

IMMIGRATION AND THE EARNINGS OF YOUNG NATIVE WORKERS

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This paper studies the impact of increased immigration in Austria on the wages of young native blue collar workers. We find that in regions, industries, or firms with a larger foreign share, Austrians earn higher wages. With respect to the impact of changes in the immigrant share on wage growth, the results are mixed. We develop a simple bargaining model which is consistent with these surprising results.

1. Introduction

IMMIGRATION policy has become a hotly debated issue in most Western European countries. With the fall of the Iron Curtain the possibility of mass migration from Russia and other former communist countries alarmed politicians and laymen alike. One of the main arguments for restricting legal immigration is the fear that immigrants might have a negative impact on labour market prospects of natives.¹ This distinctive public opinion contrasts sharply with widely acknowledged economic evidence.

The usual economic apparatus for analysing this question is a production framework. A growing number of immigrants with given qualifications raises the supply of this particular labour input. Depending upon the patterns of substitutability or complementarity in the production process, demand for native workers may fall or rise. Empirically, it is useful to separate different groups of native workers. Due to the limited transferability of skills, it can be assumed that immigrant labour is—at least initially—less skilled than native labour. Therefore, it can be argued that immigrants should compete on the labour market mostly with unskilled blue-collar workers, whereas complementarity can rather be assumed between skilled white-collar workers and aliens.

In recent years several studies investigated the US experience in the 1970s and the 1980s. Using regional variation in the labour supply of foreign workers, they indicate that the impact on native wages attributable to an increase in the supply of immigrants is numerically small. For an increase of 10% in the size of the immigrant population, different studies calculate a change in natives' earnings between -0.3 and $+0.5\%$.² These results refer to different native sub-samples, where the most significant negative impact of recent immigrants was found among earlier immigrant cohorts of the same ethnicity or black

¹ See Mörth *et al.* (1993) for recent opinion polls in Austria.

² See e.g. Borjas (1987), Altonji and Card (1991), LaLonde and Topel (1991), Grossman (1982).

workers. The impressive capacities of US local labour markets to absorb large immigrant flows is further confirmed by Card (1990). He investigates the Miami labour market between 1980 and 1985 after the sudden influx of over 100,000 Cuban emigrants, who comprised more than 7% of Miami's labour force (Mariel Boat lift). 'Nevertheless, the Mariel influx appears to have had virtually no effect on the wages or unemployment rates of less-skilled workers' (Card 1990, 245).³

Contrary to the extensive and systematic research in this area in the US, empirical evidence for European countries is sparse. The only available evidence refers to Germany and Austria. De New and Zimmermann (1993, 1994) use the share of immigrants per industry as an explanatory variable in their wage regressions. They find that most demographic groups are substitutes for foreign workers. For their whole sample a 1%-point increase in the share of foreign labour implies a reduction in the hourly wage of over 4%, a relatively large effect. Pischke and Velling (1994) use aggregate data for local labour markets in Germany. After controlling for self-selection of migrants, they find no adverse effects of aliens either on wages or on unemployment rates of natives.⁴ Applying descriptive techniques on employment dynamics of Austrian firms Brandel *et al.* (1994) conclude that the recent surge of new immigrants led to a significant displacement of low-qualified natives and guest-workers of earlier generations.

In Section 2 we try to replicate the available studies by investigating the impact of the regional or industry share of foreign labour on earnings of native workers. We concentrate on possible effects on young male native blue-collar workers, a group which should compete most heavily with migrant workers. To model changing conditions on the Austrian labour market we use two samples, a cross-section for 1991 and a panel covering the period 1988–91, the period with the most significant increase in foreign workers in Austria.

In Section 3 we consider a further channel, whereby detrimental impacts of immigration can be in effect. If wages are negotiated at the firm level and migrant workers are less strike-prone, then bargaining power of workers will be lower the higher the share of foreign workers in the firm. On the other hand, a high level of aliens in the firm might be considered as beneficial to natives, if natives are able to exploit the foreigners in a two-tier wage system. Section 3 elaborates these issues theoretically and empirically. In Section 4 we complement these cross-section results with first-difference estimations for the period 1988–91. Section 5 concludes and discusses possible caveats and omissions of the analysis. The main innovations of the paper are, thus, twofold: (i) we present a two-tier bargaining model which is able to explain positive wage impacts of increased immigration, even if natives and aliens are close substitutes; (ii) our empirical estimates for Austria show that most publicly expressed fears of detrimental impacts of immigration on wages are unwarranted.

³ Special issues along the US-Mexican border are explored by Davila and Mattila (1984) and Manson *et al.* (1985).

⁴ See also Hatzius (1994) for wage and unemployment effects of German immigration.

2. Labour supply effects of immigration

2.1. Institutional background

Like Germany, Austria pursued active recruitment policies for guest-workers in Southern European countries in the 1960s. Owing to recruitment stops during subsequent recessions, the share of foreign workers in Austria fell from 7.5% in 1972 to 5.5% in 1982, only to rise again to 9.6% in 1992. Especially the years 1989 and 1990 experienced a dramatic increase in employment of foreigners. For this reason we pay special attention to this period. Of these recent immigrants, around 70% came from former Yugoslavia or Turkey.⁵ The number of workers coming from Eastern European countries has risen considerably, and reached a level of 16% among the aliens in 1992. Labour force participation rates of immigrants are higher compared with natives'. The foreign share in the total population in Austria rose from 3.9% in 1981 to 6.6% in 1991 (official census data). On the other hand, the unemployment rate for aliens has been slightly higher, fluctuating between 5.9% and 7.8% in the period 1988–91, compared with 5.0–5.8% for natives.

Employment of foreign labour is very restrictive in Austria. Three different stages for immigrants have to be distinguished. Newly arriving immigrants get a 'temporary work permit I' (*Beschäftigungsbewilligung*) which is valid for one year.⁶ Only the employer may apply for such a work permit, which is issued for a specific worker, a specific firm, and a specific task within the firm. Consequently, the foreigner is not allowed to change jobs. After one year the worker may apply for a 'temporary work permit II' (*Arbeitserlaubnis*), allowing job changes within the region. Finally, aliens who have been working for three years are entitled to a 'permanent work permit' (*Befreiungsschein*). The number of foreign workers can be regulated by a restrictive issuing of 'temporary work permits I'. In recent years the Secretary of Labour additionally set a quota for the maximum employment of immigrants as a percentage of the total workforce.

2.2. Data

We use a sample drawn from Austrian social security records. In these files detailed information for all workers holding a social security card is available from 1972 onwards. As the data have been processed for social security purposes, several drawbacks arise. First, there is no information on family affiliation. Second, the level of schooling had to be approximated by the year of entry into the labour force; this gives the maximum possible number of years. Third, only monthly earnings data are available which are upper censored because of the contribution assessment ceiling (*Höchstbemessungsgrundlage*) in the social security system; no information on hours worked is available.

⁵ See Winter-Ebmer (1994) for an analysis of earnings of guest-workers in Austria.

⁶ Recognised asylum seekers—which have always been in very small numbers—automatically get a work permit; individuals entering through family unification had until recently (1992) the right to apply for such a work permit (Schamschule 1993).

To circumvent some of these problems we concentrate on male native blue-collar workers⁷ below the age of 31. These are predominantly full-time workers and the contribution assessment ceiling is found to be non-binding. Furthermore, this sub-group is very interesting to study because it should be one of the closest substitutes to foreigners. If immigrant workers face the problem of transferability of skills they should compete with the least qualified segment of the labour market. Together with past labour market performance of the individuals, we also exploit information on the firms where these workers are employed. These firm-specific characteristics will be dealt with especially in Section 3.

2.3. Results

Instead of estimating a full demand system, as e.g. Borjas (1983) or Grossman (1982),⁸ we regress the logarithmic monthly earnings ($\ln W_i$) for natives on a number of human capital variables (X_i) and the share of foreign workers in an industry (n_{iJ}) or a region (n_{iR}). In all regressions we also included some aggregate variables (Z_i): regional unemployment rates and, as a proxy for capital intensity, the investment/output ratio; to control for a differing dynamic development of industries we included the variable 'growth of employment in the last ten years'.

$$\ln W_i = \alpha X_i + \beta n_{iJ} + \gamma Z_i + \varepsilon_i \quad J = I, R \quad (1)$$

Results for the wage regressions using a regional measure of the foreign share of workers are shown in the upper part of Table 1, those on an industry basis in the lower part.⁹ As we concentrate on male blue-collar workers only, the selection process into our sample has to be modelled with a Heckman-type correction term—running a probit regression for the probability of being a blue- versus white-collar worker first (see the footnotes of Table 1 for details). In Column 1 OLS-estimates are presented. As the share of the foreign workers may be endogenously determined, we proceed by instrumenting the foreign share variable. For instruments we use regional or industry-specific indicators, respectively, primarily the immigrants' mean wage. As immigrants tend to cluster where a foreign population already exists, we also take into account immigrant shares in 1981. To control for the attraction of foreign workers by a dynamic labour market, we include employment growth in the labour market segment over the last ten years. Furthermore, to capture additional structural components, the current share of women and blue-collar workers is used.

⁷ As all persons employed in hotels and restaurants are classified as white-collar workers we included all workers in this industry in our sample.

⁸ See also Gang and Rivera-Batiz (1993) for an innovative approach with a production function with education, experience, and unskilled labour as inputs, provided by native or immigrant workers.

⁹ Observations with missing industry or regional affiliation were deleted in the respective equations.

TABLE 1
Wage impact of foreigners on Austrians

Type of regression*	Regional level				
	1 OLS	2 IV	3 IV	4 IV	5 IV
Regional foreign share	0.021 (3.5)	0.025 (5.1)	0.030 (5.1)	0.023 (3.9)	0.037 (4.2)
Lambda†	-0.05 (1.47)	-0.06 (1.67)	-0.05 (1.21)	-0.06 (1.67)	-0.05 (1.29)
Regional dummies	—	—	6	—	6
\bar{R}^2	0.224	0.222	0.223	0.222	0.216
N	1713	1713	1713	1713	1713
Instruments	—	‡	‡	§	§
Hausman test	—	2.72 2.21	5.45 2.21	2.95 2.37	9.73 2.37
<i>Industry level</i>					
Industry foreign share	0.005 (4.0)	0.006 (4.5)	0.010 (3.8)	0.005 (2.9)	0.002 (0.6)
Lambda†	0.06 (1.26)	0.09 (1.88)	0.33 (5.2)	0.06 (1.15)	0.27 (4.5)
Industry dummies	—	—	11	—	11
\bar{R}^2	0.207	0.206	0.275	0.207	0.272
N	1813	1813	1813	1813	1813
Instruments	—	¶	¶	**	**
Hausman test	—	18.85 (2.37)	6.41 (2.37)	21.88 (2.60)	5.91 (2.60)

* Further variables: years of schooling, apprenticeship, experience, experience squared, tenure, tenure squared, firm size, firm size squared, dummies for city size, and number of previous jobs, regional unemployment rate, investment/output ratio 1988, and employment growth 1981-91 on an industry level; *t*-values in parentheses.

† Selectivity correction term from a probit equation (blue-collar worker yes or no), exogenous variables: schooling, apprenticeship, experience, wage when entering the labour market, unemployment days in last quarters, share of blue-collar workers in industry and region.

‡ Foreign share 1981, employment growth 1981-91, share of blue-collar workers 1991 and share of women 1991 on a regional basis, mean foreign wage in region.

§ Same instruments as ‡ without foreign share 1981.

¶ F-Test for exogeneity of foreign share variable, 5% level of significance for rejection of the null of no endogeneity in parentheses.

** Foreign share 1981, mean foreign wage 1991, share of blue-collar workers 1991, and share of women 1991 on an industry basis.

** Same instruments as * without foreign share 1981.

As the lagged dependent variable might encompass industry- (or region-) specific error terms, it is left out in Columns 4 and 5. A set of industry or regional dummy variables is included in Columns 3 and 5.

All ten regressions show a positive sign for the foreign share variable, of which nine are even significantly positive. Contrary to results by, for example, De New and Zimmermann (1994), instrumentation did not change the results qualitatively. At the regional level, a 1% increase in the share of foreign workers

increases earnings by 2.1–3.7%, at the industry level between 0.2 and 1.0%.¹⁰ These results certainly run counter to public opinion and widespread fears, and are not reconcilable with the expectation of substitutability between young blue-collars and immigrants.¹¹

In the next section we shall investigate whether further impacts of immigration could be based on bargaining processes within the firm. This would offer a new empirical test to complement the currently used procedures.

3. Firm-specific effects of immigration on earnings

The Austrian system of wage determination is characterised by strongly coordinated industry wage negotiations. While the negotiated industry wage sets a lower limit, the actual wage outcome may well be higher; there is scope for subsequent firm-level negotiations. For instance, the fraction of workers in the metal industry who is paid the 'minimum wage' is only about 4%. Moreover, subsequent firm-level negotiations lead to agreements which have been up to 1.5% above the industry wage settlement depending on firm performance.¹² The Austrian labour law supports the formation of works councils, which predominantly exist in larger firms. The arguments presented below should therefore be of particular relevance for larger firms.

3.1. *Theoretical arguments*

In a Walrasian economy, where all workers supply a homogeneous labour input, it is obvious that wage differentials between foreign and native workers can only be of temporary nature. If there are differences in the productivity of workers, perhaps due to a limited transferability of skills for foreign workers, then wage differentials should reflect these differences in labour quality. In this case, employers are indifferent between hiring natives or hiring aliens. Consequently, in a cross-section we should not find any correlation between the composition of a firm's work force—which can be measured, for example, by the share of foreign labour within the firm—and the wage rate of native labour. It follows that there must be non-competitive elements in the labour market giving rise to wage differentials which are not due to differences in productivity, and thus making a case for an influence of the share of foreign labour on the wage rate of natives.

We will analyse the problem in the context of a dual labour market and will make the extreme assumption that native workers—insiders—have power in the bargaining process, whereas foreign workers—outsiders—do not.¹³ This

¹⁰ Detailed results also for a cross-section in 1981 are contained in a longer version of this paper.

¹¹ Recent US research (Borjas 1990, Ch. 5) finds by and large no large wage effect.

¹² This is information obtained from union officials of the *Metallgewerkschaft* of the Austrian Labour Union (ÖGB).

¹³ See Bentolila and Dolado (1994) for a related two-tier bargaining model applied to temporary and permanent workers in Spain.

can be justified by the fact that alien workers are much less attached to the host country's labour market. Many guest workers stay only for a limited period of time, before returning to their home country. Moreover, the strict regulation of employment opportunities for immigrants (see Section 2) makes guest workers less mobile within the host country and more dependent on the current employer.

Insiders derive their bargaining power from the existence of turnover costs.¹⁴ If a firm replaces all native workers by outsiders, its profit is equal to $\Pi^A - c$. Π^A denotes profits when only outsiders are employed at the competitive wage and c are replacement costs. We will assume that

$$\Pi(w^I) > \Pi^A - c \quad (2)$$

where $\Pi(w^I)$ denotes the firm's maximum profits when only insiders are employed. Fehr and Kirchsteiger (1994) have argued that under the condition (2) insiders will always prefer a two-tier wage system to a system where both the insiders and the additionally employed outsiders are paid a common wage rate, w^I . The reason is that allowing employers to hire outsiders at the secondary labour-market clearing wage creates a rent, over which the insiders and the firm can negotiate. This argument suggests that an increased number of outsiders in the firm tends to increase the insiders' wage. This is what we will call the rent-effect.

However, there may be another consequence of a two-tier wage system. A larger number of outsiders in the firm makes employers less dependent on the insiders. During a possible conflict, outsiders will not take part in collective action against the employer, since there is nothing to gain for secondary workers.¹⁵ This is why union representatives often argue against two-tier wage systems since they divide workers and weaken their bargaining strength. Since this effect tends to increase the threat point of the firm during a conflict, we call this the threat-effect. Fehr and Kirchsteiger (1994) recognise this problem by pointing to intertemporal linkages. They make a case for the threat-effect because the two-tier wage system may erode the insiders' future bargaining power.

To demonstrate the argument more formally, assume that the firm hires foreign workers before insiders and employers negotiate over w^I . This sequence makes a case for the threat-effect. Employers may have an incentive to hire more alien workers than the optimum, since this will improve their payoff during a conflict with the insider work force.

In the bargaining problem, the insiders and the firm take both the number of insiders and the number of alien workers, as well as the outsiders' wage,

¹⁴ Another argument for the protection of insiders might be a limited supply of guest workers. Immigration legislation limits the supply of foreign labour not only for the labour market as a whole, but also for individual firms. In Austria, for instance, employers have to apply for temporary work permits *I* for new foreign workers.

¹⁵ Note that our framework is different from the conventional insider–outsider approach, where it is usually assumed that outsiders become insiders after some period of time. With prospects of being promoted to better paid jobs, of course, there will be an incentive to participate in strikes or other measures of collective action.

as given. We assume for simplicity that the insiders' utility equals their wage rate, and that their income in the case of disagreement is proportional by a factor s to the aliens' wage rate on the secondary labour market, w^A .¹⁶

To derive the equilibrium wage rate, we apply the Nash bargaining solution. In our case, this may be written as

$$w^I = \arg \max[\Pi(w^I, L^A) - \Pi^0]^{1-\alpha} [w^I - sw^A]^\alpha \tag{3}$$

where $\Pi(w^I, L^A) = R(L^I + kL^A) - w^I L^I - w^A L^A$ and $\Pi^0 = tR(kL^A) - w^A L^A$. According to the revenue function R in (3), foreign workers and natives are perfect substitutes in production up to some factor k . We assume $k \leq 1$, because of incomplete transferability of foreigners' skills to the host country's labour market. In the case of a conflict all aliens will work, but they will not necessarily be able to produce the potential conflict output given by $R^0 = R(kL^A)$. Instead, in the absence of native labour, the average productivity of aliens is only a fraction $t \leq 1$ of their potential capita-output so that (one effective unit of) foreign labour is a perfect substitute for a native worker only at the margin, but not for intramarginal workers. This may be caused by the nature of technology, requiring specific communication skills or other cultural preconditions, only possessed by natives; or it may be the consequence of sabotage of insiders, who view aliens as strike-breakers, and thus will try to reduce their productivity.¹⁷

The solution to (3) can be written as

$$w^I = (1 - \alpha)sw^A + \alpha \frac{R(L^I + kL^A) - tR(kL^A)}{L^I} \tag{4}$$

This reproduces the standard result that the wage rate in the Nash bargaining solution can be written as a weighted average of the reservation wage and the negotiable pie. From (4) the ambiguity of L^A on w^I already becomes clear. On the one hand, an increase in the number of alien workers increases the negotiable pie, the rent effect. On the other hand, it weakens the workers' bargaining strength by improving the firm's outside option. In the first stage, firms set the employment of alien workers by taking into account that an increased number of immigrants will have an impact on the bargaining outcome. To derive the optimal level of L^A , substitute (4) into the expression for $\Pi(w^I, L^A)$ defined in equation (3), and set the derivative with respect to L^A equal to zero. This yields

$$\frac{\partial \Pi(w^I, L^A)}{\partial L^A} = (1 - \alpha)kR' + \alpha tkR^{0'} - w^A = 0 \tag{5}$$

where R' is the derivative of R with respect to effective labour, evaluated at

¹⁶ We will assume below that alien workers are less productive than natives by a factor k which is firm-specific. s may therefore reflect a weighted average of $(1/k)$'s across all firms.

¹⁷ We consider only values $t \in [w^A L^A / R(kL^A), 1]$ so that $\Pi^0 \geq 0$. For smaller values of t it is not profitable for the firm to operate during a conflict.

$L^I + kL^A$; $R^{0'}$ is the corresponding derivative when employment is kL^A . (5) may be written as

$$kR' - w^A = \alpha K(R' - tR^{0'}) \tag{5'}$$

If $\alpha = 0$, so that natives have no bargaining power, the firms will operate on their labour demand curve: the value marginal product of an additional alien worker, kR' , will equal marginal cost, w^A . For $\alpha > 0$, it depends on the sign of $(R' - tR^{0'})$ whether firms will hire fewer ($kR' > w^A$) or more ($kR' < w^A$) foreign workers than the optimal number in the absence of subsequent wage negotiations. If $R' > tR^{0'}$, the rent effect is dominant. It is not profitable for the firm to hire too many aliens, since they have to share the additional rents with the insiders. If $R' < tR^{0'}$, firms have an incentive to employ a large number of aliens, since this will improve their position in the subsequent wage bargain. The deviation from the competitive solution will be larger, the higher the bargaining power of insiders is.

Now assume that there is a cross-section of firms, and that these firms differ in technology in the sense that there are high- k firms where the technology is such that the skills of foreign workers are easily transferable, and low- k firms where the opposite is the case. Intuitively, the result should be that high- k firms will employ a relatively large foreign work force. To see under which conditions the intuition holds, implicitly differentiate (5) to get

$$\frac{dL^A}{dk} = - \frac{(1 - \alpha)R'[1 - 1/\varepsilon] + \alpha tR^{0'}[1 - 1/\varepsilon^0]}{(1 - \alpha)k^2R'' + \alpha k^2R^{0''}} \tag{6}$$

where R'' , $R^{0''} < 0$ are the second derivatives of R , respectively at $(L^I + kL^A)$ and at kL^A ; ε and ε^0 are defined as: $\varepsilon \equiv -R'/(R''kL^A)$ and $\varepsilon^0 \equiv -R^{0'}/(R^{0''}kL^A)$. Obviously, the denominator on the right-hand side of (6) is negative, whereas the sign of the numerator is ambiguous. It is sufficient for $dL^A/dk > 0$ if both ε and ε^0 are larger than 1. This will always be the case, for instance, with a Cobb-Douglas production function with decreasing returns to labour.

It is not *a priori* clear, whether high- k firms will also be high-wage firms. For any given level of foreign labour input, kL^A , it will depend on the relative size of rent- or threat-effect. To see this, take the derivative of (4) with respect to k , by taking into account that L^A also is a function of k

$$\frac{dw^I}{dk} = \frac{1}{L^I} (R' - tR^{0'}) \left(L^A + k \frac{dL^A}{dk} \right) \tag{7}$$

If the rent effect dominates, both dL^A/dk and dw^I/dk are positive, so we will observe high wages in firms with a high share of foreign workers. If the threat effect dominates, there will be a negative correlation between the share of foreign workers and the natives' wage rate.

The above analysis makes a case for wage differentials of equally productive workers employed in different firms. Moreover, it provides the surprising result that in a rent-sharing economy, the native work force might even gain from the presence of foreign labour.

So far we have not yet studied the effects of an increase in immigration. This is the question, which is interesting from the point of view of immigration policy. In the above model, an increase in the number of guest-workers increases the supply of labour in the secondary labour market and thus reduces the secondary workers' wage rate, w^A . To see how the insider wage is affected by an increase in immigration it therefore suffices to consider how w^I responds to a reduction in w^A . Taking the derivative of (4) with respect to w^A yields

$$\frac{dw^I}{dw^A} = (1 - \alpha)s + \frac{\alpha}{L^I} k(R' - tR^{0'}) \frac{\partial L^A}{\partial w^A} \quad (8)$$

It should be clear that the sign of (8) is not *a priori* clear. The first term is positive and reflects the fact that a lower w^A weakens the bargaining power of insiders, since sw^A is the income of insiders in the case of a conflict. This tends to reduce the insider wage. The second term captures the impact of a larger employment of immigrants due to a reduction in w^A . Once again it is the relative size of the rent- and the threat-effect which determines the sign of the second term in (8). If $R' > tR^{0'}$ the second term is negative: a decrease in w^A tends to increase the insiders' wage because employing more alien workers at lower wages increases the firm's profits, in which native workers have a share in.

3.2. Estimation

For the empirical implementation we adopt a simultaneous-equations framework. We assume that the joint determination of the natives' wage rate and the share of aliens in the firm's work force can be represented by the following system of equations

$$\ln W_i = \gamma_1 n_i^* + x_{1i} \beta_1 + \varepsilon_{1i} \quad (9a)$$

$$n_i^* = \gamma_2 \ln W_i + x_{2i} \beta_2 + \varepsilon_{2i} \quad (9b)$$

x_{1i} and x_{2i} are explanatory variables for the wage of individual i ($i = 1, \dots, N$) and the share of immigrants hired by the firm of individual i , respectively. β_1 and β_2 are the corresponding structural parameters. We will assume that the disturbance terms ε_{1i} and ε_{2i} are jointly normally distributed with $E(\varepsilon_j) = 0$, $E(\varepsilon_j^2) = \sigma_j^2$ and $E(\varepsilon_1, \varepsilon_2) = \sigma_{12}$.

A particular problem arises from the fact that a large part of workers in our sample are employed in firms which did not hire any alien workers. This implies that the observed share of immigrants in a firm, n_i , but not the relevant index, n_i^* , in the structural form is equal to zero for many observations. (9b) therefore represents the information structure of a Tobit model

$$\begin{aligned} n_i &= n_i^* & \text{for } n_i^* > 0 \\ n_i &= 0 & \text{for } n_i^* \leq 0 \end{aligned} \quad (10)$$

Nelson and Olsen (1978) study the Tobit model in a system of simultaneous equations of the type (9). They propose an estimation procedure analogous to

two-stage least squares. This involves estimation of the reduced form

$$\ln W_i = x_i \pi_1 + u_{1i} \quad (11a)$$

$$n_i = \begin{cases} x_1 \pi_2 + u_{2i}, & \text{if } n_i^* > 0 \\ 0 & \text{if } n_i^* \leq 0 \end{cases} \quad (11b)$$

where x_i contains all variables in x_{1i} or x_{2i} , or in both. Consistent estimates of the reduced form coefficients π_1 and π_2 are obtained by OLS (11a) and Tobit-regressions (11b), respectively. To obtain estimators of the structural parameters, we use the estimated reduced form coefficients, $\hat{\pi}_1$ and $\hat{\pi}_2$, to create instruments $\ln \hat{W}_i = x_i \hat{\pi}_1$ and $\hat{n}_i^* = x_i \hat{\pi}_2$. Since $\ln \hat{W}_i$ and \hat{n}_i^* are asymptotically uncorrelated with the disturbances ε_2 and ε_1 of the structural form, asymptotically consistent estimators of the structural form will result from estimating (11a) and (11b) as single equations. This procedure guarantees asymptotically unbiased structural coefficients, but it is not asymptotically efficient. Amemiya (1979) derives the asymptotic covariance matrix of the Nelson and Olsen estimator. We will focus in particular on the parameter γ_1 and the covariance-matrix of $\hat{\alpha}_1 \equiv (\hat{\gamma}_1, \hat{\beta}_1)$, which is given by

$$V(\hat{\alpha}) = c(H'X'XH)^{-1} + \gamma_1^2(H'X'XH)^{-1}H'X'XV_0X'XH(H'X'XH)^{-1} \quad (12)$$

$$H \equiv (\hat{\pi}_2, J_1), \text{ where } J_1 \text{ satisfies } XJ_1 = X_1, V_0 = V(\hat{\pi}_2), \text{ and } c \equiv \sigma_1^2 - 2\gamma_1\sigma_{12}$$

where X and X_1 are matrices consisting of N row-vectors x_i and x_{1i} , respectively. The Nelson and Olsen procedure yields estimates of α_1 , π_2 , $V(\pi_2)$, and σ_1^2 , so that all components of $V(\hat{\alpha}_1)$, except for c , can be estimated. To compute c one has to find an estimate for σ_{12} . Greene (1991, p. 636) proposes to estimate σ_{12} by adopting Heckman's two-stage selectivity correction technique: redefine the dependent variable n_i as a dummy, d_i , with $d_i = 0$ if $n_i = 0$, and $d_i = 1$ otherwise; run a probit regression on d_i including the variables of the reduced form, x_i , as regressors; calculate the selectivity correction term (Heckman's λ) from the probit-coefficients; include Heckman's λ_i as a regressor, in addition to x_i , in a wage regression on the subsample of observations for which $d_i = 1$. From the estimated coefficient of Heckman's λ , σ_{12} and thus $V(\hat{\alpha}_1)$ can be calculated.

3.3. Results

The results in Table 2 show that young native blue-collar workers can expect to be better paid in firms employing a relatively large number of guest-workers. The wage gap among otherwise equally endowed workers, resulting from a 10% difference in the share of aliens in the firm, may be up to 5.4%. This suggests that the wage-increasing effect of a two-tier system may be important.

With only one exception all coefficients of \hat{n}_i in Table 2 have a positive sign, and are statistically different from zero at the 10% level. We also ran regressions excluding industry and regional dummy variables (Columns (2) and (4)). In

TABLE 2
Structural (instrumented) earnings regressions

1991	(1)	(2)	(3)	(4)	(5)	(6)	Mean (SD) full sample
log earnings	—	—	—	—	—	—	9.691 (0.291)
foreign share	0.0013 (1.92)	0.0020 (3.27)	0.0041 (4.43)	0.0054 (6.49)	-0.0004 (0.56)	0.0039 (4.44)	0.072 (0.120)
education (yrs)	0.0024 (1.73)	0.008 (0.31)	0.0024 (1.74)	0.010 (1.25)	0.001 (0.01)	-0.002 (0.18)	9.721 (1.175)
apprenticeship (0, 1)	0.123 (7.21)	0.132 (7.58)	0.124 (7.32)	0.131 (7.67)	0.158 (5.64)	0.093 (4.42)	0.777
experience (yrs)	0.076 (9.63)	0.080 (9.87)	0.077 (9.78)	0.080 (10.16)	0.088 (7.02)	0.061 (6.14)	4.842 (3.033)
experience squ.	-0.005 (6.80)	-0.004 (6.24)	-0.004 (6.95)	-0.005 (6.65)	-0.005 (4.57)	-0.004 (4.17)	
tenure (yrs)	-0.024 (3.02)	-0.028 (3.57)	-0.025 (3.25)	-0.029 (3.73)	-0.026 (2.22)	-0.015 (1.43)	2.093 (2.411)
tenure squ.	0.002 (2.51)	0.002 (2.81)	0.002 (2.74)	0.003 (2.97)	0.002 (1.40)	0.002 (2.00)	
# prev. employers: 1 or 2 (0, 1)	0.028 (1.63)	0.013 (0.73)	0.025 (1.45)	0.009 (0.56)	0.004 (0.17)	0.035 (1.59)	0.325
# prev. employers: 3 or 4 (0, 1)	0.031 (1.58)	0.015 (0.73)	0.021 (1.06)	0.005 (0.27)	-0.003 (0.09)	0.033 (1.27)	0.207
# prev. employers: 5-8 (0, 1)	0.026 (1.12)	-0.006 (0.27)	-0.012 (0.55)	-0.018 (0.78)	-0.048 (1.40)	0.033 (1.11)	0.177
# prev. employers: 9 or more (0, 1)	0.004 (0.13)	-0.063 (2.23)	-0.013 (0.47)	-0.079 (2.82)	-0.103 (2.51)	0.018 (0.49)	0.083
employment growth in industry 1981-91 (")	-0.029 (0.86)	-0.0008 (3.27)	-0.0008 (0.25)	-0.0007 (31.8)	-0.0005 (1.17)	-0.0014 (4.39)	-0.017 (0.377)
unemployment rate in region 1991 (%)	0.002 (1.44)	0.003 (2.72)	0.003 (2.15)	0.004 (3.48)	0.001 (1.17)	0.014 (5.10)	0.061 (0.057)
investment/output ratio 1988 (%)	0.007 (6.12)	0.004 (4.59)	0.006 (4.99)	0.004 (4.68)	0.003 (2.41)	-0.0003 (0.16)	0.103 (0.093)
log (firm size)	0.040 (8.75)	0.047 (11.25)	0.031 (6.12)	0.035 (7.72)	0.075 (6.65)	0.020 (1.56)	3.719 (1.601)
eastern region (0, 1)	-0.029 (1.04)	-0.080 (3.53)	-0.011 (0.38)	-0.066 (2.97)	-0.101 (3.37)	0.073 (1.67)	0.350
middle region (0, 1)	-0.050 (2.04)	-0.081 (4.03)	-0.030 (1.19)	-0.057 (2.83)	-0.093 (3.60)	0.023 (0.59)	0.536
city size >100,000 and <1,000,000 (0, 1)	0.084 (3.38)	0.021 (1.22)	0.116 (4.43)	0.027 (1.57)	-0.035 (1.26)	0.111 (4.33)	0.156
city size >999,999 (0, 1)	0.150 (5.87)	0.089 (4.03)	0.126 (4.86)	0.040 (1.72)	0.124 (3.88)	0.023 (0.73)	0.155
Heckman's Lambda	0.241 (4.62)	-0.002 (0.06)	0.238 (4.57)	0.096 (2.29)	0.105 (1.38)	-0.040 (0.98)	0.272 (0.253)
constant	9.201	9.168	9.237	9.299	9.126	9.206	
# industry dummies	11	—	11	—	—	—	
# region dummies	7	—	7	—	—	—	

TABLE 2 (continued)

1991	(1)	(2)	(3)	(4)	(5)	(6)	Mean (SD) full sample
\bar{R}^2	0.293	0.228	0.299	0.241	0.208	0.281	
N	1813	1813	1813	1813	1001	812	

corrected asymptotic *t*-values in parentheses

Model (1): full sample, foreign share, *n*, instrumented by *n*(-1) and *n*(-2), see footnote 18 for further instruments.

Model (2): Model (1) without industry and regional dummy variables

Model (3): Model (1), but *n* instrumented without *n*(-1) and *n*(-2)

Model (4): Model (3) without industry and regional dummies

Model (5): Model (2) for firms with less than 50 employees

Model (6): Model (2) for firms with 50 employees and more.

Columns (1) and (2) \hat{n}_i was calculated from an instrumental regression including one- and two-period lagged values of n_i ,¹⁸ whereas in Columns (3) and (4) we renounced instrumenting n_i by its lagged values. The results were very robust in all these different specifications.

Columns (5) and (6) split the sample in small (less than 50 employees) and large firms, respectively. It turns out that for small firms there is in general no significant impact of \hat{n}_i on earnings. Only workers in larger firms may have benefited from an increased number of alien workers in the firm. As expected, our bargaining explanation for rent-sharing at the firm level is better applicable to larger firms, where works councils are more prevalent.

The results on human capital variables confirm prior expectations. The completion of an apprenticeship strongly increases earnings, and the returns to experience are comparably high in this age group. That years of education have no significant impact on wages may be the result of the low sample variation of this variable (most workers have either nine or ten years of schooling). Another reason may be measurement errors. Years of education are calculated as: age in 1991 minus age at entrance into the labour market minus six. Therefore this variable measures the maximum amount of schooling for a given individual. The resulting measurement error may well be negatively correlated with the wage.

Tenure has a comparably small effect on earnings.¹⁹ As we concentrate on young workers, the benefits of job-search and job-hopping have to be considered. We included a series of dummies for the number of previous employers. The results show no clear picture. Only individuals with a very unstable career (nine or more previous employers) seem to have lower earnings.

¹⁸ The other instruments were: share of blue-collar workers and females in the firm and the expected mean wage of immigrants at the firm level. Because some firms had no foreign workers the last variable had to be imputed by running a selectivity-corrected wage regression for immigrants' wages.

¹⁹ In another paper (Zweimüller and Winter-Ebmer 1995) we found that firms which employ foreign workers reward tenure of natives much better than firms employing no or only a relatively small share of foreign workers. A result which is consistent with an explanation based on internal labour markets.

Past employment growth within the industry reduces earnings, but becomes insignificant once industry dummies are introduced. That the regional unemployment rate is positively correlated with wages may be a matter of causality: regions with high wages tend to have high unemployment. This is in contrast to previous Austrian results for wages curves (Winter-Ebmer 1996).²⁰ The investment/output ratio was included to proxy the capital intensity of an industry. It shows the expected positive sign. Firm size is one of the most important explanatory variables: doubling firm size increases the wage by 4%. Finally, regional (east–west and rural–urban) wage differentials are substantial.

4. Further evidence on wage growth

In the preceding sections no negative influence of the share of foreign workers on natives' earnings could be detected. This applies to regional and industry regressions as well as to firm-specific effects. These results are in line with a bargaining model, where incumbents profit from the existence of outsiders. In equilibrium high-paying firms have a high share of foreign workers and vice versa. This cross-sectional picture has to be complemented by a dynamic consideration: what happens if the general level of foreign workers rises due to an exogenous shift in the supply of immigrant labour?

To answer this question we concentrate on the period 1988–91, where a substantial increase in the employment of immigrants occurred. We select blue-collar workers employed in May 1988 and trace their earnings growth till May 1991. Regression results for the share of foreign workers on a firm, regional and industry level are presented in Table 3. The arising selection problem—no wage growth can be observed if the individual is not working in May 1991—is dealt with by including a selection term (Heckman's λ) resulting from a probit employment equation.²¹ To instrument the change of the fraction of foreign workers we included amongst others its initial share in 1988 which was found to be a strong predictor for the inflow of immigrants in the US (Bartel, 1989).

Column 1 in Table 3 presents the results for firm-level effects. Newly accumulated human capital has no effect on earnings growth. This is not surprising since variation in these variables can only come from temporary layoffs of workers returning to their firms. Earnings growth is lower for persons holding an apprenticeship, and for higher educated and more experienced workers. Furthermore, earnings grow faster in large firms and—somewhat surprisingly—in regions where unemployment rose recently.

The central variable, the increase in the share of foreign workers, yields conflicting results. On the firm level it lowers wage growth, it is insignificant

²⁰ It may be due to the smaller sample size and a more restrained population in this study.

²¹ Note that in the firm-level case we have to limit the sample to people working still or again with the same firm in 1991 because otherwise no firm characteristics would be available. The selection equation has to be interpreted correspondingly. Variables in the employment equations include age, working career till 1988, regional dummies and indicators for employment dynamics 1981–8.

TABLE 3
*Changes in earnings 1988–91 (instrumented regressions)**

	1	2	3	Mean (SD) full sample
Δ earnings	—	—	—	0.237 (0.250)
Δ foreign share (%)				
firm level	−0.005 (3.24)	—	—	na
regional level	—	−0.003 (0.53)	—	0.037 (0.050)
industry level	—	—	0.034 (3.51)	0.018 (0.029)
Δ experience (yrs.)	0.022 (0.49)	−0.007 (0.19)	−0.050 (1.25)	2.805 (0.350)
Δ tenure (yrs.)	0.001 (0.33)	0.006 (1.81)	0.010 (2.69)	0.869 (2.801)
unemployment duration 1988–91 (yrs.)	0.003 (0.05)	−0.070 (1.57)	−0.176 (3.01)	0.133 (0.265)
# of employers 1988–91	—	−0.006 (0.89)	−0.016 (1.98)	0.954 (1.350)
changed industry (0, 1)	—	0.082 (3.89)	0.160 (4.70)	0.312
changed region (0, 1)	—	0.028 (1.29)	0.012 (0.54)	0.320
Δ regional unemployment rate	0.005 (2.04)	0.007 (2.54)	0.010 (4.08)	0.012 (0.030)
Δ investment/output ratio (1983–8)	0.001 (1.17)	0.002 (2.32)	0.002 (2.05)	0.042 (0.093)
employment growth 1981–91 (industry)	0.000 (0.00)	−0.001 (2.39)	0.001 (1.54)	−0.027 (0.382)
employment growth 1981–91 (region)	0.029 (1.18)	0.001 (2.17)	0.002 (3.76)	−0.207 (0.227)
apprenticeship (0, 1)	−0.024 (1.40)	−0.059 (2.63)	−0.069 (2.78)	0.779
schooling (yrs.)	−0.015 (2.81)	0.002 (0.29)	0.009 (1.22)	9.608 (1.200)
experience in 1988 (yrs.)	−0.008 (3.63)	−0.014 (4.57)	−0.012 (3.86)	6.020 (2.781)
eastern region in 1988 (0, 1)	−0.014 (0.69)	0.048 (2.02)	0.075 (2.71)	0.362
middle region in 1988 (0, 1)	−0.029 (1.34)	0.034 (1.42)	0.045 (1.78)	0.498
log (firm size) in 1988	0.018 (4.13)	−0.016 (3.38)	0.006 (0.90)	3.900 (1.702)
Heckman's λ	0.010 (0.43)	−0.269 (2.89)	−0.358 (3.32)	0.179 (0.101)
Constant	0.318 (2.17)	0.427 (3.27)	0.266 (1.87)	
\bar{R}^2 (adj.)	0.048	0.058	0.049	
N (obs)	687	1185	1457	1457

* (1) Sample restricted to individuals who were employed in the same firm in May 1988 and in May 1991.

(2) Sample restricted to individuals employed in May 1988 and in May 1991. Observations with no information on the location of employer were excluded.

(3) Same as (2). Observations with no information on the industry affiliation of the employer were excluded. Missing data on aggregate regional and industry variables were set to national averages.

at the regional level, and, finally, earnings are even raised at the industry level. This can be reconciled if the sample composition is taken into account. Column 1 consists solely of persons working with the same firm in 1988 and 1991—interruptions by temporary layoff are allowed. In contrast, persons in the sample underlying the results in Columns 2 and 3 may have changed the firm, but also the industry or the region over the period analysed.

To test for the relevance of labour mobility on the measured impact of immigration, we split the sample into job changers and stayers. Table 4 reports regression coefficients for a change in the foreign share—both in the industry

TABLE 4
Coefficients of Δ foreign share (instrumented regressions)

	Earnings growth	Coeff. (t-value)	N (obs)
Δ foreign share (industry)			
job changers	0.257	0.027 (3.42)	770
stayers	0.223	-0.009 (3.69)	687
Δ foreign share (region)			
job changers	0.254	0.005 (0.52)	532
stayers	0.224	-0.029 (3.24)	653

and the region—on earnings growth for these two subgroups. For stayers we get significantly negative coefficients consistent with the firm-level results in Table 3. The quantitative effects are rather high: they range between 0.5% and 2.9% less earnings growth for an increase in the foreign share by 1%. Over the period 1988–91 the share of foreign workers increased, on aggregate, by 3.6%. According to our estimates the yearly earnings loss of job-stayers employed in the average firm (region or industry, respectively) amounts to 0.6% (3.4% or 1.1%). For mobile workers—those who changed at least the firm—a rise in the share of foreign workers is neutral or even positive. Note, however, that two effects may be comprised in the job changers equations. For those who also changed industry or region, a positive structural effect will be present according to Table 1: high-wage industries are associated with high foreign share in a cross-section. To this positive effect a negative time effect has to be added. Changing industry as such is found to be highly profitable (see Table 3).²² This distinction between mobile and less mobile workers seems highly important and warrants further examination.²³

Summarising the impact of migration on earnings changes, we find that significant wage concessions have to be made by immobile workers. This is in line with the predictions from equation (8): if the bargaining power of workers is low, negative wage impacts may result even in the case when the threat effect is dominated by the rent effect.

5. Conclusions

In recent years Austria experienced a rapid increase in its foreign population. Due to the opening of eastern borders, even higher immigration prospects can be expected and have led to widespread fears in the population and also to changes in immigration laws. In this paper one aspect of the inflow of aliens is studied in detail: its impact on wages of young Austrian blue-collar workers. These workers are expected to bear a major burden of increased labour-market competition.

²² We do not discuss problems of self-selection in the context of job mobility.

²³ Existing studies on the impact of changes in the share of immigrant workers on earnings growth do not address this point (e.g. Altonji and Card 1991 or De New and Zimmermann 1994).

Using cross-sectional data for 1991 and instrumental variable techniques, no negative wage effects of high immigrant shares have been found both on a regional and industry level. Beyond these labour-supply effects we introduce a firm bargaining model: a high share of foreign workers within the firm may reduce bargaining power of natives and, in turn, hamper wage concessions reached in negotiations with the management. On the other hand, a high share of immigrants in a specific firm might be considered beneficial to natives, if natives are able to exploit the foreigners in a two-tier wage system.

Our empirical results yield a preponderance of the second hypothesis: also at the firm level no negative impact of the share of aliens can be detected. Of course, this positive effect of immigrants at the firm level could be reconciled with the notion of discrimination by fellow workers: wage premiums for natives are necessary to compensate for the pain of having to collaborate with aliens.

Finally, we present evidence on the effects of a change in the share of foreigners on wage increases over the period 1988–91. This period is of particular interest since immigration grew disproportionately. The results show a mixed picture: immobile workers, staying with the firm, experienced lower earnings increases the faster the growth of the foreign work force. The opposite was true for job changers: they were not, or even positively, affected by an increase in immigration.²⁴

Our conflicting evidence from cross-sections and first differences may have several reasons. With a given overall supply of foreign workers our theoretical model may lead to a positive cross-sectional relation of wages and foreign shares in equilibrium, whereas ambiguous conclusions can emerge from an exogenous rise in the number of immigrants. First-difference results have the advantage that any bias resulting from the correlation of firm- (industry- or region-) specific effects with the fraction of foreign workers will be eliminated. Furthermore, first-difference analysis is more likely to capture the short-run effects of immigration, in which no full adjustment has taken place. This adjustment can apply to the capital stock but also to internal mobility of workers. Our results for job-changers and stayers point in this direction of short-run disequilibrium effects: mobile workers who are able to take evasive actions even gain from an increase in the foreign share.

Chiswick (1992, 1993) criticises cross-sectional studies of the impact of immigration on natives' wages from a more fundamental point of view. He argues that these studies incorrectly assumed regionally distinct labour markets,²⁵ where no mobility of factors of production existed. If workers are mobile, they should bring about factor price equalization, which would spread out the effects of immigration all over the country.²⁶ In fact, Filer (1992)

²⁴ See Winter-Ebmer and Zweimüller (1994) for complementary evidence that also unemployment risk of natives is only slightly increased by higher immigration.

²⁵ Pissarides and McMaster (1990) modelled regional migration, wages and unemployment for the UK and found that regional adjustment would not be reached within 20 years.

²⁶ See also Chiswick *et al.* (1992) and Dolado *et al.* (1994) for long-run growth effects of immigration.

found that in the US, natives react to the arrival of large immigrant groups with interregional out-migration. Our results for job-changers underline the importance of mobility for the individual consequences of increased immigration. Whether natives react in the aggregate on the development of immigrant enclaves has not been studied so far in the European context.

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APPENDIX

Data Sources

Data for individuals come from social security records of a sample of employees of 5,000 Austrian firms (Hauptverband der Sozialversicherungsträger, Vienna).
 Aggregate data (93 regions and 78 industries).
 Unemployment rates: Amtliche Nachrichten des Bundesministeriums für Arbeit und Soziales, Vienna, several years (regional level).
 Investment–output ratio: Nichtlandwirtschaftliche Bereichszählung 1988, Austrian Statistical Office, Vienna (industry level).
 Share of foreign workers, share of women, share of blue-collar workers, employment growth: Austrian Census 1981, Hauptverband der Sozialversicherungsträger (industry and regional level).
 Mean wage for foreign workers on regional and industry level and all aggregate firm level data: calculated out of the sample (116,000 persons).