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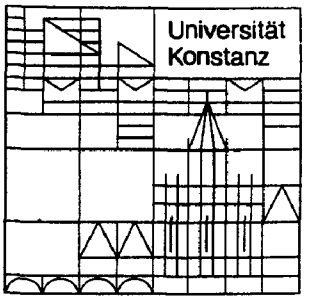
Diskussionsbeiträge



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Migratory Movements in a Disequilibrium Macroeconometric Model for West Germany

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MIGRATORY MOVEMENTS IN A DISEQUILIBRIUM MACROECONOMETRIC MODEL FOR WEST GERMANY*

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März 1993

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Abstract

This paper attempts to evaluate economic effects of migration into Germany on the basis of a macroeconometric disequilibrium model. Germany has the advantage of having experience with migratory movements of guestworkers. There was a tremendous inflow of those workers in the sixties as well as an immigration stop enacted in 1973. Both aspects are discussed in this study. Moreover, in recent years and in the foreseeable future a high inflow from Eastern Europe into Germany is expected. Extending the model until 1995 a simulation experiment concerning this inflow is carried out, too. The upshot of the econometric exercise is that the effects of immigration on macroeconomic variables is "regime–specific", i.e., they depend on the type of disequilibrium prevailing on the goods and labor market.

1 Introduction

Free movement of labor as well as agitation against foreign workers by parts of the native population is not only a recent phenomenon and focus of public attention in many countries but also has numerous historical antecedents. The historian might wish to follow in Abraham's tracks, he may study mass movements of labor from rural areas which accompanied industrialization in the nineteenth century, he may look at several remigrations of Polish workers in 1907 after they had flooded into Germany, and, after all, he certainly is unsurprised but deeply concerned about the flaring up of hostility against foreigners in our days.

In light of the tremendous literature on the causes and consequences of international migration, Germany has the advantage of being able to contribute with recent experience to that discussion. As long as the influence of migration on the macroeconomic performance is concerned, the controversial debate is on how migration affects unemployment, growth, and inflation. Unfortunately, existing studies are anything but unique in their assessment of the advantages and disadvantages of guestworkers.

This paper takes a fresh look on this issue and argues that it is fairly unsurprising that various studies reach different conclusions. The main reason is that some studies take snap–shots of time only and fail to take into account that the macroeconomic consequences of guestworkers immigration depend crucially on the disequilibrium situation prevailing in the economy such as a period of excess demand for labor (as in Germany in the sixties) or a situation with labor in excess supply (as in the seventies and eighties). Given the recent research efforts on macroeconometric disequilibrium models the paper attempts to marshall the macroeconomic effects of guestworker employment in a disequilibrium context. This experience is then used to simulate the impact of recent and future migration from Eastern Europe into Germany.

The paper is organized as follows. The next section is devoted to a quantitatively oriented review of guestworker employment in Germany including some important institutional regulations. Migration from Central and Eastern Europe into Germany is the topic of section 3 where several types of those migrants are distinguished.

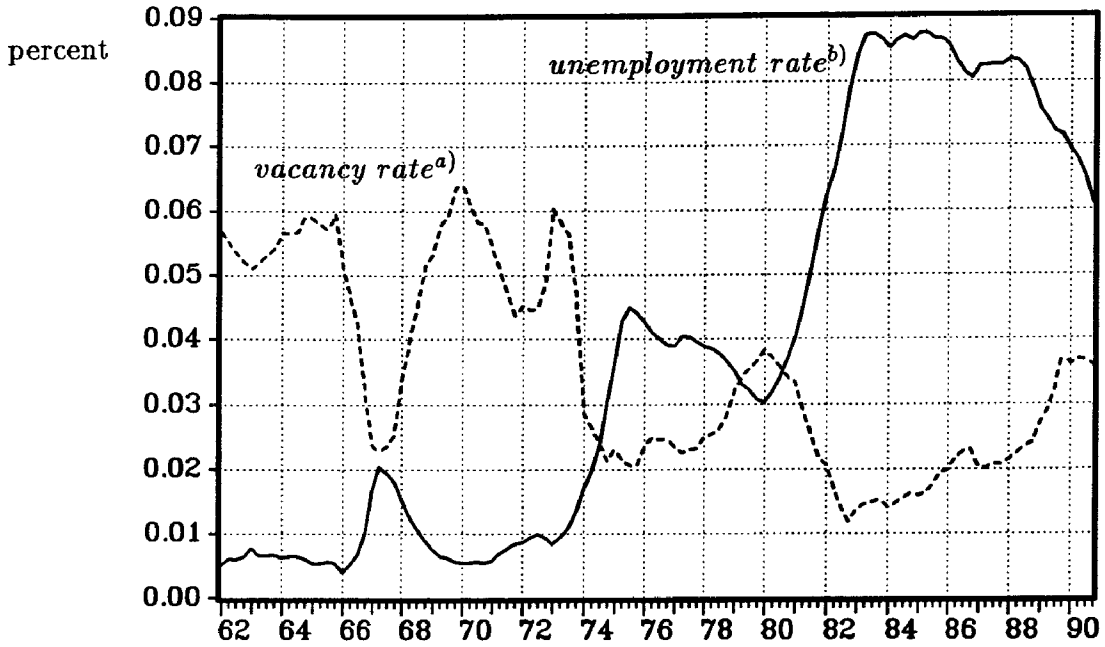
2 Guestworkers in Germany: The Institutional and Empirical Background

As a prerequisite for the subsequent discussion some major institutional and legal regulations of the immigration and employment of foreign workers are outlined.

To begin with legal regulations a distinction is to be made whether the homecountry of the guestworker is an EC member country. As article 48 and 49 of the treaty of Rome stipulate there is, in principle, free movement of labor within the EC. The final stage of this agreement was signed in 1968. Hence, a foreign worker coming from an EC member country cannot be prohibited from working in Germany. As in other EC member states there are, however, some institutional barriers for carrying out certain professions depending on whether foreign diplomas are accepted, for example.

The immigration of non–EC–foreigners is to a much greater extent under governmental control. In situations with an excess demand for workers – as in the sixties (see figure 1) – the German economy had little difficulties, if any, to fill this gap due to a very high degree of willingness among non–EC workers to migrate to Germany.

Figure 1: German Labor Market Indicators



a) corrected vacancies divided by employment

b) unemployed persons divided by labor force

Source: Franz and Smolny (1993).

For example, before the immigration stop was enacted in 1973, more than one million Turkish nationals reportedly wanted to become employed in Germany. Before that immigration stop a permission was required for an employment of non- EC workers which the firm in Germany could obtain rather easily if it was proved that the vacancy could not be filled by a German worker. In more administrative terms, recruitment agreements were signed between Germany and countries such as Greece, former Yugoslavia, Portugal, Spain, Turkey and several North African states. The German Federal Labor Office (Bundesanstalt für Arbeit) established branch offices in these countries especially designed to recruit foreign workers which had to register there and were matched to given workplaces in Germany. While in the mild recession 1967 reduced labor demand in Germany and, hence, less requests for foreign workers decreased the inflow of foreign workers without formal governmental intervention by one half, the deeper recession starting in 1973 led the federal government to close all those branch offices and to restrict severly the recruitment of non–EC workers on the firm's own initiative. However, under certain conditions family members of guest workers were allowed to join them in Germany.[1]

How long are foreigners allowed to stay in Germany? According to laws enacted in 1978/79 a foreigner has a claim to an unlimited residence permit if he has worked in

[1] Basically, these conditions refer to the length of stay of the guest worker. Moreover there is an age ceiling for immigrating children.

Germany for at least eight years and if he fullfills some requirements concerning knowledge of the German language, residency and the like. The permission can be granted earlier but in any case the foreigner has to have worked in Germany for at least five years without interuption. In 1979 (1984) about half (two thirds) of all foreigners fullfilled this eight years–requirement. The more time passes, therefore, the fewer will be the number of non–EC foreign workers serving as an instrument of a remigration policy. In addition, the immigration stop may have induced some reluctance to return home voluntarily. Some of those non–EC workers who have planned to go back to their home country (temporarily) will now stay in Germany, since they will have no possibility of returning to Germany now that the immigration stop is in operation. Hence, the enforcement of involuntary remigration of some non–EC workers may be compensated for or even offset by a higher unwillingness to leave Germany by other non–EC workers who would otherwise have departed. Remigration policy focussed on financial incentives to encourage voluntary remigration. In 1983 a "return promotion law" ("Rückkehrhilfegesetz") was enacted which for 1984 granted a single lump–sum payment on the surrender of residence and work permits and the permanent departure of the worker and his family provided that he had become unemployed due to a bankruptcy of (parts of) the firm he was employed before or that he has experienced short–term work.[2] Entitled to this "repatriation grant" were basically foreign workers from Jugoslavia and Turkey. The law had limited success, however. Only some 14,000 workers made use of this grant, i.e., only 1.5 p.c. of all guest workers entitled.[3]

The following stylized facts highlight the quantitative importance of guestworkers migration:[4]

i The number of foreign workers in Germany (see figure 2 increased from 280,000 persons in 1960 to a peak of 2.5 million in 1973 (i.e., from about 1.3 percent to 10 percent of all employees). As of 1989 (before unification) this figure declined to 1.7 million persons (or 6 percent).

ii With respect to the country of origin, in the time period 1985/89 one third of all foreign workers came from Turkey, nearly 20 percent of Yugoslavia, and some 10 percent from Italy and again 10 percent from Greece and Spain.

iii More than 60 percent of foreign employees belong to the age group 25 – 45 years compared with 45 percent of Germans (all figures refer to 1983).

iv Labor force participation rates are generally higher for foreigners but the difference is most markedly for married women (Germans: 42 percent, foreigners: 53 percent; 1983).

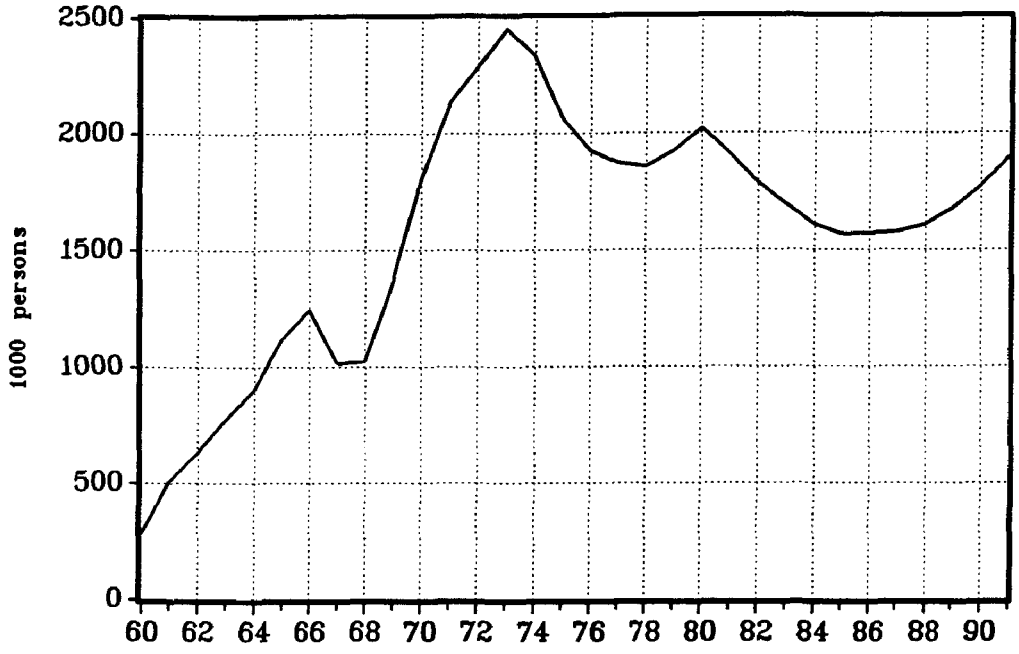
v The share of foreign workers with completed school and/or vocational training falls short of the respective shares for German workers.

[2]The amount of this grant was some 10,000 DM for the worker and 1,500 DM for each child.

[3]A remigrant could cash in his contributions to social security (old age pensions) and his claims to subsidized savings accumulated on the basis of a governmental program for wealth accumulation of workers. See Hönekopp (1987), pp.287 for details. Some 100,000 foreigners made use of this possibility.

[4]For more detailed information including figures, tables, and sources the reader is referred to Franz (1991).

Figure 2: Number of Foreign Workers in Germany (1000)



a) Workers covered by security laws.

Source: Amtliche Nachrichten der Bundesanstalt für Arbeit, various issues.

vi Especially in the eighties unemployment rates for foreigners exceed those of Germans considerably (1989: 12.2 and 8.3 percent, respectively).

vii Guestworkers earned in the eighties 20 to 25 percent less than Germans but their earnings do not seem to catch up to the overall mean. This is due to the fact that guestworkers are almost entirely confined to blue collar positions. Among blue collar workers there is little noticeable difference between earnings of Germans and guestworkers.[5]

3 Migratory Movements from Eastern and Central Europe

For the subsequent analysis four groups of migrants from Central and Eastern Europe have to be distinguished:

(i) *Germans emigrating from the former German Democratic Republic (GDR) and East-Berlin to the Federal Republic of Germany (these people are called "Übersiedler").* After German unification these persons are statistically subsumed under "internal migration" within Germany. These "Übersiedler" have been given immediately the same rights as the West Germans. Table 1 reveals the sharp increase of "Übersiedler " and – later – of persons migrating from East to West Germany.

[5] Pischke (1992). Other related studies include Dustmann (1990) and Licht and Steiner (1992).

Table 1: Inflows of German Emigrants from the GDR and Eastern Europe[a)]

Country of origin	1985/88[b)]	1989	1990	1991	1992
GDR[c)]	20	344	238	—	—
East Germany[d)]	—	—	157[e)]	200[f)]	150[f)]
Eastern Europe	91	377	397	222	231
– Poland	60	250	113	40	
– USSR	16	98	148	147	
– Romania	14	23	107	32	
Total[g)]	111	721	792	422	381

Notes:

a) See text for explanations; inflows into West Germany cumulated sums per year, 1000 persons.

b) yearly averages.

c) figures refer to "Übersiedler"; per definitionem "Übersiedler" are registered as such only prior to 30.06.1990.

d) after unification.

e) includes a minor fraction of foreigners changing residence from East Germany to West Germany.

f) estimates by the authors based on Blaschke et al. (1992), p. 122.

g) sum of first three rows.

Sources: Statistisches Jahrbuch 1992, pp. 87 and 91; Zahlen zur wirtschaftlichen Entwicklung der Bundesrepublik Deutschland 1992, table 13; Blaschke et al. (1992); calculations by the authors.

(ii) *German citizens or people of German national identity who are repatriated from their emigration areas in Eastern Europe (these people are christened "Aussiedler").* Table 1 displays figures of these peoples, too. As can be seen there is a jump from 91 thousand persons per year during 1985 and 1988 to 377 thousands in 1989 with a decline to 189 thousands in 1992. These "Aussiedler" were normally recognized as Germans, the "rejection rate" is less then 10 percent[6]. Therefore, they had virtually unlimited access to the German labor market and to social benefits including special "integration benefits".

(iii) *Migration of non-Germans from Eastern Europe into Germany.* Table 2 provides figures for net inflows of Germans and foreigners from Eastern Europe to West Germany. In 1989 and 1990 some 150,000 foreigners belong to this group. A comparison of the figures for Germans in table 2 with the respective figures in table 1 has to take into account two differences. First, table 2 displays net inflows rather than gross inflows. Second, in table 2 the attribute "German" refers not only to German emigrants but also to other Germans leaving the country under consideration. Therefore, the figures in table 1 are higher in most cases.[7]

Until recently, foreigners from Eastern Europe were regarded as refugees for political reasons. This means that they were not sent back to their native countries

[6] Source: Hönekopp (1991), p. 117.

[7] For example, in 1990 we have 397,000 gross inflows of "Germans" according to table 1, but 348,000 net inflows of "Germans" according to table 2.

Table 2: Net Inflows into Germany from Eastern Europe (cumulated sums per year; 1000 persons)[a)]

Country of origin	1980/84[c)]		1985/88[c)]		1989		1990	
	G	F	G	F	G	F	G	F
Poland	24	16	45	48	191	118	95	43
Romania	12	3	11	5	15	11	96	62
USSR	3	1	13	2	88	22	155	26
Eastern Europe[b)]	40	26	70	63	297	163	348	146

a) G = German nationals, F = foreigners; b) includes also Bulgaria, Czechoslovakia, Hungary; c) yearly averages.

Sources: Hönekopp (1991), pp. 127-128; Statistisches Jahrbuch 1992, p. 90; calculations by the author.

Table 3: Inflow of asylum – seekers (cumulated sums; 1000 persons)

Citizenship	1985/88[a)]	1989	1990	1991[b)]	1992[b)]
Europe	38	73	102	167	
– Yugoslavia	7	19	22	75	
– Romania	2	3	35	41	
– Turkey	10	20	22	24	
Africa	7	13	24	36	
Asia	36	33	61	51	
Total	84	121	193	256	438

a) Yearly averages; b) unified Germany.

Source: Statistisches Jahrbuch 1992, pp. 72; calculations by the authors.

and, until some years ago, were allowed to have immediate access to the German labor market. Currently they have to wait for such a permission one year.

(iv) *Asylum – seekers.* Table 3 reveals that in 1991 167,000 asylum – seekers from Europe were registered (among a total of 256,000) and that the three countries named there contribute the overwhelming share. For 1992, a total of 438,000 asylum – seekers is reported. Although only a minor fraction of asylum – seekers is recognized as a political refugee (asylum – seekers for economic reasons are not recognized as refugees) the overwhelming number of non-recognized asylum – seekers is not (immediately) sent back to their home countries either on humanitarian grounds (Geneve convention) or because they appeal against this decision. The present regulatim is that refugees have immediate access to the German labor market.

In summing up, West Germany has experienced a tremendous inflow of persons both from Eastern Europe and the former *GDR* in the last years. For example, in 1989 and 1990 net inflows from Eastern Europe amounted to nearly one million persons (table 2). In the same years 500,000 persons changed residence from East Germany to West Germany (net of those who moved in the other direction). Adding the inflow of about 300,000 asylum – seekers during 1989 and 1990 gives a figure of nearly 1.8 million

persons, i.e. nearly 3 percent of the West German population.

4 The Past: Guest Worker Migration

In this section the basic philosophy of the disequilibrium model is outlined very briefly. Moreover, some modifications and extensions are discussed which are designed to allow for migratory movements. Finally, macroeconomic effects of guestworker employment are evaluated.

4.1 Basic Philosophy of the Disequilibrium Model

Since the basic philosophy of the model has been surveyed elsewhere[8] we can be very brief and concentrate on our own modifications and extensions.

Table 4: Variables of the theoretical model

YT	Output transacted
YD	Demand for output
YC	Output determined by existing capacities
YS	Supply of output
Y_{L^*}	Output produced with optimal labor demand L^*
Y_{LS}	Output produced with full utilzation of labor LS
K	Capital stock
LT	Employment
LD	Demand for labor
LS	Supply of labor
L_{YC}	Labor demand determined by YC
L^*	Optimal labor demand determined by expected goods demand $E(YD)$

To begin with output and employment decisions, their flexibility depends on the time span under consideration:[9]

(i) In the short run the firm's supply of output is fixed and the transacted quantities on the market (YT) are the minimum of the goods demanded (YD) and goods supplied (YS), i.e.,

$$YT = \min(YD, YS). \tag{1}$$

(ii) In the medium run employment can be subject to variations, whereas the capital stock is still a fixed factor of production. Employment (LT) is then the minimum of labor demanded (LD) and labor supplied (LS), i.e.,

$$LT = \min(LD, LS). \tag{2}$$

The demand for labor is either determined (as L^*) by expected goods demand (YD) or (as L_{YC}) by the optimal utilization of existing capacities (YC). Consider

[8] See Franz and König (1990) and Drèze and Bean (1990), for example.

[9] The following considerations are partly based on Smolny (1991) where a more detailed analysis of various aspects is presented.

L_{YC} first and note that, by definition,

$$L_{YC} \equiv \frac{YC}{(Y/L)^*} \equiv K \cdot \left(\frac{Y}{K}\right)^* / \left(\frac{Y}{L}\right)^*, \tag{3}$$

where the terms in brackets denote optimal capital and labor productivity, respectively. They can be derived from the first–order conditions of a cost minimizing firm given a CES–technology and depend on factor price ratios and efficiency terms reflecting labor and capital saving technical progress, respectively. The determination of L^* is best understood by recognizing that in the optimum marginal costs of labor (i.e., the wage rate W) should equal marginal returns from labor (P is the price of goods):

$$W = P \cdot \text{prob}\left[YD > Y_{L^*})\right] \cdot \left(\frac{Y}{L}\right)^* \tag{4}$$

The r.h.s. term of eq. (4) reflects the marginal returns from labor. Y_{L^*} is output produced by the optimal labor demand L^*. The second expression stands for the probability that expected goods demand exceeds those quantities (Y_{L^*}) which can be produced with optimal labor (L^*). As can be shown[10], from eq. (4) one can develop the following equation for labor demand by making use of a log–normal distribution of excess demand on micro markets and a logistic approximation of the cumulative distribution function:

$$L^* = E(YD) \cdot \left(\frac{L}{Y}\right)^* \cdot \left[\exp(-0.5 \cdot \sigma_{yd}^2) \cdot \left(\frac{1-sl}{sl}\right)^{\alpha}\right] \tag{5}$$

where E is the expectations operator, σ_{yd}^2 is the logarithmic variance of goods demand, and

$$sl = \frac{W}{P} \cdot \left(\frac{L}{Y}\right)^*, \quad \alpha = \frac{\sigma_{yd} \cdot \sqrt{3}}{\pi}.$$

(iii) In the long run firms can adjust capacities (YC) by changing the capital stock (K) and/or the production technology. More specifically, YC is determined by the condition that the expected marginal return of capital should equal capital costs. The first–order condition for an optimal capital stock is given by equating the marginal revenue from capital minus the additional labor costs for a marginal investment with marginal capital costs (UC):

$$P \cdot \text{prob}\left(Y^A > YC\right) \cdot \left(\frac{Y}{K}\right)^* - W \cdot \text{prob}\left(Y^A > YC\right) \cdot \left(\frac{L}{Y}\right)^* \cdot \left(\frac{Y}{K}\right)^* = UC \tag{6}$$

or:

$$\left[P - W \cdot \left(\frac{L}{Y}\right)^*\right] \cdot \left(\frac{Y}{K}\right)^* \cdot \text{prob}(Y^A > YC) = UC \tag{7}$$

where Y^A denotes the minimum of Y_{LS}, Y_{L^*} and YD:

$$Y^A \equiv \min\left\{Y_{LS}, Y_{L^*}, YD\right\}. \tag{8}$$

[10] See Franz, Heidbrink and Scheremet (1991), Appendix A.

Y_{LS} is output which can be produced with available labor supply. YD, Y_{L^*}, Y_{LS} are the possible constraints that may prevent the firm from full utilization of capacities.

$$Y_{LS} = LS \cdot \left(\frac{Y}{L}\right)^*, \tag{9}$$

$$Y_{L^*} = L^* \cdot \left(\frac{Y}{L}\right)^*. \tag{10}$$

Solving for $(\text{prob}(Y^A > YC))$ yields the expression:

$$\text{prob}(Y^A > YC) = \frac{sk}{1 - sl} \tag{11}$$

with $$sk = \frac{UC}{P} \cdot \left(\frac{K}{Y}\right)^*.$$

From this the following equation for YC can be developed by making use of the same methods as in step (ii):

$$YC = E(Y^A) \cdot \left[\exp(-0.5 \cdot \sigma^2_{Y^A}) \cdot \left(\frac{1 - sl - sk}{sk}\right)^{\beta}\right] \tag{12}$$

with $$\beta = \frac{\sigma_{y^A} \cdot \sqrt{3}}{\pi}.$$

Capacities are chosen to be proportional to the expected minimum of goods demand YD and goods supply Y_{L^*} and Y_{LS} determined by L^* and LS. Further determinants are a measure of profitability and the variance of log Y^A.

Then K is obtained by:

$$K = \left(\frac{K}{Y}\right)^* \cdot YC. \tag{13}$$

We now turn to the aggregation of demand and supply quantities from the micro goods and labor markets to economy wide quantities. Following Lambert (1988) we assume the joint statistical distribution of micro level goods demand and supply to be described by a bivariate lognormal distribution. Aggregation over micro markets then yields a tractable functional form for goods transacted YT ("smoothing by aggregation"):

$$YT = \left\{Y_{LT}^{-\rho_G} + YD^{-\rho_G}\right\}^{-\frac{1}{\rho_G}} \tag{14}$$

The two variables Y_{LT} and YD in the CES-function have the following interpretation. Y_{LT} is output determined by employment times optimal producitivity, i.e. labor productivity at full utilization of labor. As mentioned before [(see the discussion of eq.(3)], the latter is obtained by regressing actual labor productivity on, among others, factor prices and capacity utilization. Using this regression and calculating labor productivity for full utilization gives the aforementioned optimal labor productivity.

Turning to the treatment of aggregate demand YD, private consumption, investment, exports and imports are endogenous variables, whereas government expenditures

and housing investment are treated exogenously. Consumption depends on disposable income, the interest rate, and on a labor market indicator. The investment equation is based on the accelerator principle. Rationing is introduced in the following way. Excess demand for domestic goods will lead to additional imports to bypass the constraint, while on the other hand, excess demand on the world market will restrain German imports. The opposite may hold for exports: Domestic constraints will hinder foreign demand, while supply constraints on the foreign market may induce additional German exports. Rationing of the demand components other than exports and imports will be observed only in the case of simultaneous constraints on the domestic and the world markets. No significance of those effects was found. Therefore they may be regarded as rather small. Demand for exports (XD) and imports (MD) are calculated for a situation with no rationing on the domestic market. This gives the following identities for goods demand:

$$YD = C + I + G + XD - MD \tag{15}$$

A mismatch parameter ρ_G enters the CES–function. It measures the mismatch of supply and demand on the goods markets. The main determinant of mismatch on the goods market is the expectation error of demand on the micro markets. As firms have no perfect information about demand at the time of the employment decision, they have to decide under uncertainty. Employment determines output. Therefore, the size of the mismatch on the goods market ρ_G depends essentially on the adjustment speed of employment with respect to changing conditions on the goods market. For $\rho_G \to \infty$ equation (14) tends to the usual minimum–condition, i.e., now not only each micro market but also the aggregate economy is subject to only one of the constraints.

Similar arguments can be applied to the labor market. Transacted labor LT, i.e., employment, is determined either by labor supply LS or by labor demand LD. The latter is split into labor demand based on expected goods demand (L^*) and labor demand brought about by productive capacities L_{YC}. The mismatch parameter ρ_{LT} represents what is mostly understood by the term mismatch on the labor market such as regional or qualification mismatch. By the same way of reasoning we obtain:[11]

$$LT = \left\{ LS^{-\rho_{LT}} + (L^*)^{-\rho_{LT}} + (L_{YC})^{-\rho_{LT}} \right\}^{-\frac{1}{\rho_{LT}}}. \tag{16}$$

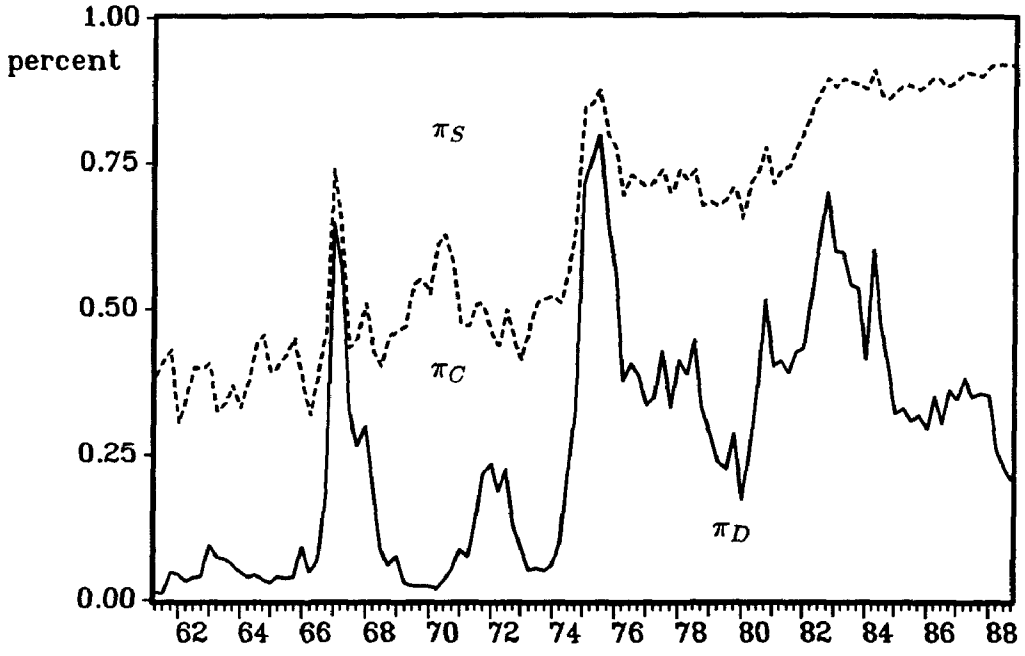
Eq. (16) can be transformed into elasticities of LT with respect to LS, L^*, and L_{YC}. Moreover, these elasticties can be shown to represent share of firms ("regimes") being constrained either by labor supply, goods demand, or capacities:

$$\left.\begin{aligned} \epsilon_{LT,LS} &= \left\{ LT/LS \right\}^{\rho_{LT}} \\ \epsilon_{LT,L_{YD}} &= \left\{ LT/(L^*) \right\}^{\rho_{LT}} \\ \epsilon_{LT,L_{YC}} &= \left\{ LT/L_{YC} \right\}^{\rho_{LT}} \end{aligned}\right\} \tag{17}$$

Wages and prices are determined by demand and supply factors and react slowly to market disequilibria. Price setting of firms is assumed to follow a mark–up pricing on several types of costs, where the mark–up depends on demand conditions on the goods market. Costs considered are wage costs, i.e., standard wages relative to actual

[11] This CES–function could be interpreted as well as a matching function in the framework of Blanchard, Diamond (1989). For a discussion of this aspect see Franz, Smolny (1993).

Figure 3: Regime Proportions[a)]



a) See text for details.

labor productivity, prices of imported goods relative to the GNP–deflator, value added taxes, and the share of non–wage labor costs in total labor costs. Wages are set in negotiations between labor unions and employers. Explanatory factors are expected inflation, change in labor productivity, and several supply variables. The effect of labor market conditions is captured by the unemployment rate.

The upshot of the estimation results of this model can be summarized by figure 3 which displays the regime proportions according to equation 17. While the periods 1960– 1966 and 1969–1974 are characterized by the preponderance of capacity and labor supply constraints, the demand constraints become dominant in recession periods with peaks in 1967, 1975, and 1982/83. Referring to the period after 1982 an increasing importance of capacity constraints can be observed. This is partly due to the restrictive monetary and fiscal policies in the beginnings of the eighties which led to an investment squeeze.

4.2 Migratory Movements of Guestworkers

A central aspect of the model is, of course, labor supply. Labor supply consists of two components. First, labor supply of Germans is modelled by an endogenously determined labor force participation rate which depends on the real wage rate and the unemployment rate in order to allow for discouraged workers.

The number of foreigners is described by inflow and outflow equations discussed below. Their labor force participation rate is determined by the same explanatory variables as for Germans. In addition, the share of males among foreign workers enters the participation equation for foreigners which is designed to take into account the

higher participation rates of male guestworkers.

While based on theorecal considerations of the migration literature[12], the inflow and outflow equations are fairly standard and observe little explanations.[13] To begin with, inflows Z of foreigners into Germany are formulated and estimated as an error correction version in order to distinguish between short–run and long–run effects and will be estimated for five nationalities of immigrants (Italy, Spain, Greece, Turkey, Jugoslavia).

$$\begin{aligned} \Delta Z_t^i &= a_1 \cdot W^{diff} + a_2 \cdot \Delta UR_t + a_3 \cdot \Delta UR_t^i \\ &+ \lambda[Z_{t-1}^i + a_0 + a_4 \cdot W^{diff} + a_5 \cdot UR_{t-1} \\ &+ a_6 \cdot UR_{t-1}^i] + \epsilon_t^i \end{aligned} \tag{18}$$

where W^{diff} is the expected income difference between Germany and the country i under consideration. For all but three countries this equation has been estimated for the period 1961–1988 using annual data. The exceptions are Greece, Jugoslavia, and Spain where the estimation covers the time period 1961–1973 only. The reason is the immigration stop for non–EC immigrants put into effect at the end of 1973. Although immigration from these countries dropped dramatically, it was still present due to the immigration of guest workers' families joining them in Germany.[14] For the sake of simplicity, immigration from these countries during 1974–1988 is described by the following equation:

$$Z_t^j = a_7 + a_8 \cdot POP_{t-1}^j + \epsilon_t^j, \tag{19}$$

where j is a subscript for Greece, Jugoslavia, and Spain, respectively, and POP^j represents the population of nationality j, already living in Germany.

Both equations (18) and (19) are jointly estimated for each nationality i. The explanatory variables for countries j are multiplied by dummy variables D and $(1-D)$, respectively, where $D = 1$ for 1961–1973 and $D = 0$ for 1974–1988. This ensures that the explanatory variables are in effect only for the relevant time period as described before. For Italy and Turkey equation (18) is estimated for the whole time period 1961–1988. This is obvious for Italy due to its EC membership. For Turkey which is no EC member country this procedure deserves an explanation. In contrast to the low and fairly constant level of the number of immigrants from Greece, Jugoslavia, and Spain after the immigration stoppage, the respective figure for Turkish immigrants exhibits a high variability and a substantial increase by the end of the seventies which was abruptly terminated in 1980/81. One explanation of this pattern is the family reunification mentioned above because only about 15 percent of these immigrants have been belonging to the labor force.[15] In these years several changes of institutional regulations took

[12] See Molho (1986), Stark (1991) and Straubhaar (1988) for surveys. The following considerations are based on Franz and Smolny (1990) and Smolny (1992).

[13] Most inflow and outflow equations for migrants are based on a decision model for the migrants. Then, the unemployment rates in the home and in the receiving country are measures of the employment probability. An alternative way to model these flows would be to include demand side factors such as the share of firms being constrained by the labor supply. However, for the estimation it is not possible to include both the share of labor supply constrained firms and the unemployment rate due to their high correlation.

[14] See section 2. Note that Z covers all immigrants (not only workers).

[15] Source: Deutsches Institut für Wirtschaftsforschung, DIW–Wochenbericht 37/1982, p. 456.

place such as the payment of child allowances (which, by and large, could be claimed by the foreigners only for those children who lived in Germany). Moreover, studies of Turkish migration conclude that immigration of Turkish immigrants is highly sensitive to business fluctuations[16] which are partly captured by the unemployment rates in equation (18).

The equations describing remigration exhibit basically the same structure as equation (18). Lagged immigration serves as an additional explanatory variable, however, in order to recognize the possibility that some guest workers deliberately want to stay in Germany for a short time period only. This concerns mainly young male foreign workers planning to work in Germany for one or two years as is evidenced in Werner (1987, p. 358).[17] Therefore, the figure for remigration mirrors to some extent the lagged figure for immigration. Moreover, a dummy variable $D_{84} = 1$ for 1984 and zero otherwise is introduced in order to allow for possible positive effects on remigration due to the enactment of the return promotion act.[18]

The estimation results are displayed in appendix A. To begin with immigration, the error correction specification has been applied but variables with insignificant coefficients have been dropped in the final version. By and large, domestic and foreign unemployment rates as well as foreign population wind up as explanatory variables. The notable exception is Italy where the wage differential W^{diff} also plays a significant role. One explanation for the lack of significance of W^{diff} for the other countries may be that these differentials are so large that even a compression does not lead to a significant reduction of migration into Germany. Moreover, a structural break in the equations for immigration has in fact been found for Greece, Jugoslavia, and Spain (but not for Turkey) for 1974, the first year when the immigration stoppage for non–EC foreigners was in operation. Possible reasons for the absence of such a break for Turkey have been discussed before.

4.3 Macroeconomic Impacts of Guestworker Employment

In order to evaluate the impact of guestworker employment on major macroeconomic variables a hypothetical (but not completely unrealistic) immigration policy is simulated. This policy enacts an immigration stoppage for non–EC foreigners already in 1968 rather than in 1973 as actually happened. More specifically, the immigration of non–EC foreigners is restricted on its average value between 1962–1966. This means that immigration of non–EC foreigners is roughly halved until 1974. The recession year 1967 is not included in this average in order not to simulate an overly restrictive immigration policy. This ceiling of 229,000 foreigners from non–EC countries is in operation during the entire simulation period, i.e., from 1968–1986.

As an immediate effect, labor supply of foreigners is reduced with a maximum of 504,000 persons in 1973. The reduction amounts to 227,000 persons in 1986. This negative impact on labor supply is mitigated, but not offset, by the increase of German labor supply. This in turn is induced by the inverted discouraged workers effect stemming from the decrease in unemployment due to the more restrictive stoppage. Moreover, we observe a decrease of both employed and unemployed persons. At the end of the

[16] See Gümrükcü (1986) and Werner (1987) for more details.

[17] It is unknown to what extent this behaviour is due to incomplete prior information. See Brecht (1990) for an analysis of Turkish remigration based on the socio–economic panel.

[18] See section 2.

simulation period, however, the negative effect on employment vanishes whereas the decrease of unemployment is more permanent. The highest decline in employment occurs in 1973 (–264,000 employees). Real GNP–growth rates are influenced rather modestly: negatively until 1972 (with a maximum of –0.3 percentage points) and positively since 1973 (with an exception in 1979 and 1986). How are these effects brought about?

As is documented in figures 1 and 3 above, the period 1968–1973 can be characterized by a substantial labor supply shortage. Hence, a reduction of labor supply has stronger consequences in this time period compared with the following years where employment was to a greater extent determined by goods demand. This implies for the period 1968–1973 stronger influences on wages and prices, too. At the maximum, nominal wage inflation increases for 1.4 percentage points[19] and the growth rate of the GNP deflator exceeds its actual value for 0.9 percentage points. Therefore, the real product wage is now higher and employment lower. Reduced employment affects consumption negatively[20] as well as investment expenditures enforced by the accelerator principle in the investment equation. This explains why real GNP growth rates may fall. On the other hand, labor productivity may increase because firms substitute away from labor in due course of higher real product wages. This phenomenon gives rise for higher real GNP growth rates as a possible outcome of a more restrictive immigration policy. If labor is in excess demand, a higher labor productivity reduces labor shortage as a rationing barrier and enables higher GNP growth. Taken together, the period 1968–1972 was dominated by the negative impact on real GNP growth, while the reverse holds for the period afterwards (with the two exceptions mentioned already).

The first oil price shock causes an immediate loss in purchasing power thus leading to an enlarged share of firms subject to goods demand constraints. Simulated wage and price inflation is only slightly higher (0.25 and 0.36 percentage points, respectively, for an average of the period 1975–1979). The real product wage and, consequently, labor productivity decline. These developments are continued in the eighties. Employment is now mainly determined by aggregate goods demand so that a reduction of the foreign work force has smaller effects, if any, on employment.

5 The Future: Inflows of German Emigrants

In recent years East-West migration has taken center stage in the public discussion of international migration. There are several reasons to expect a migration pressure from the former Soviet Union and East European countries. Not only are people there aware of huge income differentials to Western industrial countries, but also there is virtually no reason to expect that the transition process to a market economy will soon lead to a considerable increase in prosperity in Eastern Europe and the former Soviet Union. Equally important for our considerations is the expectation of a growing inflow of German ethnics mostly from the former Soviet Union. According to the German government some 2.2 million people of German origin (out of 3.5 million people) living in the former Soviet Union will emigrate to Germany.[21] Another forecast by B. Knabe (1991) concludes that by the year 2000 some 2.7 million people of German origin will

[19] The share of firms being labor constrained is one of the explanatory variables of wage inflation (with a positive coefficient). A higher simulated share therefore implies additional wage inflation.

[20] According to the life cycle hypothesis on consumption the employment rate reflects the probability of receiving (future) income.

[21] Source: Ochel and Vogler-Ludwig (1993), p. 31.

move to Germany, i.e., nearly 300,000 persons per year.

Taken together these figures highlight the concern about the expected inflow of German emigrants into Germany. Therefore, a second goal of our study is to evaluate the impact of an (hypothetical) immigration of German emigrants during 1989 to 1995 on major macroeconomic variables. The remainder of this section is organized as follows. Subsection 5.1 is devoted to a discussion of the modifications of the disequilibrium model presented in section 4 in order to make it suitable for the analysis under consideration. A subsequent section displays the results of the simulation experiment.

5.1 Modifications of the Disequilibrium Model

For obvious reasons we cannot use the inflow equations stated in section 4.2 for the purpose at hand. Neither are German emigrants and guestworkers homogenous groups, nor are reliable data on (future) income differentials with the former Soviet union or unemployment rates available. In addition non-economic motives may be more important for German emigrants compared with immigrating guestworkers. Therefore, we regard the inflow of German emigrants as an exogenous variable.

Moreover, we attempt to allow for additional channels in the disequilibrium model for effects of the number and/or inflow of foreigners. These extensions concern consumption, wage determination, and the equations for output and employment, respectively. With respect to consumption the standard consumption function with real disposable income, real interest rate and the unemployment rate as the explanatory variables is modified so that the marginal propensity of consumption depends on the share of foreign population and the unemployment rate. The reason is, firstly, to test whether foreigners have a higher or lower marginal rate of consumption compared with domestic consumers: On the one hand one might argue that they want to achive the prevailing standard of living as soon as possible, on the other hand, the "target saver" may wish to reach his target more quickly by a higher marginal propensity of saving. Secondly, the dependence of the marginal propensity of consumption on the unemployment rate reflects the observation that unemployed persons have a higher propensity of consumption (although they consume less due to their reduced income). As a counterargument, standard life cycle theory of consumption suggests that a lower probability to receive future incomes (approximated by a higher unemployment rate) lowers current consumptions.

In an estimated dynamic version of such a consumption function it turns out that in the short–run foreigners consume more than Germans but in the long–run solution foreigners wind up with a higher savings rate.[22] Moreover, current unemployment has a negative sign, whereas unemployment lagged once exhibits a positive value slightly higher than the coefficient associated with current unemployment.

Wage determination is also subject to an influence of foreign workers. Two effects emerge which work in the opposite direction, however. First, foreign workers typically take over low paid jobs which calls for a negative impact on wage growth. On the other hand, filling those jobs with foreigners enables firms to promote domestic workers by offering higher qualified jobs to them (after some internal or external training). From this we expect a positive effect of foreign workers on wage growth. Our wage equation is specified and estimated as an error correction model with nominal wage inflation as

[22] Estimates are carried out both for a consumption function with level variables and ratios such as the average rate of consumption, respectively. The results do not differ substantially, however.

the dependent variable. Prices, productivity, wedge variables, and the unemployment rate (and their growth rates) serve as the explanatory variables.[23] In addition the share of foreign workers turned out to have a significant influence in the error correction term. More precisely, there exists a positive level effect of this share on wages which outperforms the negative substitution effect mentioned before.[24]

We also made considerable efforts to test whether effects of foreign workers can be identified in the CES-functions for output and employment, respectively [eqs. (14) and (16)]. The most obvious channel is through the mismatch parameters ρ_G and ρ_{LT}. As has been shown in section 4.1, the mismatch parameter ρ_G in eq. (14) reflects the adjustment speed of employment with respect to changing conditions on the goods market. Emigrants might contribute to an increase of this speed due to their mobility especially when they enter Germany with no clear preferences for special regions and/or branches. This effect is not rejected by the estimation of

$$\rho = \alpha_0 + \alpha_1 \cdot t + \alpha_2 \cdot t^2 + \alpha_3 \cdot \log s \tag{20}$$

where t is the time trend and s the share of foreign workers. The mismatch parameter increases with s, that means the mismatch is reduced with a higher share of foreign workers to a considerable amount. With a growing value of s this effect becomes lower, however. A similar result is obtained for the mismatch parameter ρ_{LT} in eq. (15). This mismatch parameter represents what is mostly understood by the term mismatch on the labor market such as a regional or qualification mismatch.[25]

5.2 A Simulation Experiment

The simulation experiment refers to the time period 1989 to 1995. Since the estimation period of our model covers the period 1961/1 to 1988/4 (quarterly data) a forecast up to 1995 is necessary which serves as the baseline solution to be compared with the simulated values of major endogenous variables.

The assumptions concerning the development of the exogenous variables are contained in appendix B. In order to concentrate on the direct effects of migration fiscal and monetary policies are exogenous with regard to the immigration flows. The share of the public sector was treated as constant from 1989/1 on. The monetary authorities were assumed to accomodate the effects of different immigration scenarios, i.e. the nominal interest rates were regarded as exogenous to influences of migration. This assumptions rest on the aim of this section to evaluate the "pure" effects of immigration (see conclusions).

Figures 4, 5, 6 display the development of the growth rates of real GNP, real wages and employment during the period 1989/1 to 1995/4 as predicted by the model given the forecast of the exogenous variables for this period.[26] Although forecasting is not the issue under consideration, Table 5 compares, for 1992, actual values with our predictions in order to obtain an impression of the accuracy of the model. As can be seen the model slightly overestimates all growth rates.

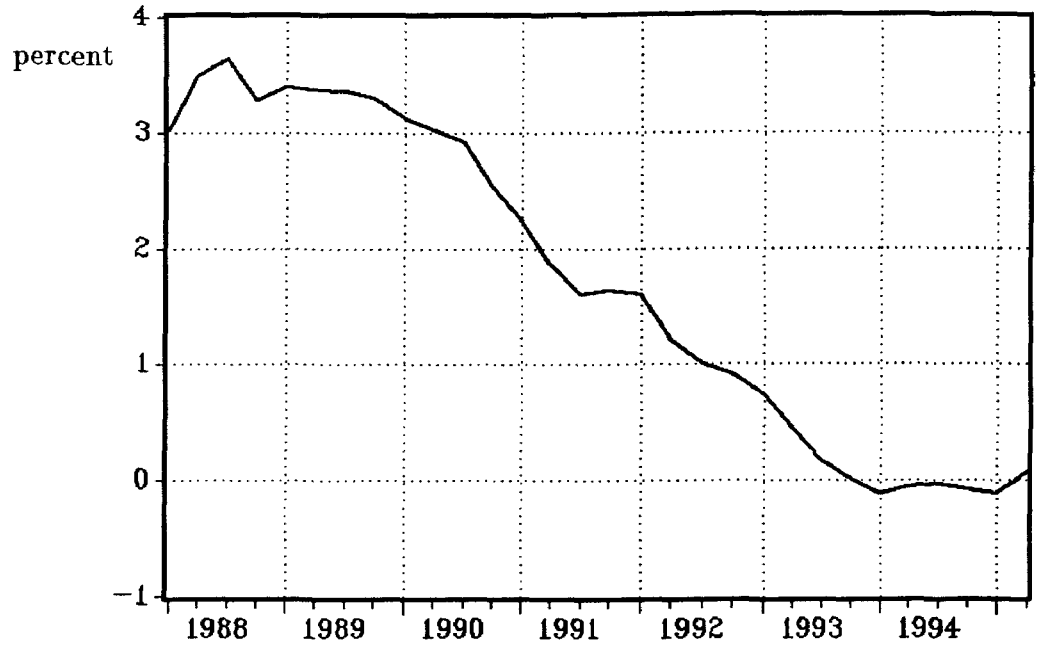
[23] See Franz and Gordon (1993) for a more detailed analysis of wage determination.

[24] See Gehring et al. (1992).

[25] See Franz (1991) for a more detailed analysis of mismatch on the German labor market.

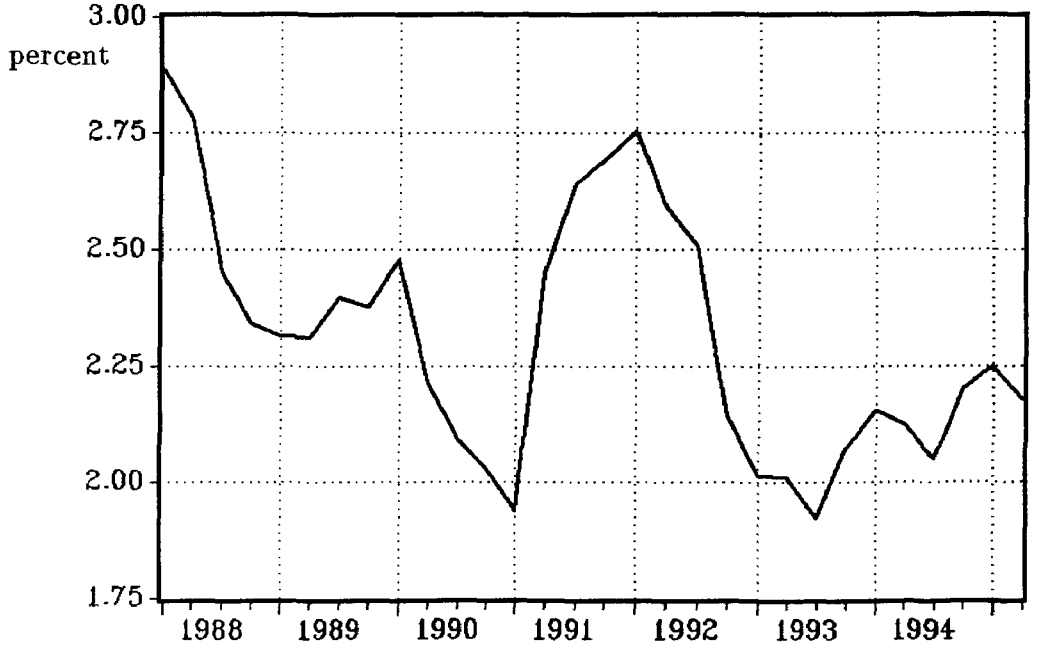
[26] Note that we employ a full dynamic forecast also for the period up to 1992, i.e., (lagged) endogenous variables are the result of the model's forecast rather than known actual values.

Figure 4: Predicted real GNP growth rate[a)]



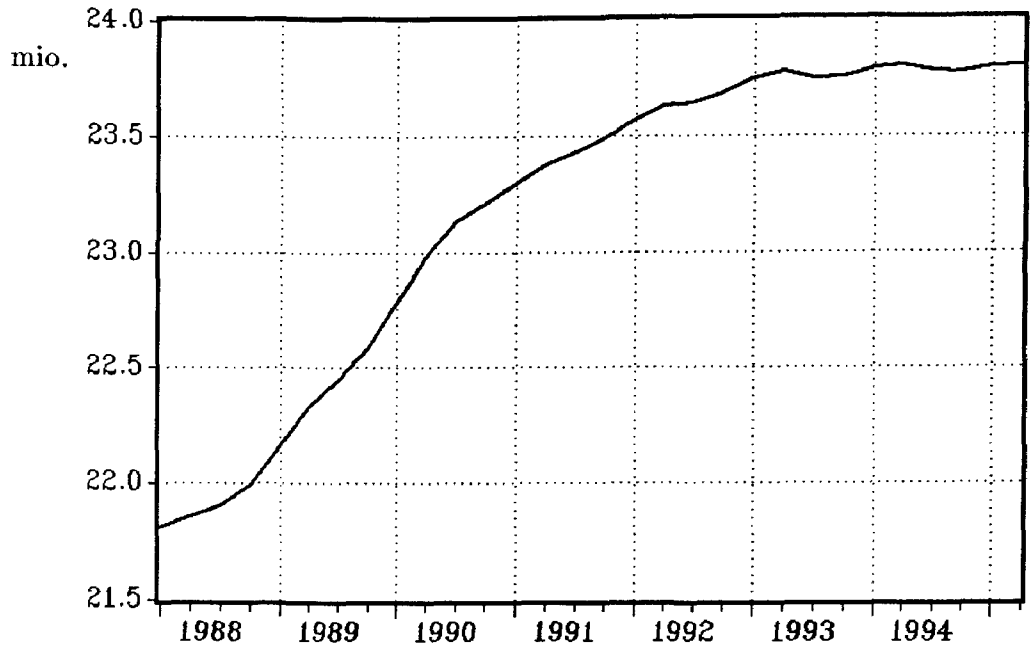
a) See text for details.

Figure 5: Predicted real wage growth rate[a)]



a) See text for details.

Figure 6: Predicted employment in the private sector[a)]



a) See text for details.

Given the unique situation in Germany after 1988 which is not taken into account by the estimation of the behavioural equations the forecasted values of the endogenous variables are within reasonable ranges. Especially the predicted values for employment and real GNP growth seem fairly reliable which play a more important role in our model.

The regime shares discussed in section 4.1 are more in the center of interest. Their time pattern predicted for the period 1989 to 1995 is exhibited in figure 7 by the solid lines. At the beginning of the simulation period 1989 we observe a share of firms constrained by existing capacities of about 70 percent whereas nearly 20 percent are constrained by goods demand and only 10 percent by labor supply. Unsurprisingly, as time passes the latter regimes loose most of their importance. Given the tremendous

Table 5: Growth rates of actual and predicted variables[a)]

	hourly nominal wages	prices[c)]	real wages	real GNP	employment
actual[b)]	+6.6%	+4.6%	+2.0%	+0.7%	+0.8%
predicted	+7.8%	+5.3%	+2.5%	+1.0%	+0.9%[d)]

a) See text for explanations.

b) Source: DIW Wochenbericht 1-2/93 of January, 7th 1993.

c) GNP–deflator.

d) without public sector.

Table 6: Net Inflows 1989 to 1995[a)]

	1989	1990	1991	1992	1993	1994	1995
Commuters	—	75	292	352	290	290	290
Migrants from East to West Germany[b)]	344 (241)	395 (276)	246 (178)	180 (155)	120 (99)	50 (40)	20 (16)
German ethnics	377 (188)	397 (205)	204 (154)	198 (116)	160 (91)	96 (54)	96 (51)
Foreigners[c)]	150 (94)	150 (72)	169 (72)	167 (73)	160 (72)	160 (72)	160 (72)
Asylum seekers	121 (32)	193 (30)	246 (123)	394 (223)	240 (153)	240 (120)	240 (120)

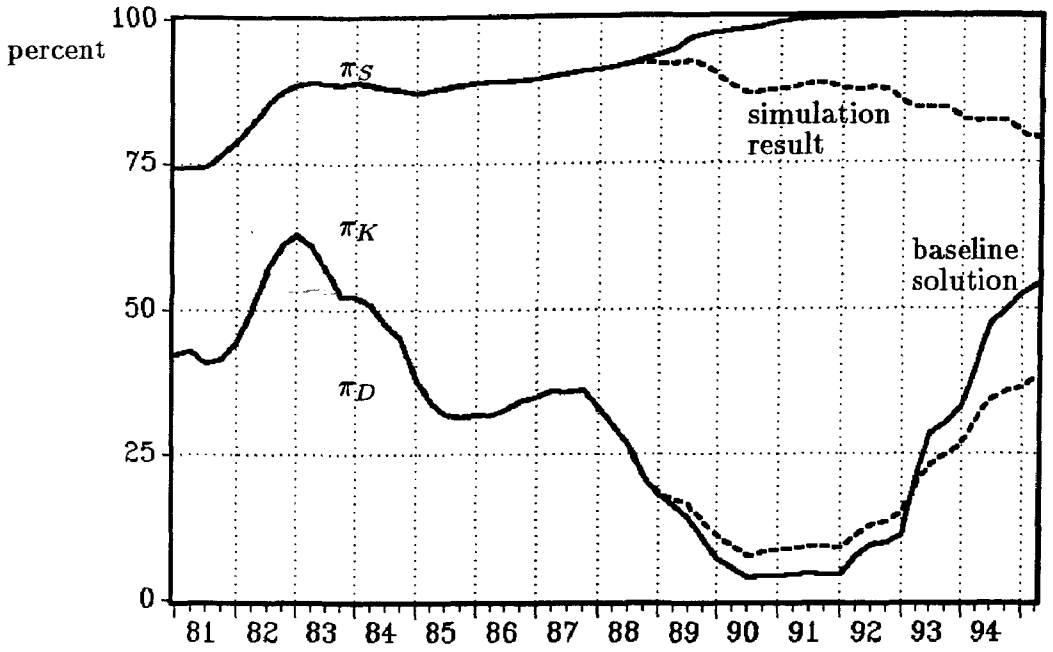
a) See text for explanations; figures in brackets denote labor supply;
b) until October 90: migrants from the former German Democratic Republic.
c) excluding asylum seekers.

"exports" of goods from West to East Germany[27] only a negligible amount of firms are still constrained by goods demand until 1992. Since that year, however, the West German economy is predicted to face a recession and, moreover, goods demand from East Germany falls short of its previous high levels. This explains why the share of demand constrained firms approached in 1995 its 1982–recession level. On the other hand, due to the expected high inflow of foreigners and German emigrants there is virtually no firm being constrained by available labor supply. Table 6 highlights the assumptions being made concerning the inflow of various groups. While the figures 1989 to 1992 mostly refer to actual and therefore known values, the data for the period 1993 to 1995 are based on projections by the Institute of Labor Research.[28] Multiplying these net inflows with their expected labor force participation rate[29] give the net inflows of labor suppliers (figures in brackets).

In order to obtain some guess estimates about current and future effects of these immigration flows, the following hypothetical simulation experiment is carried out. It is assumed that the numbers in table 6 hold only for foreigners and commuters. Put differently, the inflow of people migrating from East to West Germany, German ethnics, and asylum seekers is hypothetically restricted to be zero from 1989 on. The reason for these differences in controlling inflows are that, firstly, the inflow of foreigners consists mostly of EC–nationals and non–EC–nationals due to family unification. Both groups are barely under governmental influence. Secondly, the inclusion of commuters has technical reasons since it is unknown to what extent they consume directly in West or East Germany. All other groups are assumed to be under governmental control. This seems more obvious for asylum seekers and German ethnics rather than for migrants from East to West Germany. Given that our experiment is deliberately hypothetical anyway (in order not to be accused of hostility against foreigners) and neglecting constitutional regulations, one might think of governmental incentives for people to stay in

[27] For example "exports" from West to East Germany in 1991 amounted to some 200 billion DM, i.e., some 8 percent of GNP.
[28] Sources: MittAB 4/89 and 4/90; information given by IAB 7.1.1993; estimates by the authors.
[29] ibidem.

Figure 7: Regime Proportions[a)]



a) See text for details.

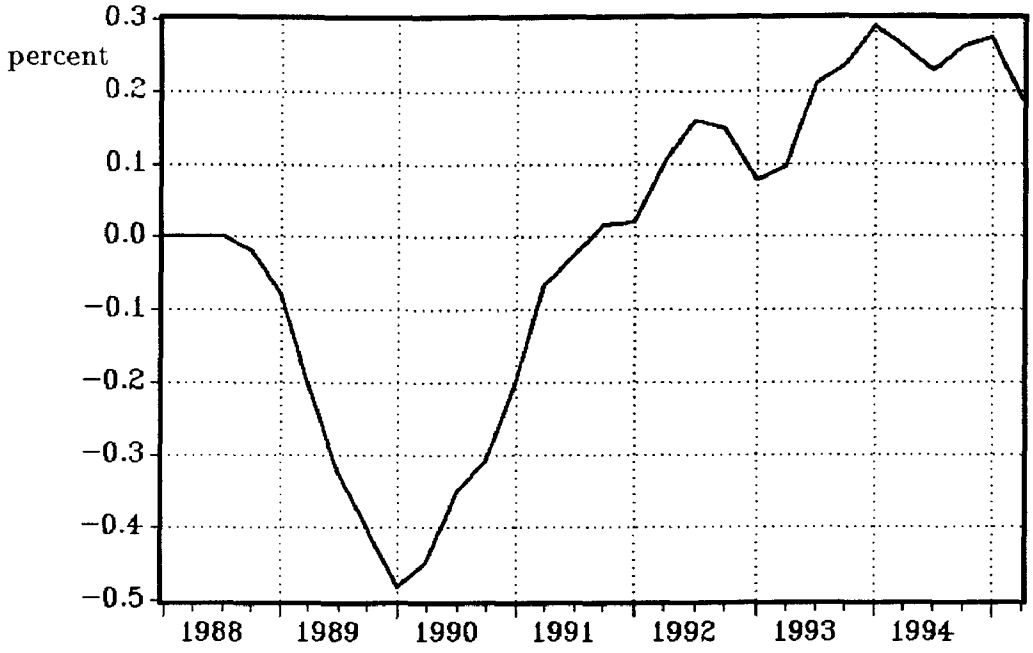
East Germany or even of temporary restrictions to move from East to West Germany.

In light of the present political debates in Germany, it should be stressed again that the experiment is only carried out to evaluate some economic effects of existing and forecasted migratory movements. It goes without saying that no claim whatsoever is made that the hypothetical simulation should form a basis for policy recommendation and the like.

The development of the regime shares gives a first impression of the consequences of the simulation experiment. The dotted lines in figure 7 show firstly that the share of firms constrained by labor supply gains importance. Due to the decreasing domestic labor supply the still existing, albeit reduced inflow of migrants is not sufficient to remove labor shortages completely. Note that during[30] 1990 to 1992 the decline in domestic labor supply amounts to 67,000 persons per year whereas the same figure for the period 1993 to 1995 is some 100,000 persons per year. This is one explanation as to why the labor shortage regime does not decline or even vanishes in the recession period 1993 to 1995. The other explanation is based on the development of the share of firms being rationed by aggregate demand. As can be seen this share exceeds the baseline solution slightly between 1989 and 1992 but falls short afterwards. The reason for the first observation is the lack of consumption expenditures stemming from the reduced inflow of migrants: Between 1989 and 1992 this reduction amounts to 3.3 mill. persons compared with 1.3 mill. persons between 1993 and 1995. This gap of aggregate demand, however, causes a slowdown of the enlargement of capacities. Consequently, less firms have problems to fully utilize their lower capacities after 1992.

[30]Source: information given by the IAB 7.1.1993.

Figure 8: Difference between simulated and predicted real GNP growth rates[a)]

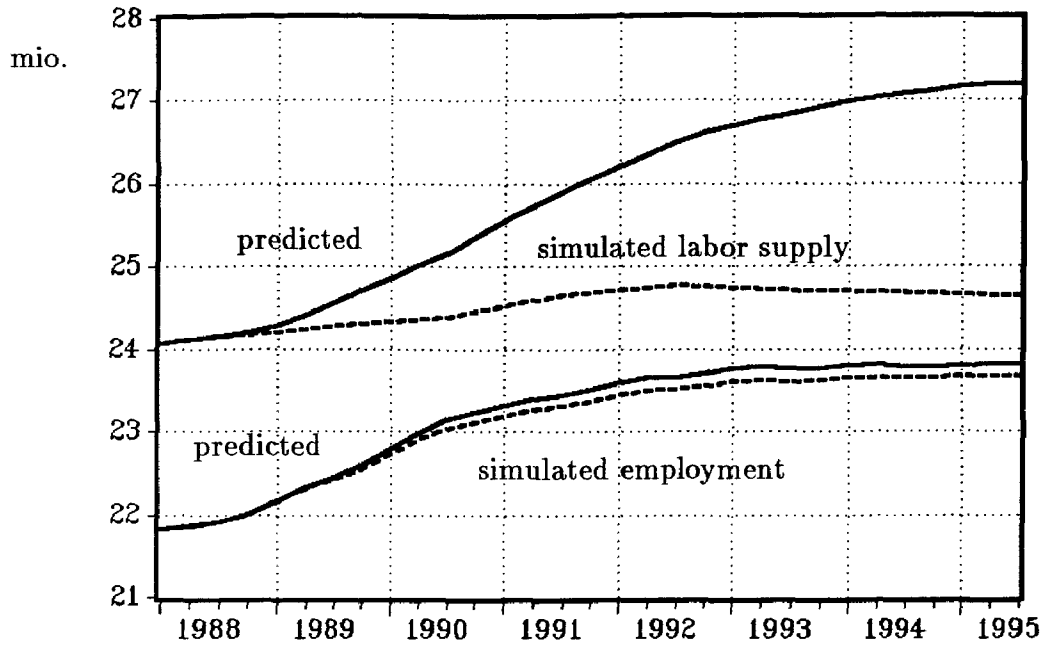


a) See text for details.

This description of the development of the regime shares can be complemented by a discussion of several other variables. For the sake of brevity, we concentrate on the development of growth rates of GNP, real wage rate, and (un–) employment. To begin with, figure 8 shows that until 1992 GNP growth rates fall short of the baseline solution with a trough of -0.5 percent in 1990. As has been mentioned this is due both to a decline in aggregate demand and a higher share of firms rationed by available labor supply so that they are, in the short run, forced to shrink their production. However, after 1992 real GNP growth rates exceed the path of their baseline solution with peaks of +0.3 percent in 1993/4 and 1994/4. This outcome is the result of two effects working in opposite directions. First, given labor supply shortages firms, in the medium run, switch to more capital intensive production and invest more. This causes real GNP to increase. This switch is supported by the behaviour of the real wage rate. Less immigrants reduce labor supply and induce higher nominal wage increases. Because price inflation is smaller than wage inflation, real wage growth exceeds its baseline solution and gives incentives for firms to substitute away from labor. Second, as in the period 1989–1992 there is an increasing share of firms which are rationed by available labor. This causes real GNP to fall. Our simulation for 1992 to 1995 suggests that the first effect outperforms the second albeit to a small extent. Note however, that the absolute values of GNP and employment falls short of the predicted levels for the whole simulation period.

Unsurprisingly, unemployment is lower due to the reduction of labor supply which is a limiting factor of production in the baseline solution. Despite the recession unemployment declines to about 3 percent at the end of the simulation period. But, differently, simulated unemployment consists virtually of frictional unemployment in 1995 compa-

Figure 9: Predicted employment in the private sector[a)]



a) See text for details.

red with a predicted 10 percent mark as the baseline solution. On the other hand, employment is also slightly lower as can be seen from figure 9 (some 150.000 persons since 1992, i.e., about 0.6 percent of total employment). As has been discussed before, this is also the result of the increase of the real wage rate due to higher labor supply shortages.

6 Conclusion

The purpose of this paper was to take another look at the macroeconomic consequences of migration by making use of a macroeconometric disequilibrium model. More specifically, which lessons can be drawn from the past and which consequences are to be expected for the foreseeable future? From the past we tried to discuss the experience with guest worker migration. For the present and future time we evaluate impacts of the immigration of migrants from East to West Germany, German ethnics, and asylum seekers.

What, if anything, can be learnt from these exercises? Disequilibrium models pay equal attention to demand as well as to supply constraints. Therefore, they are better designed to capture effects which may correspond to intuition namely that the consequences of restricting immigration are more dramatic when the labor market is tight than when the economy experiences high unemployment. This explains partly the divergence of various macroeconomic studies which claim to evaluate the impact of guest worker employment (in Germany). Moreover, there are many channels through which immigration may have an impact on unemployment and output: through changes of the regime shares, through investment and, hence, capacity building, and, more indirectly

through induced wage and price inflation. Since some of those effects work in the opposite direction an econometric assessment is warranted and that was exactly what this paper attempted to do.

As usual our list of caveats is long. Besides some shortcomings of the model mentioned in the text, this paper is completely silent about other important effects of immigration such as on social security, education, housing, and income distribution. Although highly desirable a treatment of these aspects is beyond the scope of this study.

This concerns also the treatment of monetary and fiscal policies. As has been emphasized we deliberately wanted to simulate effects stemming from migration for a given macropolicy. It is obvious that different policies can attempt to support or mitigate some outcomes of our simulation experiment. These aspects remain on the research agenda, too.

A Estimation Results of Inflows and Outflows of Guestworkers

Immigration

$$
\begin{aligned}
Z_t^I &= 115.9^* - 31.52^* \cdot \Delta UR_t + 27.5^* \cdot UR_t^I + 2.5 \cdot \Delta W_t^{diff} \\
&\quad +0.53^* \cdot Z_{t-1}^I + 3.3^* \cdot W_{t-1}^{diff} - 8.13^* \cdot UR_{t-1} \\
Z_t^E &= (53.9^* - 43.67^* \cdot \Delta UR_t + 7.3^* \cdot \Delta UR_t^E + 0.38^* \cdot Z_{t-1} \\
&\quad -24.13^* \cdot UR_{t-1}) \cdot (1 - D_{7486}) + (-5.3^* + 0.05 \cdot POP_{t-1}^E) \cdot D_{7486} \\
Z_t^{Gr} &= (-5.0 - 36.70^* \cdot \Delta UR_t + 0.78^* \cdot Z_{t-1}^{Gr} + 4.3 \cdot UR_t^{Gr}) \cdot (1 - D_{7486}) \\
&\quad +(-0.7 + 0.05 \cdot POP_{t-1}^{Gr}) \cdot D_{7486} \\
Z_t^T &= 23.1^* - 41.40^* \cdot \Delta UR_t + 13.1 \cdot \Delta UR_t^T + 72.9^* \cdot D_{73} + 0.83^* \cdot Z_{t-1}^T \\
Z_t^{YU} &= (-259.7^* - 71.54^* \cdot UR_t + 53.6^* \cdot UR_t^{YU} + 0.52^* \cdot Z_{t-1}^{YU}) \cdot (1 - D_{7486}) \\
&\quad +(-88.6 + 0.20 \cdot POP_{t-1}^{YU}) \cdot D_{7486}
\end{aligned}
$$

* denotes significance at the five percent level.
Z^i : immigration from country i
W^{diff} : relative wage difference, Italy compared with the FRG
D_{7488} : dummy (1974-1988) = 1
I: Italy, E: Spain, Gr: Greece, T: Turkey, YU: Yugoslavia

Remigration

$$
\begin{aligned}
F_t^I &= 47.1^* + 5.77^* \cdot UR_t - 7.3^* \cdot UR_t^I + 0.28^* \cdot F_{t-1}^I + 0.52^* \cdot Z_{t-1}^I \\
F_t^E &= -5.1 + 3.81^* \cdot UR_t - 1.1^* \cdot UR_t^E + 0.54^* \cdot F_{t-1}^E + 0.46^* \cdot Z_{t-1}^E \\
F_t^{Gr} &= -0.3 + 9.09^* \cdot \Delta UR_t - 4.2 \cdot \Delta UR_t^{Gr} + 0.71^* \cdot F_{t-1}^{Gr} + 0.22^* \cdot Z_{t-1}^{Gr} \\
F_t^T &= -9.9 + 17.06^* \cdot \Delta UR_t - 9.4 \cdot \Delta UR_t^T + 0.44^* \cdot F_{t-1}^T + 0.22^* \cdot Z_{t-1}^T \\
&\quad +153.2^* \cdot D_{84} \\
F_t^{YU} &= 4.6^* + 2.67^* \cdot \Delta UR_t + 0.61^* \cdot F_{t-1}^{YU} + 0.22^* \cdot Z_{t-1}^{YU}
\end{aligned}
$$

F^i : remigration to country i

D_{84} : dummy, 1984 = 1

Population

$$POP^f = POP^I + POP^E + POP^{Gr} + POP^T + POP^{YU} + POP^{other}$$

$$\begin{aligned}
POP_t^I &= 0.750^* \cdot (Z^I - F^I)_t + (1 - 0.750^*) \cdot (Z^I - F^I)_{t-1} \\
&\quad +1.012^* \cdot POP_{t-1}^I \\
POP_t^E &= 0.699^* \cdot (Z^E - F^E)_t + (1 - 0.699^*) \cdot (Z^E - F^E)_{t-1} \\
&\quad +1.018^* \cdot POP_{t-1}^E \\
POP_t^{GR} &= 0.660^* \cdot (Z^{GR} - F^{GR})_t + (1 - 0.660^*) \cdot (Z^{GR} - F^{GR})_{t-1} \\
&\quad +1.027^* \cdot POP_{t-1}^{GR} \\
POP_t^T &= 0.693^* \cdot (Z^T - F^T)_t + (1 - 0.693^*) \cdot (Z^T - F^T)_{t-1} \\
&\quad +1.030^* \cdot POP_{t-1}^T \\
POP_t^{YU} &= 0.759^* \cdot (Z^{YU} - F^{YU})_t + (1 - 0.759^*) \cdot (Z^{YU} - F^{YU})_{t-1} \\
&\quad +1.015^* \cdot POP_{t-1}^{YU}
\end{aligned}$$

Labor force participation

$$\begin{aligned}
LS &= LS^f + LS^d \\
LS^f &= EQ^f \cdot POP_{1565}^f \\
LS^d &= EQ^d \cdot POP_{1565}^d \\
POP_{1565}^f &= \beta_t^f \cdot POP^f \\
POP_{1565}^d &= \beta_t^d \cdot POP^d
\end{aligned}$$

$$\begin{aligned}
EQ_t^f &= -5.88^* - 1.1 \cdot UR_t + 0.5^* \cdot (wn - p)_t + 2.11^* \cdot \left(\frac{POP^m}{POP^f}\right)_t \\
&\quad +0.42^* \cdot EQ_{t-1}^f \\
\Delta EQ_t^d &= 0.87^* - 0.22^* \cdot UR_t - 0.07^* \cdot (wn - p)_t + 0.17^* \cdot t \\
&\quad -0.27^* \cdot EQ_{t-1}^d + 0.33 \cdot \Delta EQ_{t-1}^d
\end{aligned}$$

POP_{1565}	:	population aged 15 - 65, f: foreigners, d : Germans
POP^m/POP^f	:	share of males in foreign population
EQ^f	:	labor force participation, foreigners
EQ^d	:	labor force participation for Germans
LS	:	labor supply
wn	:	net wage rate

B Major exogeneous variables 1989–1995

variable	1989	1990	1991	1992	1993	1994/95
value added tax	14%	14%	14%	14%	15%	15%
governmental value added as percentage of GNP	const.	const.	const.	const.	const.	const.
imports USA[a)]	+6.1%	+3.0%	−1.0%	+8.4%	+5.9%	+7.3%
imports UK[a)]	+7.1%	+1.0%	−3.1%	+6.2%	+4.0%	+5.4%
imports France[a)]	+8.3%	+6.5%	+2.9%	+2.1%	+3.7%	+5.2%
imports Italy[a)]	+9.6%	+7.9%	+2.9%	+6.8%	+3.5%	+4.5%
imports Netherl.[a)]	+4.9%	+5.4%	+4.0%	+2.1%	+2.1%	+4.3%
imports Belgium[a)]	+9.0%	+4.6%	+2.7%	+2.1%	+2.0%	+2.9%
GNP UK[a)]	+2.3%	+0.5%	−2.2%	−1.0%	+1.3%	+2.4%
GNP France[a)]	+3.4%	+2.2%	+1.2%	+1.9%	+1.6%	+2.8%
GNP Italy[a)]	+3.1%	+2.2%	+1.4%	+1.2%	+0.8%	+1.7%
GNP Netherl.[a)]	+4.3%	+3.9%	+2.1%	+1.4%	+1.2%	+2.4%
GNP Belgium[a)]	+4.2%	+3.3%	+2.1%	+1.3%	+1.3%	+2.2%
world trade[a)]	+2.3%	+3.8%	+3.6%	+5.1%	+1.2%	+2.6%
working hours[b)]	−1.3%	−2.0%	−1.0%	−1.0%	−1.0%	−1.0%
wedge[c)]	+1.0%	−1.8%	+3.0%	+2.3%	+0.3%	+0.0%
short term interest rate[a)]	7.1%	8.6%	9.4%	9.9%	7.8%	6.4%
long term interest rate[a)]	7.1%	8.9%	8.6%	7.9%	7.2%	6.7%
exchange rate USA[a)]	1.88	1.62	1.66	1.54	1.54	1.54
exchange rate UK[a)]	3.08	2.88	2.93	2.84	2.84	2.84
exchange rate France[a)]	0.29	0.30	0.29	0.30	0.30	0.30
exchange rate Italy[a)]	1.37	1.35	1.34	1.31	1.31	1.31
exchange rate Netherl.[a)]	0.89	0.89	0.89	0.89	0.89	0.89
exchange rate Belgium[a)]	0.048	0.048	0.049	0.049	0.049	0.049

a) Source: OECD Economic Outlook, various issues
b) Source: DIW Wochenberichte, various issues, up to 92.4
c) Source: DIW Wochenbericht, various issues, up to 93.4

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