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Natives, Immigrants and the Recruitment Halt 1973

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Dynamic Labor Demand: Natives, Immigrants and the Recruitment Halt 1973

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Abstract: Reacting to a shortage of unskilled labor in the 1960s and early 1970s, Germany actively recruited guest workers from Southern Europe. In the face of an upcoming recession, the German government in November 1973 abruptly stopped this active immigration policy. This paper considers this recruitment stop as a natural experiment for supply restrictions and increasing hiring costs. Using a panel of German firm data, we investigate the effects of this change in immigration policy on the dynamic adjustment of labor demand for foreign and native blue-collar workers. The estimation results show that guest workers have served as a buffer to shocks, i.e. they are complements to natives in a period of hiring, and substitutes to natives in the process of firing. The recruitment stop significantly increased the hiring costs of foreigners and natives without affecting firing costs. The results confirm that the switch in immigration policy regimes in 1973 can be considered a supply effect.

1. Introduction

As has been pointed out by Hamermesh (1993), labor demand is an expanding field of research with particular deficits in the use of micro data and the application of dynamic models. A dynamic specification is helpful in analyzing adjustment costs and to investigate whether they are responsible for the slow response of firms to demand and cost shocks. It is also very important to know what these costs look like, especially if they are different for (i) different types of labor, (ii) across policy regimes, and (iii) increases or decreases of labor demand. Most of the existing empirical studies on dynamic labor demand use macro time-series data assuming symmetric adjustments and homogeneous labor, and examine the effects of firing costs. Little work has been done on policy measures affecting hiring costs.

Immigration policies have important impacts on labor supply and hiring costs in various ways. In particular, they aim at attracting a specific mix of migrants that are in demand in the native labor market. Before 1973, many European countries, such as Germany, were operating a liberal labor immigration policy to attract blue-collar workers that were a scarce input factor. Government recruitment offices in various sending countries were active in providing German firms with the required profiles of substitutes to German blue-collar workers. Firms had to pay recruitment fees for this service. In November 1973, recruitment was abruptly stopped by the government in the face of an upcoming recession. Since then, migration policies have been hostile to labor migration — not only in Germany, but also in the other Western European countries that had attracted foreign workers for so many years. Policy measures provided more and more incentives for return migration.

We consider this recruitment stop as a natural experiment for supply restrictions, and hence increases of hiring costs. We are also able to employ German panel micro data of firms to investigate the dynamic adjustment of labor demand for heterogeneous labor, namely foreign and German blue-collar workers. We studied how the case of

heterogeneous labor differs from a model that assumes homogeneous labor, and how differences in adjustment costs of hiring and firing workers for the particular groups prevail under both immigration policy regimes discussed here. The paper is outlined as follows: Section 2 discusses the theoretical background and details the historical situation around 1973 that is investigated. Section 3 explains the estimation procedure and the used data set. Section 4 contains estimation results, and Section 5 concludes.

2. Increasing Hiring Costs and Interrelated Labor Demand

In general, policy measures may affect the dynamic adjustment of employment through two different ways: (i) they may change the costs of hiring workers, and (ii) they may result in changing costs to fire workers. Most of the existing theoretical and empirical literature in this area concentrates on the latter, namely the effects of changing job security such as advance notice to workers of impending plant closings or mass layoffs, the introduction of flexible labor contracts, mandatory severance payments or unemployment benefits paid by the employer.[1] The majority of empirical studies have used macroeconomic data to analyze the effects of increasing or decreasing job security on the speed of employment adjustment. The results of these studies are twofold. On the one hand, several studies found negative effects of job security policies on employment adjustment. By using data for France, West Germany, Italy, and the United Kingdom, Bentolila and Bertola (1990) obtained that labor demand of a firm is more stable if firing costs are large. Analyzing Spanish manufacturing firms, Bentolila and Saint-Paul (1992) showed that the introduction of flexible labor contracts leads to greater fluctuations in labor demand. Using data on 22 countries Lazear (1990) found that the introduction of severance pay requirements reduce the employment–population ratio, and Bertola (1990) could reveal greater variation in employment where job security regulations are less stringent using data on 10 OECD countries. On the other hand, Fallon and Lucas (1993) could not confirm that legislation increasing job security slows the adjustment of

employment for manufacturing industries in Zimbabwe and India. Abraham and Houseman (1993) obtained that the adjustment of overall labor input is generally similar in the US and Germany even though job security is much more stringent in Germany. Finally, Burgess (1989) did not find very strong effects of variables that represent firing costs like unfair dismissal payments, redundancy payments or union strength for four manufacturing industries in the UK.

Much less attention has been devoted to policies affecting dynamic labor demand through hiring costs. Direct restrictions on firms on the hiring of new employees may exist through collective bargaining, such as the one in the German steel industry in the late 1970s. An example for a policy that effectively raises hiring costs is the mandatory listing of job vacancies with government employment agencies. Such regulations of the recruitment of employees exist in most Western European countries and have been proposed in the United States. One can more frequently observe policies which affect the hiring costs only for a sub-group of the labor force. For example, the affirmative action legislation in the United States, which has been introduced to improve the employment possibilities of Black and Hispanic people and of women, affect the hiring costs of people not covered by this legislation. Since employers risk the sanction of being debarred from government contracts if the distribution of their employment do not coincide with the respective regional average, firms care about whom they recruit. Hence hiring costs are increasing. Leonard (1984) has shown that in enterprises which have been affected by the affirmative action legislation, the growth rate of employment of the minorities favored by the law was faster than in the rest of the economy, whereas the employment growth rate of white men was slower, indicating a relative increase in the hiring costs of the latter. Another policy with similar effects is the adoption of regulations regarding the employment of handicapped persons. German firms with more than 15 employees are required to take a 5 percent quota of handicapped persons. If this quota is not fulfilled, the firms have to pay a fine of DM 200 per month per head, whereas companies fulfilling more

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1 A comprehensive survey over labor market regulations in industrialized countries is given by Emerson (1988). See also Hamermesh (1993) for a survey of the theoretical and empirical work on this topic.

than the quota receive subsidies. As with the affirmative action legislation, this regulation results in increased hiring costs for persons not handicapped.

Despite the policies discussed so far, hiring costs are also affected by labor supply policies. Using search and matching models, one can show that hiring costs depend on the tightness of the labor market (see Burgess 1993). These models suggest that at any point in time, a number of workers are searching for jobs and a number of firms are searching for workers. The rate at which both types of agents meet is determined by a matching function. The hiring costs of a firm include expenditures on search and recruitment and therefore depend, among other things, on the number of searchers on both sides of the labor market. Since the hiring costs are paid per unit of time the vacancy is open, they also depend on the duration of the unfilled vacancy, thus increasing dependence of hiring costs on labor-market tightness. To make this point more obvious, consider the following simple model.

Suppose that there are two groups of workers i = 1, 2 and that the number of potential matches M of the group of workers i to firm n is given by:

(1) $$M_{in} = m_i(s_{in}V_{in}, L_i/V_i, X_i), \text{ with}$$

$$\frac{\partial m_i}{\partial(s_{in}V_{in})} > 0, \frac{\partial m_i}{\partial(L_i/V_i)} > 0, \frac{\partial^2 m_i}{\partial(s_{in}V_{in})^2} < 0, \frac{\partial^2 m_i}{\partial(L_i/V_i)^2} < 0, \text{ for i = 1, 2,}$$

where s represents the search intensity of firms for worker i, V the number of vacancies with respect to worker i and X a set of other variables influencing the matching with regard to worker i. L_i measures the size of the labor market for the respective group of workers. L_i/V_i indicates the number of potential matches per vacancy and can be interpreted as a measure of the tightness of the labor market for workers of type i. The number of potential matches increases with a rising search effort of the firm and with a higher number of potential workers L_i .

Let p_{in} be the proportion of offers accepted for worker i. Then the number of hires of the firm n, H_{in} , is related to M_{in} by $H_{in} = p_{in}M_{in}$. Inverting (1) and solving for $s_{in}V_{in}$ results in the following expression:

$$(2) \qquad s_{in}V_{in} = m_i^{-1}\left(\frac{H_{in}}{p_{in}}, \frac{L_i}{V_i}, X_i\right).$$

Assume that the relationship between the hiring costs C_{in} and $s_{in}V_{in}$ can be described as

$$(3) \qquad C_{in} = c_i(s_{in}V_{in}), \text{ with } c_i' > 0, \quad c_i'' \geq 0$$

Inserting (2) in (3) one obtains the following equation for the hiring costs:

$$(4) \qquad C_{in} = \gamma_i\left(\frac{H_{in}}{p_{in}}, \frac{L_i}{V_i}, X_i\right), \text{ with } \frac{\partial\gamma_i}{\partial(H_{in}/p_{in})} > 0, \quad \frac{\partial\gamma_i}{\partial(L_i/V_i)} < 0\,.$$

Equation (4) shows that *ceteris paribus* the costs of hiring a given number of workers i increase if the number of potential workers L_i decreases. To show the interdependence between the hiring costs of both groups of workers we assume that $H_1 = \alpha H_2$. The coefficient α shows the relationship between both types of workers in the production process: If $\alpha > 0$ the two types of workers are complements, if $\alpha < 0$ they are substitutes and if $\alpha = 0$ there exists no relationship. Inserting this relationship into equation (4) results in the following expressions for the hiring cost function:

$$(5) \qquad C_{1n} = \gamma_1\left(\frac{\alpha H_{2n}}{p_{1n}}, \frac{L_1}{V_1}, X_1\right)$$

for worker of type 1, and

$$(6) \qquad C_{2n} = \gamma_2\left(\frac{H_{1n}}{\alpha p_{2n}}, \frac{L_2}{V_2}, X_2\right)$$

for worker of type 2. Since H_{in} depends on the labor-market tightness of the respective group of workers, equations (5) and (6) show that if both types of workers are complements in production, i.e. if $\alpha > 0$, the hiring costs of one type of worker increase if the labor market of the other type of workers becomes tighter. If both types of workers

are substitutes in production, i.e. $\alpha < 0$, a tighter labor market for one type of worker results in lower hiring costs for the other type.

Several policies alter the supply of labor generally or only for particular types of workers. Let us consider just a few of such policies (an overview is given by Hamermesh 1993). In many countries there exist legislative requirements on the training of workers for particular occupations. An intensification of such requirements increases the necessary human capital investments of persons who want to choose such an occupation, lowering the number of persons who are able or willing to make such investments and therefore the overall supply. Another kind of policy influencing the supply of labor can be found in income tax regulations. In Germany, for example, married couples have the choice between being taxed separately or splitting income for tax purposes (Ehegattensplitting). In most cases the second alternative is chosen, where the income of the spouses is added and the appropriate tax rate for the family is found for 50 percent of this amount. The tax payment is then the proportion of income that is indicated by this tax rate. The possibility to split income for taxation has negative incentive effects for the labor supply for the partner who earns the lower amount of money. Simulation studies that removed the system of split taxation demonstrate that female work participation would be significantly higher within a system of separate taxation (see Zimmermann, 1993).

In this paper we concentrate on another kind of policy which directly affects labor supply and consequently hiring costs, namely immigration policy. Of particular importance for the evaluation of the labor market effects of immigration on various groups of workers is the identification of the skill mix of the migrants. For example, Canada and Australia are operating under immigration laws that aim to attract skilled immigrants. Such a policy clearly has different effects on the relative supply of labor by skill group than a policy that emphasizes admitting refugees or family members as in the US.[2] In the empirical part of this paper, we want to analyze the effects of the guest worker policy of Germany in the period from 1970 to 1975 on dynamic labor demand.

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[2] A detailed overview of the labor market effects of immigration is given by Borjas (1994).

In the early 1960s, Germany experienced rising tensions in the labor market due to a shortage of labor. This shortage lead the government to establish a Guest Worker System by means of a series of recruitment treaties with Italy (1955), Spain and Greece (1960), Turkey (1961), Portugal (1964), and the former Yugoslavia (1968).[3] About 400 recruitment offices of the German Federal Labor Office operated in these countries on behalf of German firms. The recruitment and mediation of foreign guest workers took place only due to concrete orders of German firms. For the recruitment and mediation of a foreign guest worker the firms had to pay a fee. Until September 1973 this recruitment fee amounted to DM300 per worker. In the face of increasing social tensions and increasing fears about a recession after the first oil price shock, this recruitment fee was raised to DM1,000 in order to decrease the demand for foreign labor. In November 1973 the recruitment of foreign labor was stopped abruptly by the German government.

For several reasons this recruitment stop can be seen as a natural and somewhat extreme experiment for a restriction of the supply of a particular group of workers, in this case of unskilled blue-collar workers. Before the recruitment stop, there was an infinite although regulated supply of unskilled workers; after the recruitment stop, this supply was restricted to natives and foreign workers already residing in Germany. Note however, that this recruitment stop was not effective for guest workers from Italy, since they were covered by the Treaty of Rome of 1957, which provides the free movement of labor for citizens of the member states of the European Community.[4] According to our theoretical considerations we suppose that the hiring costs of guest workers increased after the recruitment stop. The effect of the recruitment stop on the hiring costs of native workers was depending on their relationship to the guest workers. If they are complements to natives, the hiring costs of natives should increase; if they are substitutes, the hiring costs should decrease. Since the recruitment stop was enforced relatively abruptly, it is reasonable to assume that this measure was unexpected by most German firms.

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[3] A detailed description of the German Guest Worker System is given by Schmidt and Zimmermann (1992).

Furthermore, unemployed guest workers usually had to leave Germany as soon as their residence permit expired.[5] Therefore, the recruitment stop lowered the supply of unskilled production workers when the firms decided to lay off guest workers. If the firms considered this fact in their employment adjustment decisions, the recruitment stop also increased the firing costs of guest workers.

Table 1 summarizes some important labor market statistics for the period under study. The numbers show that the German labor market was near full employment until 1973. Most of the total employment growth between 1970 and 1973 was due to the recruitment of foreign labor as the unemployment rate was very low and there was a relatively large number of vacancies. With the first oil price shock, the situation changed dramatically. In the period from 1973 to 1975, total employment decreased by 755,000 of which nearly 58 percent was due to a decrease in the employment of guest workers. The total unemployment rate increased from 1.2 percent in 1973 to 4.6 percent in 1975 and the unemployment rate of foreigners increased in the same period by 5.5 percentage points. Furthermore, the number of vacancies decreased from nearly 800 thousand in 1970 to 236 thousand in 1975. These numbers elucidate the function of guest worker employment as a buffer for the German labor market.

3. Estimation Procedure and Data Description

To evaluate the effects of the recruitment stop on the adjustment process of native and foreign employment, we use a multivariate flexible accelerator model. The empirical literature on dynamic labor demand has overwhelmingly assumed symmetric convex adjustment costs which can be represented by a quadratic function.[6] Convex adjustment

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4 All but Turkey and the former Yugoslavia are members of the European Union today, but Greece joined the Union in 1981, Portugal and Spain in 1986. Therefore only Italian workers were allowed free mobility in the period under study.

5 Since 1971 the residence permit usually expires after two years.

6 An overview of the literature of theoretical and empirical studies of dynamic labor demand is given by Nickell (1987), Hamermesh (1993), and Bresson et al. (1992b).

costs imply that the marginal costs of varying the employment level L_t increase in ΔL_t. From the assumption of symmetry follows that the marginal cost of increasing L_t is the same as that of an equally large decrease. Adopting this assumption, the adjustment process of native and guest worker employment, N and G, to their desired long-run equilibrium levels N* and G* can be formulated as (see Nadiri and Rosen, 1973):

(7) $\Delta L_t = \Lambda (L_t^* - L_{t-1})$,

where

$$\Delta L_t = \begin{bmatrix} \Delta N_t \\ \Delta G_t \end{bmatrix}, \quad \Lambda = \begin{bmatrix} \lambda_{NN} & \lambda_{NG} \\ \lambda_{GN} & \lambda_{GG} \end{bmatrix}, \text{ and } (L_t^* - L_{t-1}) = \begin{bmatrix} N_t^* - N_{t-1} \\ G_t^* - G_{t-1} \end{bmatrix}.$$

The adjustment parameters, which are represented by the 2x2 matrix Λ, are negatively related to the costs of adjusting employment to the desired level. Assume further that L_t^* can be described by the following relationship:

(8) $L_t^* = \beta X_t$

with $\beta = \begin{bmatrix} \beta_N \\ \beta_G \end{bmatrix}$,

where β_N and β_G are parameter vectors to be estimated, and X_t is a vector of variables that represent expectations about the long-run equilibrium employment levels L_t^*. Different specifications of L_t^* have been discussed in the literature (see Hamermesh, 1993). Due to limitations in the available data set we adopt the simple procedure of assuming that the path of future expected demand shocks can be described by lagged values of X_t. By inserting (8) in (7) and adding error terms, one obtains the following equation used to estimate the labor adjustment with symmetric adjustment costs:

(9) $\Delta L_t = \Lambda (\beta X_t - L_{t-1}) + \varepsilon_t$,

with $\varepsilon = \begin{bmatrix} \varepsilon_N \\ \varepsilon_G \end{bmatrix}$, E[ε] = 0 , and $E[\varepsilon\varepsilon'] = \begin{bmatrix} \sigma_{NN} & \sigma_{NG} \\ \sigma_{GN} & \sigma_{GG} \end{bmatrix} \otimes I$.

The equation system (9) was estimated using OLS.

Since estimation of equation system (9) does not allow the identity of different effects of the recruitment stop on the hiring and firing costs of natives and guest workers, we extend equation (9) to allow for asymmetric adjustment costs. Various methods have been used to test whether the costs of increasing employment differ from the costs of decreasing employment. Pfann and Verspagen (1989) and Pfann and Palm (1993) propose a specification of the adjustment costs that allows for asymmetry in marginal costs and contains symmetric costs as a special case. Chang and Stefanou (1988) and Jaramillo et al. (1993) maintained the assumption of quadratic adjustment costs but allowed the adjustment coefficients to vary between the hiring and firing regime.[7] In this study we want to follow the latter approach. For this purpose we define the following dummy variables to separate the sample into a hiring and a firing regime:

(10) $$H_{ti} = \begin{cases} 1 \text{ if } \Delta L_t \geq 0 \\ 0 \text{ if } \Delta L_t < 0 \end{cases} \quad \text{for i = N , G ,}$$

$$F_{ti} = \begin{cases} 1 \text{ if } \Delta L_t < 0 \\ 0 \text{ if } \Delta L_t \geq 0 \end{cases} \quad \text{for i = N , G .}$$

Using these dummy variables equation system (9) becomes:

(11) $$\Delta L_t = D_t' \left[\Lambda (\beta X_t - L_{t-1}) + \varepsilon_t \right] ,$$

where $D_t = \begin{bmatrix} H_{tN} + F_{tN} \\ H_{tF} + F_{tF} \end{bmatrix}$.

We estimate equation system (11) using GLS. Note, however, that the dummy variables employed to separate the hiring and firing regimes are endogenously determined by realizations of ΔL_t. Therefore, it is possible that our estimations suffer from biased and

inconsistent parameter estimates due to sample selection. We tried to control for this problem by using a two-stage inverse Mills ratio procedure proposed by Heckman (1979). In the first step we estimate probit models with the four dummy variables of equation (10) as endogenous variables using various different specifications. The calculated inverse of Mills ratio from these estimations is added as exogenous variable to the respective equation in (11) to correct for sample selection bias. In most cases the estimation results reveal insignificant estimations of the coefficient of the correction variable. Furthermore, the correction method has not lead to significant changes in the parameter estimates of all other coefficients. For this reason and other problems connected with the Heckman-correction (see Nawata 1993a, 1993b; and Olsen 1982), we decided to report only the estimation results generated without using the two-stage estimation procedure.

As we have noted in Section 3, German firms had to pay a fee for the recruitment and mediation of guest workers. Furthermore, firms had to provide housing for the recruited employees. Also, since the guest workers often lack knowledge of German language it is reasonable to assume that the integration of guest workers in the production process of a firm was much more costly compared to that of native workers. For these reasons we expect higher hiring costs for guest workers relative to native workers. On the other side, guest workers usually had work contracts restricted to one year whereas natives normally had long-term contracts. Due to these temporary contracts, guest workers and firms had less incentives to invest in the firm-specific human capital of the guest workers. Therefore, we expect lower firing costs for guest workers. From a theoretical point of view it is not clear if guest workers and natives are dynamic p-substitutes or dynamic q-complements, though one would expect that the demand for native and guest workers are dynamically symmetric; that means that $\lambda_{NG} = \lambda_{GN}$.

Due to arguments discussed in the former section, we expect that the hiring costs of guest workers will increase because of the recruitment stop since the supply of this kind of worker is restricted to those guest workers already residing in Germany. However, the

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[7] An overview of studies assuming an adjustment cost function which differs from that of convex and symmetric costs is given in Hamermesh (1993), Pfann (1993), and Bresson et al. (1992b).

recruitment stop should also increase the firing costs of guest workers since the firms will take into account the difficulties of hiring foreign workers in the future. All in all, we expect that the own adjustment coefficient of guest workers λ_{GG} will decrease after the recruitment stop. The effects of the recruitment stop on the hiring and firing costs of natives crucially depends on their relation to guest workers. If natives and guest workers are dynamic q-complements, the change in the hiring and firing costs of natives should be similar to that of the guest workers. If they are dynamic p-substitutes, the change in the hiring and firing costs of natives should be in the opposite direction to that of guest workers. Hence, we are unable to provide clear prediction about the evolution of the cross-adjustment coefficients.

The data set used for estimating the equation systems (9) and (11) is a sample of 1,696 firms in German manufacturing called "Betriebserhebung 1976".[8] This data set represents approximately 4 percent of all German firms in the manufacturing industry in 1975. It should be noted that these firms have been selected according to the following criteria: in 1975, they had to have at least 200 employed persons, or a capital stock of DM500,000, or annual revenues of at least DM5 million. The data set covers retrospective questions on annual employment of German and foreign production workers[9] as well as annual revenues for the period 1970–1975. Annual revenues and their first-order lags are used to represent demand effects on employment adjustment. To control for technological factors that might affect employment adjustment patterns, we used detailed information on the manufacturing process[10] and two-digit industry-dummies of the respective firm. Since these variables are only available for 1975, we assume they have not changed in the period under study. It is clear that factor prices affect employment demand. Since the data set provides no information on wage rates, we used hourly wage rates and their first-order lag

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8 A detailed description of the data set is given by Gaugler et al. (1978).

9 Similar data for non-production workers is not available. Note however, that studies analyzing the speed of employment adjustment of production and non-production workers found throughout that the adjustment of non-production workers is more slowly compared to production workers (see Nadiri and Rosen (1973), Shapiro (1986), and Palm and Pfann (1990).

on the two-digit-industry level.[11] Revenues and hourly wages rates are deflated using the producer price index of the manufacturing sector. All quantities and prices are measured in logarithms. Due to the short time period, we decided to pool the data. After eliminating missing values, a total sample of 6,531 observations was available.

Table 2 provides some basic descriptive statistics of the used sample over the entire period and the sub-periods 1971–1973 and 1974–1975. Over the period 1971–1975 the firms employed on average 461 production workers of which 79.5 percent where natives and the remaining 20.5 percent guest workers. Relative to the whole period the average total employment in the period 1971–1973 was slightly higher and decreased to an average of 446 workers in the period 1974–1975. Between the two sub-periods the fraction of native workers on total employment decreased from 80.4 percent to 78.2 percent. Accordingly, the fraction of guest workers increased from 19.6 percent in the period from 1971–1973 to 21.8 percent after the recruitment stop. Regarding the whole sample, total employment is found to fall in 54.5 percent, native employment in 57.7 percent, and guest worker employment in 39.9 percent of the observations. In the remaining 45.5 percent for all workers, 42.3 percent for natives and 60.1 percent for guest workers, employment is found to be stable or increasing. The picture is quite different if one examines the two sub-periods. After the recruitment stop, the number of observations with net hirings falls by 14.6 percentage points for total employment but only by 4.1 percentage points for natives and by 22.2 percentage points for guest workers.

4. Estimation Results

In Table 3 and Table 4 we present separate estimations of the matrix of adjustment parameters Λ of the equation systems (9) and (11) for the whole sample period 1971–1975 and the sub-periods 1971–1973 and 1974–1975 as well as for total employment and for native and foreign workers. The last two columns of each table show the sum of

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[10] We use the following dummy-variables for the production techniques of the firm: Single production, Small Series, Middle Series, Large Series, Semi-Automatic Mass Production, Assembly Line, and Process Production. Note, that each firm could have several of this production techniques.

squared residuals and the R^2 for the respective equations. A full set of the estimation results is given in Table A1 and Table A2 of the Appendix only.

Table 3 shows the estimated matrix of adjustment parameters for the symmetric model. All coefficients are highly significant and all estimated own-adjustment coefficients, λ_{ii} for i = N, G have the expected sign. Consider first the differences between natives and guest workers. For all periods the results show higher adjustment costs of foreign employment compared to native employment. The absolute asymptotic t-values associated with the null hypothesis $\lambda_{NN} = \lambda_{GG}$ are 22.03 for the whole sample period, 15.07 for the period 1971–1973, and 18.19 for the period 1974–1975. The cross-adjustment coefficients, λ_{NG} and λ_{GN}, are significant and positive for all periods under study, suggesting that natives and guest workers are q-complements. However, for all estimations in the symmetric model t-tests on similarity of the cross-adjustment coefficients revealed that λ_{NG} is significantly greater than λ_{GN} which contradicts the notion of dynamic symmetry of these coefficients.[12] According to these results, a greater disequilibrium in demand for natives slows down adjustment of guest worker employment to a greater extent than in the reverse case. This result could be explained by the different skill composition of natives and guest workers. For the year 1975 the data set enables us to differentiate the production workers into high-skilled and low-skilled workers. It appears that nearly 86 percent of the guest workers are low-skilled workers and the remaining 14 percent high-skilled. On the other hand, 39 percent of the natives are high-skilled workers and the remaining 61 percent low-skilled. If low-skilled and high-skilled workers are complements in the production process the above results seem to be highly plausible.

The effects of the recruitment stop on native and guest worker employment adjustment can be studied by comparing the estimated coefficients for the two sub-periods 1971–1973 and 1974–1975. A Chow-test reveals that the structural break between the

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[11] This data was covered from Görzig et al. (1994).

[12] The asymptotic t-values are 9.85 for the period 1971-1975, 7.79 for the period 1971-1973, and 7.56 for the period 1974-1975.

two periods is significant at the 1 percent-level. The respective test statistics are 8.1 for natives and 18.7 for guest workers. In relation to the period 1971–1973 the adjustment parameters decreased throughout after the recruitment stop. Furthermore, the decrease of the adjustment parameters between the two sub-periods is much higher for guest worker employment. Whereas λ_{NN} shows a decrease of 25 % from 0.364 to 0.275 with an asymptotic absolute t-value of 7.29, the adjustment parameter for guest worker employment, λ_{GG}, decreases by 65% from 0.196 to 0.068 with an asymptotic absolute t-value of 13.80. This result suggests that the recruitment stop leads to a sharp increase of the costs of adjusting guest worker employment. Furthermore, since natives and guest workers are dynamic q-complements the recruitment stop slows the speed of adjustment of native employment to their long-run equilibrium level.

A much more detailed description of the effects of the recruitment stop on dynamic labor demand is given in Table 4, which shows the estimation results for the asymmetric model. Chow-tests on similar coefficients in the hiring and firing regime lead to the conclusion that for all periods the symmetric model has to be strongly rejected in favor of the asymmetric model. The respective Chow-statistics for natives are 104.9 for the whole sample period, 70.4 for the period 1971–1973, and 48.2 for the period 1974–1975. The respective numbers for guest worker employment are 70.4, 36.9, and 57.0. Consider first the differences in the estimated adjustment coefficients between the hiring and the firing regime. In all periods the costs of firing workers are low compared to the costs of hiring. The following intuition can explain this result. On the one hand, when product demand declines, production workers are laid off. On the other hand, when product demand starts to rise again, the firm reacts with increasing overtime work for the incumbent workers and new hirings are started only gradually. The firms' propensity to fire workers is thus higher than it is to hire workers. This conclusion is in accordance with results of comparable research of Chang and Stefanou (1988) using data on Pennsylvania dairy farms, and Pfann and Verspagen (1989) using data of manufacturing firms in the Netherlands. However, this result is not at odds with the studies of Bresson et al. (1992a) who were unable to reject symmetric adjustment costs for unskilled workers in France, and of Jaramillo et al.

(1993) who found for a sample of 52 large firms in Italy that firing costs exceed hiring costs.

The estimates of the cross-adjustment parameters λ_{NG} and λ_{GN} show that natives and guest workers are dynamic q-complements when employment is increasing and dynamic p-substitutes when employment is decreasing. Note that in the period between 1971–1973 the cross-adjustment parameters in the firing regime are insignificant. Furthermore, this is the only case where a test on similarity of the cross-adjustment parameters could not be rejected, whereas λ_{NG} is significant smaller than λ_{GN} in the hiring regime and significantly greater in the firing regime.[13] As in the symmetric model, this result suggests that the firms' reaction to a disequilibrium in the employment of natives lies in a slower adjustment of guest worker employment. But this result holds only for the hiring regime. In the firing regime, a slower downward adjustment of native employment speeds up the downward adjustment of guest worker employment. Again, this result seems to be highly plausible in the face of the differences in the skill-composition of natives and guest workers.

Looking at the differences between natives and guest workers, it appears in all estimations that the hiring costs for guest workers are significantly higher than those for natives. Different to the hiring regime, the estimations revealed that the downward adjustment of guest worker employment is significantly faster than that of natives indicating smaller firing costs of guest workers in relation to natives.[14] Note also that the estimated differences in the adjustment parameters between natives and guest workers are much greater in the hiring than in the firing regime. This result suggests that the conclusion of a slower adjustment of guest worker employment comes mainly from the

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[13] For the null-hypothesis that $\lambda_{NG} = \lambda_{GN}$ the asymptotic absolute t-values revealed values of 3.13 for the period 1971-1975, 4.05 for the period 1971-1973, and 8.15 for the period 1974-1975 in the hiring regime, and 2.03, 0.17, and 3.25, respectively, in the firing regime.

[14] The asymptotic absolute t-values associated with the null hypothesis $\lambda_{NN} = \lambda_{GG}$ are 32.21 for the period 1971-1975, 23.73 for the period 1971-1973, and 29.52 for the period 1974-1975 in the hiring regime. The respective numbers in the firing regime are 12.42, 8.09, and 8.92.

relatively high costs of hiring guest workers. The q-complementarity in the hiring regime is greater for natives whereas the p-substitutability in the firing regime is greater for guest workers. These results clearly underline the function of guest workers as a buffer for the German labor market. In phases of growing demand for unskilled workers combined with a labor shortage on the supply side, firms recruit labor from other countries. On the other hand, guest workers bear a disproportionate amount of downward employment adjustment compared to natives.

A comparison of the estimations for the periods before and after the recruitment stop shows significantly different results for the two sub-periods. As in the symmetric model, Chow-tests on a structural break in the coefficients are significant on a 1 percent level for all estimated equations. The respective test statistics in the hiring regime are 20.2 for natives, and 29.3 for guest workers, and in the firing regime 46.6 for natives, and 6.3 for guest workers. As we have expected, the hiring costs of guest workers increased sharply after the recruitment stop in 1973. The estimated adjustment parameter λ_{GG} dropped by nearly 69% from 0.205 to 0.064. But the recruitment stop affected also the hiring costs of natives, although to a lesser extent than the hiring costs of guest workers. The adjustment parameter λ_{NN} dropped from 0.460 in the period 1971–1973 by 17% to 0.383 in the period 1974–1975. Since native workers and guest workers are q-complements in the hiring regime, this result is in accordance with our theoretical considerations.

Regarding the firing costs, the picture is quite different. Whereas the downward adjustment of native employment becomes slower, that of guest workers becomes faster. This result indicates decreased firing costs of guest workers after the recruitment stop. However, the changes of both parameters are not significant on a 5 percent level. Analyzing the cross-adjustment parameters, it appears that the q-complementarity between natives and guest workers in the hiring regime decreased between the two sub-periods, but only for λ_{NG} on a significant level. On the other hand, the p-substitutability increased

significantly in all cases.[15] Again, this result confirms the buffer function of guest workers in the German labor market.

5. Conclusions

This study is novel in various aspects: It uses micro data on firm-specific heterogeneous labor demand to investigate asymmetric adjustments under policy regimes affecting labor supply conditions and hence hiring costs. The findings are fairly strong and provide a clear picture. Asymmetric models are essential to measure firm adjustment processes. Hiring costs are more important than firing costs. Guest workers have served as a buffer to shocks; they are complements to natives in a period of hiring and substitutes to natives in the process of firing. Labor supply-side policies have been shown to affect employment decisions of firms. The recruitment halt has created important changes in the adjustment process of firms, among them a significant increase in the hiring costs of foreigners but also of natives. In contrast, firing costs did not change much. This confirms that the regime switch in 1973 can be considered as a supply effect.

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[15] For the hypothesis of similar coefficients in the two subperiods the asymptotic t-values in the hiring regime are -5.35 for λ_{NG} and -1.44 for λ_{GN}. The respective numbers in the firing regime are 2.79 for λ_{NG} and 3.32 for λ_{GN}.

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