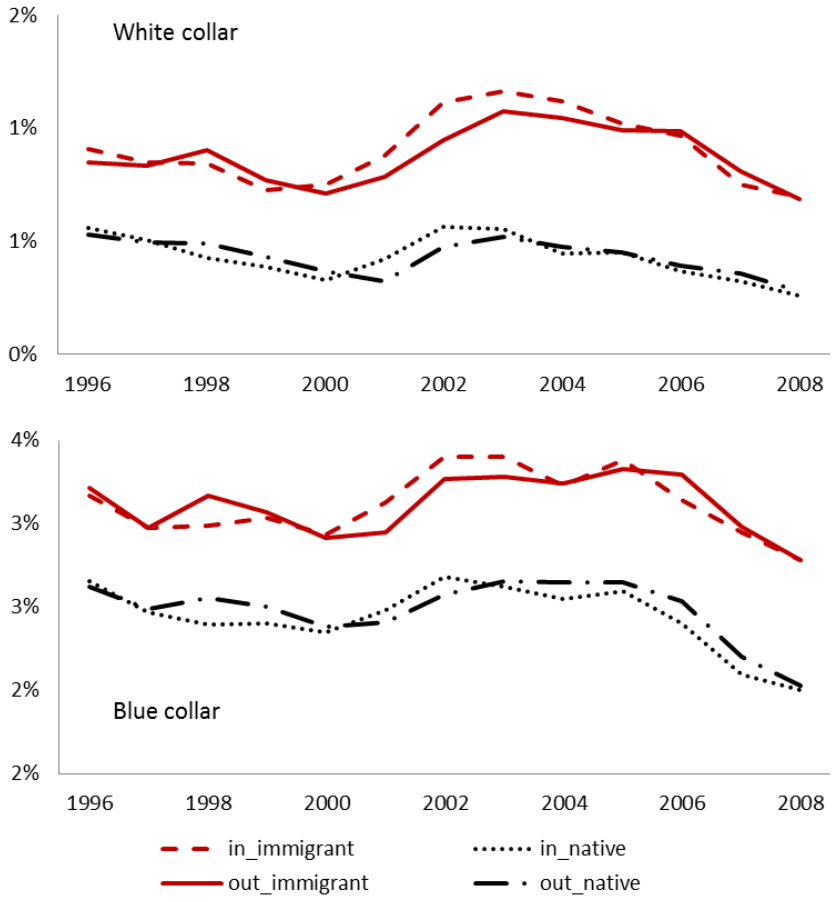


Figure 3: Gross worker flows into and out of unemployment

Seasonally adjusted monthly flows, expressed as yearly averages; source: ASSD.

Table 1: Summary statistics: Male native and immigrant employment in Austria (1995–2008)

| | Native | | EEA | | Non-EEA | |
|---|---|---|---|---|---|---|
| | white-col. | blue-col. | white-col. | blue-col. | white-col. | blue-col. |
| *Occupational structure of employment* | | | | | | |
| Share white-collar | 48.7 | | 32.3 | | 10.8 | |
| Share blue-collar | | 51.3 | | 67.7 | | 89.2 |
| *Sectoral structure of employment, by industry°* | | | | | | |
| Agriculture, forestry | 0.4 | 1.1 | 0.3 | 6.8 | 0.1 | 2.4 |
| Manufacturing | 23.6 | 38.0 | 21.3 | 22.3 | 15.7 | 28.7 |
| Construction | 5.9 | 19.8 | 3.8 | 22.3 | 4.8 | 24.8 |
| Sales | 20.7 | 12.1 | 18.5 | 10.3 | 26.0 | 11.5 |
| Hotels and restaurants | 1.1 | 5.0 | 2.9 | 15.6 | 5.8 | 11.0 |
| Transport | 5.8 | 9.0 | 5.8 | 10.3 | 9.5 | 8.7 |
| Business services | 21.7 | 5.9 | 22.8 | 8.8 | 15.4 | 9.4 |
| Admin., educ., int. organizations | 12.2 | 5.9 | 11.6 | 0.6 | 10.2 | 1.0 |
| Health, social work | 3.9 | 0.8 | 5.2 | 0.4 | 5.4 | 0.4 |
| Other services | 4.7 | 2.3 | 7.8 | 2.6 | 7.0 | 2.1 |
| TOTAL | 100 | 100 | 100 | 100 | 100 | 100 |
| *Unemployment rate** | | | | | | |
| Agriculture, forestry | 3.8 | 19.6 | 3.6 | 2.8 | 10.0 | 17.0 |
| Manufacturing | 3.6 | 7.6 | 3.0 | 6.3 | 5.3 | 9.9 |
| Construction | 5.6 | 17.1 | 6.2 | 11.6 | 14.2 | 19.4 |
| Sales | 6.9 | 11.4 | 6.1 | 7.7 | 12.8 | 13.5 |
| Hotels and restaurants | 10.7 | 19.5 | 7.8 | 6.7 | 9.7 | 14.3 |
| Transport | 6.2 | 11.2 | 4.8 | 5.2 | 9.1 | 13.2 |
| Business services | 4.8 | 25.3 | 4.7 | 12.9 | 11.1 | 24.4 |
| Admin., educ., int. organizations | 2.5 | 7.8 | 2.3 | 10.7 | 3.5 | 13.5 |
| Health, social work | 3.7 | 27.4 | 3.5 | 22.3 | 6.5 | 30.4 |
| Other services | 6.9 | 18.5 | 6.3 | 8.7 | 8.8 | 16.1 |
| ALL INDUSTRIES | 4.9 | 12.8 | 4.6 | 8.2 | 9.5 | 15.5 |
| *Share of seasonal employment*** | | | | | | |
| Agriculture, forestry | 2.0 | 25.3 | 8.4 | 31.0 | 7.6 | 46.8 |
| Manufacturing | 0.4 | 2.7 | 1.5 | 4.4 | 0.7 | 3.3 |
| Construction | 2.1 | 23.2 | 3.4 | 20.4 | 7.3 | 26.7 |
| Sales | 0.9 | 4.0 | 2.3 | 6.7 | 1.5 | 5.2 |
| Hotels and restaurants | 6.6 | 24.0 | 11.1 | 35.6 | 3.1 | 28.2 |
| Transport | 0.8 | 10.8 | 2.4 | 10.4 | 0.9 | 8.0 |
| Business services | 0.5 | 8.8 | 2.1 | 18.2 | 1.8 | 9.0 |
| Admin., educ., int. organizations | 1.2 | 4.0 | 6.0 | 7.0 | 4.8 | 8.7 |
| Health, social work | 0.6 | 2.2 | 1.4 | 4.4 | 0.7 | 2.4 |
| Other services | 2.7 | 8.9 | 6.9 | 23.1 | 5.2 | 9.8 |
| ALL INDUSTRIES | 0.9 | 9.6 | 3.2 | 17.2 | 2.3 | 14.3 |

Source: Austrian Social Security Database (ASSD), own calculations. Sample based on male white-collar and blue-collar workers.

° See appendix B.1 for details on industries.

* Rate defined as: Unemployed/(Employed+Unemployed).

** Share defined as: Seasonal employees/all employees.

Table 2: Unemployment rate differentials (1996–2008)

| *Sample: All workers* | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *Business cycle measure:* | $\delta_{it}$ | $dGVA_{it}$ | $dGDP_t$ | $cycGDP_t$ |
| **High-skilled workers** (white-collar) | | | | |
| _native | 1 | 1 | 1 | 1 |
| _EEA | 1.220 | 1.483 | 1.292 | 0.950 |
| | [0.239] | [1.137] | [0.402] | [0.254] |
| _nonEEA | 2.656 *+ | 2.185 | 2.456 * | 2.848 *+ |
| | [0.530] | [1.736] | [0.635] | [0.769] |
| **Low-skilled** (blue-collar) | | | | |
| _native | 2.617 | 1.912 | 1.597 | 2.063 |
| | [0.397] | [1.462] | [0.345] | [0.599] |
| _EEA | 2.375 | 0.872 | 0.985 | 0.827 * |
| | [0.394] | [0.907] | [0.301] | [0.258] |
| _nonEEA | 3.678 *+ | 2.980 | 2.623 *+ | 2.842 + |
| | [0.542] | [2.281] | [0.514] | [0.720] |
| Obs. | 702 | 702 | 702 | 702 |
| Adj.R-sq | 0.865 | 0.23 | 0.311 | 0.351 |
| # Iterations | 20 | 4 | 4 | 4 |
| RSS | 156 | 890.5 | 796 | 749.8 |

NOTES: Sample includes only males. Estimation by non-linear weighted least squares. Unemployment rates calculated from quarterly data summed over years. Std. errors (clustered at the group/industry level) in parenthesis. Only $\gamma$-parameters shown. *Business cycle measure*: $\delta_{it}$: industry-time interaction dummies; $dGVA_{it}$: GVA growth rate (industry-specific); $dGDP_t$: (national) GDP growth rate; $cycGDP_t$: Cyclical component of HP-filtered (national) GDP. See Appendix B.1 for details on industries.

* Sign. different at 5% level from *native* within the same skill-group.

+ *Non-EEA* workers sign. different at 5% level from *EEA* workers within the same skill-group

Table 3: Unemployment rate differentials - Extensions I

| *Sample: All workers;* | *Business cycle measure: $\delta_{it}$* | | | |
|---|---|---|---|---|
| | *Asymmetric response* | | *Break over time* | |
| | (1) | | (2) | |
| | (a) | (b) | (a) | (b) |
| **High-skilled** (white-collar) | | *downturn* | | *after 01* |
| _native | 1 | 0 | 1 | 0 |
| _EEA | 1.402 | -0.326 | 0.949 | 0.417 |
| | [0.536] | [0.569] | [0.204] | [0.338] |
| _nonEEA | 2.681 ° | -0.040 | 1.229 | 1.937 *+ |
| | [0.939] | [1.044] | [0.342] | [0.712] |
| **Low skilled** (blue-collar) | | | | |
| _native | 2.741 | -0.261 | 1.488 | 1.516 |
| | [0.889] | [0.982] | [0.221] | [0.446] |
| _EEA | 2.505 | -0.272 | 1.884 * | 0.676 * |
| | [0.813] | [0.875] | [0.250] | [0.387] |
| _nonEEA | 4.307 *+ | -1.119 | 1.806 * | 2.581 *+ |
| | [1.377] | [1.470] | [0.266] | [0.644] |
| Obs. | 702 | | 702 | |
| Adj.R-sq | 0.867 | | 0.871 | |
| # Iterations | 34 | | 31 | |
| RSS | 154.2 | | 149.4 | |

NOTES: See Table 2. Business cycle measure $\delta_{it}$: industry-time interaction dummies. Asymmetric response: see main text for timing of economic downturn. Break over time: see main text.
* Sign. different at 5% level from *native* within the same skill-group.
+ *Non-EEA* workers sign. different at 5% level from *EEA* workers within the same skill-group
° *Non-EEA* workers sign. different at 10% level from *native* and *EEA* workers within the same skill-group

Table 4: Unemployment rate differentials - Extensions II

*Business cycle measure:* $\delta_{it}$

| | (1) | (2) | (3) |
|---|---|---|---|
| *Sample:* | All workers (baseline) | Non-seas. workers excl. | Balanced panel |
| **High skilled workers** (white-collar) | | | |
| _native | 1 | 1 | 1 |
| _EEA | 1.220 | 1.244 | 1.511 |
| | [0.239] | [0.277] | [0.308] |
| _nonEEA | 2.656 *+ | 2.741 *+ | 2.434 * |
| | [0.530] | [0.613] | [0.567] |
| **Low skilled** (blue-collar) | | | |
| _native | 2.617 | 2.453 | 2.631 |
| | [0.397] | [0.435] | [0.439] |
| _EEA | 2.375 | 2.358 | 2.958 |
| | [0.394] | [0.454] | [0.512] |
| _nonEEA | 3.678 *+ | 3.858 *+ | 3.690 *+ |
| | [0.542] | [0.669] | [0.609] |
| Obs. | 702 | 702 | 702 |
| Adj.R-sq | 0.865 | 0.843 | 0.864 |
| # Iterations | 20 | 19 | 19 |
| RSS | 156.0 | 163.2 | 169.3 |
| *White-collar gap* | 1.66 | 1.74 | 1.43 |
| *Blue-collar gap* | 1.06 | 1.41 | 1.06 |

NOTES: See Table 2. *White-collar* and *Blue-collar gap*: Gap in unemployment response between natives and non-EEA immigrants, in the respective skill-group.
* Sign. different at 5% level from *native* within the same skill-group.
+ *Non-EEA* workers sign. different at 5% level from *EEA* workers within the same skill-group.

Table 5: Worker flow differentials

| *Sample: All workers;* | *Business cycle measure: $\delta_{it}$* | |
|---|---|---|
| | (1) | (2) |
| *Dep. var.* | *Inflow rate* | *Outflow rate* |
| **high-skilled** (white-col.) | | |
| _native | 1 | 1 |
| _EEA | 0.740 | 1.467 |
| | [0.434] | [0.399] |
| _nonEEA | 2.729 + | 3.821 *+ |
| | [1.068] | [0.856] |
| **low-skilled** (blue-col.) | | |
| _native | 4.151 | 4.225 |
| | [1.452] | [0.929] |
| _EEA | 4.334 | 5.116 |
| | [1.526] | [1.136] |
| _nonEEA | 6.543 *+ | 6.827 *+ |
| | [2.228] | [1.415] |
| Obs. | 624 | 624 |
| Adj.R-sq | 0.738 | 0.788 |
| # Iterations | 22 | 22 |
| RSS | 5.4 | 4.6 |

NOTES: See Table 2. Monthly unemployment flow rates expressed as yearly averages.
* Sign. different at 5% level from *native* within the same skill-group.
+ *Non-EEA* workers sign. different at 5% level from *EEA* workers within the same skill-group.

# A Appendix figures and tables

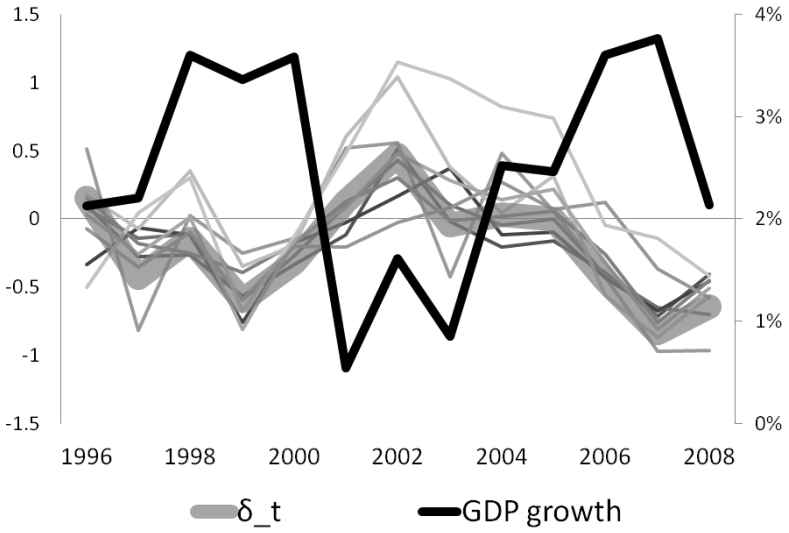


Figure A.1: Industry-specific $\delta_{rt}$ from equ. (1) (thin lines), overall $\delta_t$, and national GDP growth

GDP data from Statistik Austria.

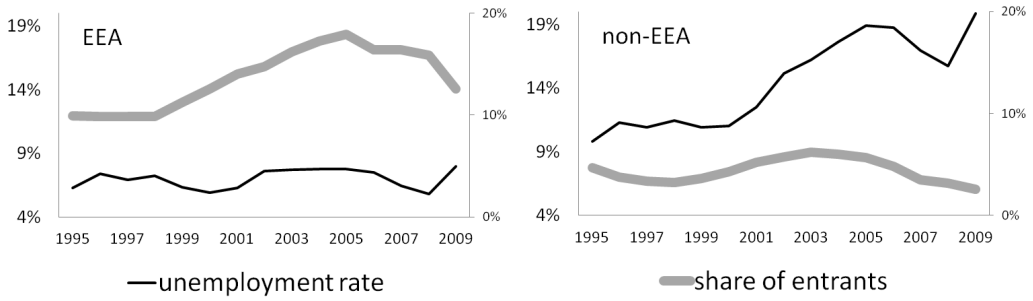


Figure A.2: Unemployment rate (left axes) and share of labor market entrants among EEA and non-EEA immigrants (right axes)

Source: ASSD, own calculations.

Table A.1: Unemployment rates (ILO definition), in selected countries (2007 and 2009)

| | 2007 | | 2009 | |
|---|---|---|---|---|
| | Native-born | Foreign-born | Native-born | Foreign-born |
| Austria | 3.5 | 9.0 | 3.9 | 9.5 |
| Belgium | 6.5 | 16.3 | 6.6 | 16.2 |
| Denmark | 3.4 | 8.2 | 5.7 | 9.9 |
| Finland | 6.7 | 14.4 | 8.0 | 15.4 |
| France | 7.2 | 13.8 | 8.4 | 14.2 |
| Germany | 6.7 * | 12.3 * | 6.9 | 12.8 |
| Greece | 8.4 | 8.7 | 9.3 | 12.0 |
| Ireland | 5.8 * | 7.6 * | 11.2 | 15.4 |
| Italy | 6.0 | 7.9 | 7.5 | 11.0 |
| Netherlands | 2.8 | 6.7 | 2.9 | 6.8 |
| Portugal | 8.4 | 9.7 | 9.7 | 13.1 |
| Spain | 7.6 | 11.7 | 16.0 | 27.2 |
| Sweden | 5.3 | 12.1 | 7.2 | 15.4 |
| United Kingdom | 5.1 | 7.4 | 7.5 | 8.9 |

*) Data from 2008

SOURCE: International Migration Report SOPEMI 2010 (OECD 2010).

Table A.2: Foreign share in selected countries, total population (2010)

| | **Foreign citizens** | | | **Foreign-born pop.** | | |
|---|---|---|---|---|---|---|
| | total | EU27 | else | total | EU27 | else |
| *in percent of total population* | | | | | | |
| Austria | 10.5 | 3.9 | 6.5 | 15.2 | 6.1 | 9.1 |
| Belgium | 9.7 | 6.6 | 3.1 | - | - | - |
| Denmark | 6 | 2.1 | 3.9 | 9 | 2.8 | 2.6 |
| Finland | 2.9 | 1 | 1.8 | 4.3 | 1.5 | 2.8 |
| France | 5.8 | 2 | 3.8 | 11.1 | 3.3 | 7.8 |
| Germany | 8.7 | 3.1 | 5.6 | 12 | 4.2 | 7.8 |
| Greece | 8.4 | 1.4 | 7 | 11.1 | 2.8 | 8.3 |
| Ireland | 8.6 | 6.9 | 1.7 | 12.7 | 9.8 | 2.9 |
| Italy | 7 | 2.1 | 5 | 8 | 2.6 | 5.3 |
| Netherlands | 3.9 | 1.9 | 2.1 | 11.1 | 2.6 | 8.5 |
| Portugal | 4.3 | 0.9 | 3.4 | 7.5 | 1.8 | 5.7 |
| Spain | 12.3 | 5.1 | 7.3 | 14 | 5.1 | 8.9 |
| Sweden | 6.3 | 2.8 | 3.5 | 14.3 | 5.1 | 9.2 |
| United Kingdom* | 7 | 3.1 | 3.9 | 11.3 | 3.6 | 7.7 |

*) Provisional
-) not available

SOURCE: Eurostat newsrelease 105/2011.

# B Sample description

## B.1 Definition of industry clusters

The industry groups in our analysis consist of the following: agriculture (agriculture, fishery, forestry, horticulture), manufacturing (mining, production of durable and non-durable goods, energy supply), constructions, sales (wholesale and retail trade, repair of motor vehicles), hotels and restaurants, transport (transport, storage, and communication), services (financial services, insurance, real estate, renting, and business activities including provision of personal), administration (public administration, education, adult and other education, driving school activities, international organizations), health and social work, other services (other community, social, and personal service activities like sewage and refuse disposal, activities of membership organizations like business organizations and trade unions, recreational, cultural, and sporting activities, news agency activities).

## B.2 Unemployment rates

Our sample consists of a random draw of male individuals in the Austrian Social Security Database (ASSD) in the period 1995-2009 (born between 1945 and 1985). The sampling size differs for natives and immigrants: we draw a 5% sample of Austrian workers, and a 80% sample of workers with non-Austrian citizenship. As native workers are much more evenly distributed over industries and skills, a smaller sample assures that we have a large enough number of unemployed to obtain reliable unemployment rates within each skill and industry (or region) group. For immigrants, the sample has to be larger to obtain reliable figures also for worker groups of those skills and industries where immigrants are typically less represented, such as high-skilled workers in construction among the group of non-EEA immigrants. Each individual has a unique person identifier (the anonymized social security number) which is used to link individuals to their employment spells. Hence, we can track the daily employment history of the sampled individuals in the period under consideration.

Employment spells can be linked to an employer, which reveals information on industry affiliation and firm (and worker) location. We focus on two employment states that are directly coded in the ASSD data: white-collar employment ("Angestellte") and blue-collar employment ("Arbeiter"). White- (blue-) collar unemployment is defined as such if the respective unemployment spell was preceded by a white- (blue-) collar employment spell. From this sample of individual white- and blue-collar spells a quarterly stock sample is generated. Quarterly observations of the number of employed and unemployed are summed over years to take out the seasonality of the data. The yearly stock sample is finally collapsed into cells defined by skill (white- and blue-collar), industry, and citizenship group (natives, immigrants from the EEA, and immigrants from non-EEA countries). Unemployment rates are calculated within each cell.

### B.2.1 Seasonal employment in Austria

Seasonal workers can be identified from the individual spell sample: as we observe the daily employment history of workers, we can identify workers with a repeated seasonal employment pattern (we follow a definition laid out by Del Bono and Weber (2008) who also use the ASSD data; see their paper for details). For the sample of non-seasonal workers, we exclude these seasonal workers from the labor force before the data is collapsed into cells as described above.

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