

**Christian-Albrechts-Universität zu Kiel  
Institut für Volkswirtschaftslehre**

**Seminar International Trade and Factor Mobility**

**Immigration and the Labour Market**

**Abstract:**

In this paper the influences of immigration on the labour markets in the country of immigration are analysed. In the first part of the paper a model of an economy facing immigration is presented and results for scenarios with perfect and imperfect capital mobility are shown. In the second section several empirical results for different countries and data sets are presented. The conclusion drawn from the model and the data is that effects of immigration on the labour market are quite small compared to the overall effects of immigration on other aspects of the economy.

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## **1 Introduction**

In the present discussion about the reformation of the German immigration laws, two arguments build the main points in the discussion. On the one hand it is said that immigrants take jobs which otherwise could be taken by native workers<sup>1</sup>, on the other hand other arguments say that increasing immigration will raise the labour demand in the country and will also lead to a higher employment rate of the native born population. In the following section, the labor market entry and behaviour of immigrants are analysed and compared to that of the native born population. In section 3 the effects of those differences on the employment of the native born population is shown in a model with flexible wages, first for the case of perfect capital mobility and then for the case of imperfect capital mobility. In section 4, some empirical results from different countries are presented. In the last section, the results are summarized and a conclusion is drawn.

## **2 Market Entry: Differences between Native Born Workers and Immigrants**

The market entry of immigrants on the native labour and goods markets differs significantly from the behaviour of the native born population<sup>2</sup>. At the arrival the immigrants at first enter the goods markets of the economy, their entrance to the labour market is delayed, because they are not completely informed about the labour market usages of the country of immigration<sup>3</sup>. Beside the labour markets usages, they may face other integration problems, which could differ between countries of origin<sup>4</sup>, for example learning the language<sup>5</sup> or arranging with the new cultural environment<sup>6</sup>. Their entry on the goods market happens earlier and their demand may after some time be above the level of the native born population for some time periods<sup>7</sup>. The assumption of a delayed market entry on the labour market by the immigrants is needed to understand the short and the long run dynamics of allowing larger immigration-inflows to a specific country in the following model.

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<sup>1</sup> See Dustmann and Preston (2000), p.31.

<sup>2</sup> See Hercowitz and Yashiv (2002), p.2, Pedersen (2000), p.14 and Felderer (1993), p.72.

<sup>3</sup> See Kaufman and Hotchkiss (2000), p.483f.

<sup>4</sup> See Hurst (1998),p.15f.

<sup>5</sup> See Pedersen (2000), p.18.

<sup>6</sup> See Hercowitz and Yashiv (2002), p.6.

<sup>7</sup> See Hercowitz and Yashiv (2002), p.7.

### 3 Model with Flexible Wages

#### 3.1 Overview

In this chapter the influences of immigration on the real wages and the employment rate of the native born population are analysed. The model is taken from the paper "A Macroeconomic Experiment in Mass Immigration" by Hercowitz and Yashiv. The key assumption of this open economy model is that the immigrants first enter the goods market and after that take part in the labour market.

The country is specialized in the production of good Y. There are two input factors used in the production process, labour L and an imported good M, which includes capital services and intermediate inputs. The supply of M is perfectly elastic at the price  $P_m^*$ . The production function of Y is:

$$Y = L^\alpha \cdot M^\beta \cdot M_0^{1-\alpha-\beta}, \quad 0 < \alpha < 1, \quad 0 < \beta < 1, \quad \alpha + \beta \leq 1$$

If perfect capital mobility is assumed, there are constant returns on L and M, so that  $\alpha + \beta = 1$  holds. If we assume imperfect capital mobility, there is a part of the input  $M_0$ , which is not adjustable at least in the short run.

Labour supply is given by the native born workers N and the immigrants I. The populations of each type are given by  $P_N$  and  $P_I$ . The immigrant population in period t is given by the sum of the immigrants arrived in the past periods.

$$P_{I,t} = \sum_{q=1}^{\infty} (\Delta P_I)_{t-q}, \text{ with } (\Delta P_I)_{t-q} \text{ as the immigration flow with a lag of } q \text{ periods.}^8$$

Demands for labour and the imported goods are then implicitly given by:

$$\alpha \cdot L^{\alpha-1} \cdot M^\beta \cdot M_0^{1-\alpha-\beta} = w \quad \text{and} \quad \beta \cdot L^\alpha \cdot M^{\beta-1} \cdot M_0^{1-\alpha-\beta} = p_m$$

w denotes the wage in terms of the domestic good,  $p_m$  is the price of the imported inputs in terms of the domestic good ("real exchange rate"). This equations state that the marginal product of each factor equals its price.

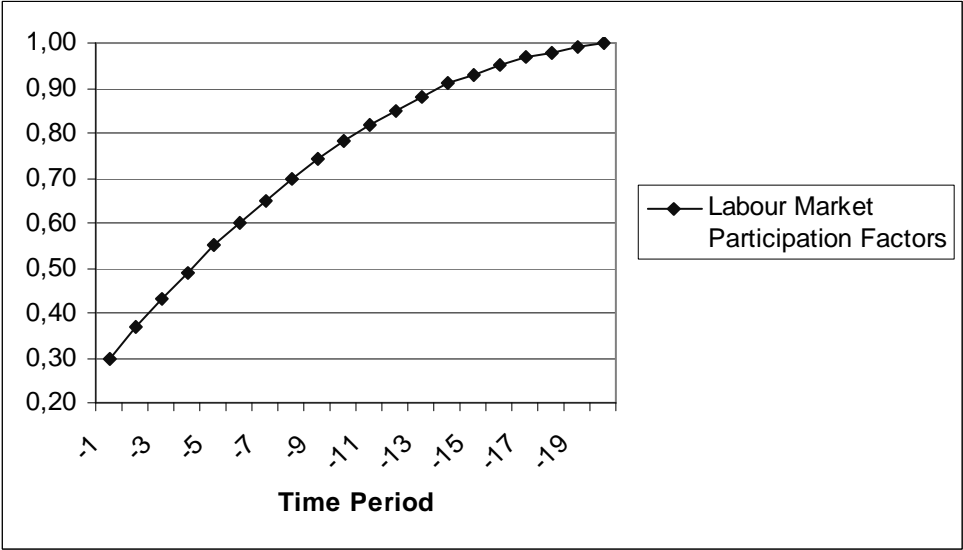
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<sup>8</sup> This time periods could in reality be months, quarters or years.

The labour supply is given by  $L_N = w^\lambda \cdot P_N$  for the native population and  $L_I = w^\lambda \cdot \overline{\Delta P_I} \cdot \overline{\theta_I}$  for the immigrants,  $\overline{\Delta P_I} = \{(\Delta P_I)_{-1}, (\Delta P_I)_{-2}, \dots\}$  is the vector of immigration flows and  $\overline{\theta_I} = \{(\theta_I)_{-1}, (\theta_I)_{-2}, \dots\}$  is the transposed vector of the "labour-participation-factors" for the immigrants of the different time periods. It is assumed that  $(\theta_I)_{-q}$  increases with q and approaches 1 from below. For the native born, this factor equals 1. This factor models the integration process of the immigrants as described in section 2.

**Figure 1: Example: Vector of Labour Market Participation Factors (this vector was used in the simulation).**

*This diagram shows an example for a possible vector of the market participation factors under the model assumptions. It can be clearly seen that the labour market participation factor of immigrants increases with the length of their stay. This vector was used in the simulation exercise in 3.2..*



In the labour market equilibrium the following condition has to hold:

$$\alpha \cdot L^{\alpha-1} \cdot M^\beta \cdot M_0^{1-\alpha-\beta} = \frac{L}{P_N + \overline{\Delta P_I} \cdot \overline{\theta_I}}^{\frac{1}{\lambda}}$$

This expression can be solved for L and M:

$$L = \left[ \left( \alpha \cdot M^\beta \cdot M_0^{1-\alpha-\beta} \right) \cdot \left( P_N + \overline{\Delta P_I} \cdot \overline{\theta_I} \right)^{\frac{1}{\lambda}} \right]^{\frac{1}{\lambda} - \alpha + 1}$$

$$M = \left[ \left( \alpha \cdot L^{\alpha-1-\frac{1}{\lambda}} \cdot M_0^{1-\alpha-\beta} \right) \left( P_N + \overline{\Delta P_I} \cdot \overline{\theta_I} \right)^{\frac{1}{\lambda}} \right]^{-\frac{1}{\beta}}$$

In terms of  $p_m$  and  $P_N + \overline{\Delta P_I} \cdot \overline{\theta_I}$  these equations can be expressed at:

$$L = Z_1 \cdot M_0^{\frac{\lambda(1-\alpha-\beta)}{\lambda(1-\alpha-\beta)+1-\beta}} \cdot \left( P_N + \overline{\Delta P_I} \cdot \overline{\theta_I} \right)^{\frac{1-\beta}{\lambda(1-\alpha-\beta)+1-\beta}} p_m^{\frac{-\lambda\beta}{\lambda(1-\alpha-\beta)+1-\beta}}$$

and

$$M = Z_2 \cdot M_0^{\frac{(1-\alpha-\beta)(1+\lambda)}{\lambda(1-\alpha-\beta)+1-\beta}} \left( P_N + \overline{\Delta P_I} \cdot \overline{\theta_I} \right)^{\frac{\alpha}{\lambda(1-\alpha-\beta)+1-\beta}} p_m^{\frac{\lambda(1-\alpha-\beta)+1-\beta+\lambda\alpha\beta}{(1-\beta)[\lambda(1-\alpha-\beta)+1-\beta]}}$$

with  $Z_1, Z_2$  and the following  $Z_N$ 's as constants.

Using these two equations, the expression for  $w$  and the equation for the labour supply by the native born, the following equation which gives the rate of employment of the native born population can be derived:

$$\frac{L_N}{P_N} = Z_1 M_0^{\frac{\lambda(1-\alpha-\beta)}{\lambda(1-\alpha-\beta)+1-\beta}} \cdot \left( P_N + \overline{\Delta P_I} \cdot \overline{\theta_I} \right)^{\frac{1-\beta}{\lambda(1-\alpha-\beta)+1-\beta}} p_m^{\frac{-\lambda\beta}{\lambda(1-\alpha-\beta)+1-\beta}}$$

On the good market, the following equations show the demand ( $Y^D$ ) and supply ( $Y^S$ ) side:

$$Y^D = p_m^\varepsilon \left( P_N + \overline{\Delta P_I} \cdot \overline{\theta_Y} \right), \quad \varepsilon > 0$$

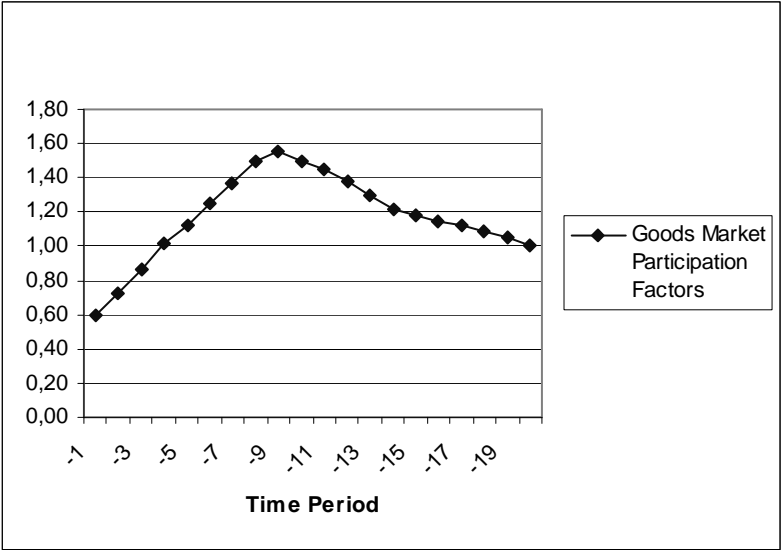
$$Y^S = Z_3 \cdot M_0^{\frac{(1-\alpha-\beta)(1+\lambda)}{\lambda(1-\alpha-\beta)+1-\beta}} \left( P_N + \overline{\Delta P_I} \cdot \overline{\theta_I} \right)^{\frac{\alpha}{\lambda(1-\alpha-\beta)+1-\beta}} p_m^{\frac{\beta(1-\lambda)}{\lambda(1-\alpha-\beta)+1-\beta}}$$

In these equations,  $\varepsilon$  is given as the price elasticity of demand and  $\overline{\theta_Y} = \{(\theta_Y)_{-1}, (\theta_Y)_{-2}, \dots, (\theta_Y)_{-n}\}$  is the exogenous vector of the participation of the immigrants on the goods market. This vector can be seen analogue to the labour-participation-factors of the immigrant. The immigrants' participation in the goods market should be less than 1 for new immigrants, then turn to values above 1 after some time and should in the long run become 1, as it is for the native born.

The goods and the labour market participation factors are defined as the participation of the immigrants in those markets divided by the participation of the native born population. Under this definition, participation factors, especially in the goods market, can exceed 1 for some periods of time. How the immigrants finance this higher participation is not treated in this model, it could possibly be by transfers from the state or by a lower savings-rate than the native born. The participation factor on the labour market gives the relation of the supply of work of immigrants to the supply by the native born, which is assumed to equal 1.

**Figure 2: Example: Vector of Goods Market participation Factors (this vector was used in the simulation).**

*This diagram shows an example for a possible vector of the goods market participation factors under the model assumptions. This vector was used in the simulation exercise in 3.2..*



The equilibrium solution  $Y^S = Y^D$  can be solved for  $p_m$ :

$$p_m = Z_4 M_0^{\frac{(1-\alpha-\beta)(1+\lambda)}{\mu}} \left( P_N + \overline{\Delta P_I \theta_Y} \right)^{\frac{[\lambda(1-\alpha-\beta)+1-\beta]}{\mu}} \left( P_N + \overline{\Delta P_I \theta_I} \right)^{\frac{\alpha}{\mu}}$$

where  $\mu = \beta(1 + \lambda) + \epsilon\lambda(1 - \alpha - \beta) + \epsilon(1 - \beta)$

By substituting this expression in the equation for the employment rate of the native born population, the following equation can be derived:

$$\frac{L_N}{P_N} = Z_5 M_0^{\frac{\lambda\varepsilon(1-\alpha-\beta)}{\mu}} P_N \left( I + \frac{\overline{\Delta P_I}}{P_N} \overline{\theta_Y} \right)^{\frac{\lambda\beta}{\mu}} P_N \left( I + \frac{\overline{\Delta P_I}}{P_N} \overline{\theta_I} \right)^{\frac{-\lambda[\beta+\varepsilon(1-\alpha-\beta)]}{\mu}}$$

In this equation both effects of immigration in this model can be seen:

- The positive exponent on the term for the goods market entry  $\left( I + \frac{\overline{\Delta P_I}}{P_N} \overline{\theta_Y} \right)$  shows the positive effect of immigration on native employment rate.
- The negative exponent on the term for the labour market entry  $\left( I + \frac{\overline{\Delta P_I}}{P_N} \overline{\theta_I} \right)$  shows the negative effect of immigration on native employment rate.

## 3.2 Simulation Results for different Levels of Capital Mobility

### 3.2.1 Perfect Capital Mobility

The simulation results for perfect capital mobility were obtained by using the following variables (The participation vectors used are those shown in the diagrams above):

$$\alpha = 0,5$$

$$\beta = 0,5$$

$$\lambda = 0,6$$

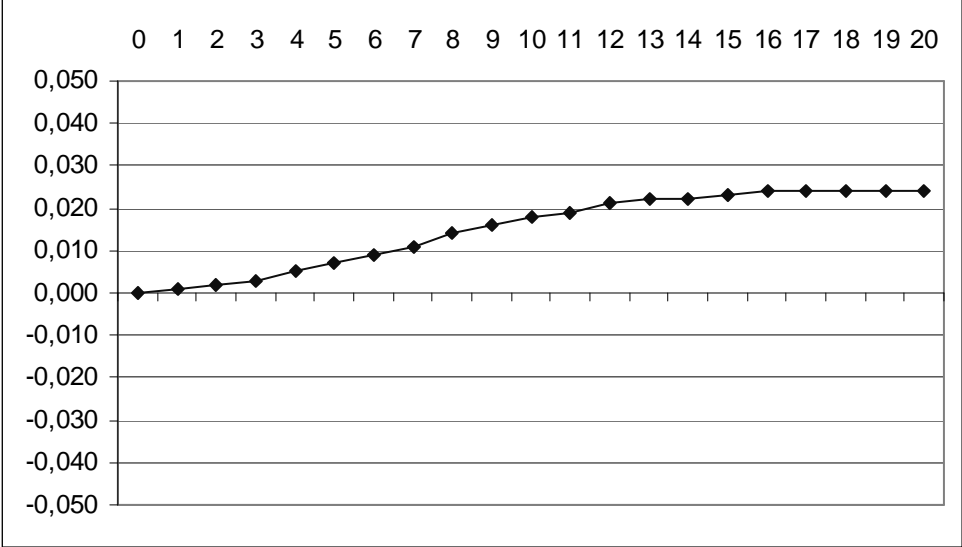
$$\varepsilon = 0,4$$

Under the assumption that in  $t = 1$  a constant inflow of immigrants of 1% of the native born population in period 0 is allowed for all future time periods, the calculated employment rate of the native born population is shown in the following diagram:



**Figure 3: Effect on the Employment Rate of the Native Born Population if Immigration of 1% of Native Born Populatio is allowed under perfect Capital Mobility.**

*This figure shows the development of the employment rate of the native born population if the vectors shown in Figure 1 and 2 are used to simulate the model outcomes.*



The effect of allowing a constant inflow of immigrants is a higher employment rate of the native born population under the assumption of perfect capital mobility. This result is caused by the two different effects of immigration. The increased demand on the goods market tends to increase the employment rate of the native born population by lowering the relative price  $p_M$  of the imported capital goods in terms of the domestic good. The increased labour supply has a positive effect on this relative price  $p_M$ . As long as the effect on the goods market is higher than the effect on the labour market, immigration leads to an increase of employment rate of the native born population. In period 20 the first cohort of immigrant has been completely integrated in the model economy.

The labour market effect is similar to Felderer’s analysis of the short and long run effects of immigration: “A heavy influx of immigrants first reduces productivity. Then, after a consequent capital accumulation, productivity returns to the original development path and may, in the long run, be increased beyond the original path...”<sup>9</sup>

**3.2.2 Imperfect Capital Mobility**

The simulation results for perfect capital mobility were obtained by using the following variables (The participation vectors used are those shown in the diagrams above):

<sup>9</sup> See Felderer (1993), p.83.

$$\alpha = 0,4$$

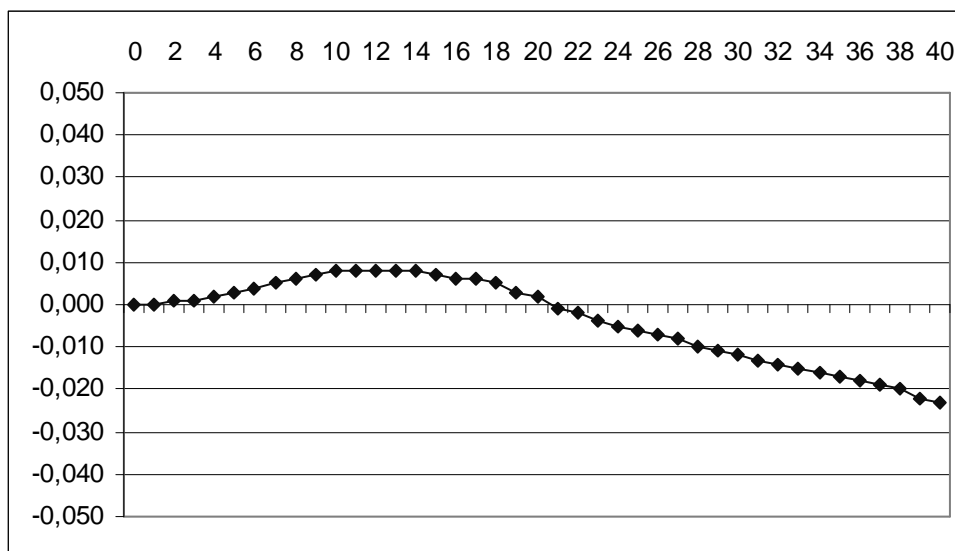
$$\beta = 0,4$$

$$\lambda = 0,6$$

$$\varepsilon = 0,4$$

The calculated employment rate of the native born population if in  $t = 1$  a constant inflow of immigrants of 1% of the native born population is allowed for all future time periods is shown in the following diagram:

**Figure 4: Effect on the Employment Rate of the Native Born Population if Immigration of 1% of Native Born Populatio is allowed under imperfect Capital Mobility.**



Even under imperfect capital mobility, first there is a positive effect of immigration on the employment rate of the native born population. Different to the case of perfect capital mobility, the missing possibility of a complete adjustment of the capital stock seems to lead to the lower effect.

After period 20 the negative effect of imperfect capital mobility can be observed. The effect of increased demand on the goods market becomes lower than the negative effect of the imperfect capital mobility. This effect is works quite simple: If the capital/labour ratio cannot be adjusted to its initial value, the marginal product of labour decreases and so does the wage.

## 4 Empirical Findings

There are several studies on the effects of immigration on the labour market. In the following section, I will present several different studies on the effect of immigration on the employment and wages of the native born population.

### *Australia*

In a study on immigration and the Australian labour market from 1985, using data from 1948 to 1984, Chapman, Pope and Withers tested the causality between immigration flows and the unemployment ratio. Their interesting result is that they found a highly significant influence of unemployment on immigration but the opposite causality is rejected<sup>10</sup>.

They used the following two equations to test the causality between immigration and unemployment rate and vice versa:

$$\Delta\left(\frac{U}{LF}\right)_t = \alpha_0 + \alpha_1 T_t + \sum_{k=1}^3 \alpha_k d_k + \sum_{i=1}^y \alpha_{t-i} \Delta\left(\frac{U}{LF}\right)_{t-i} + \sum_{j=0}^z \beta_{t-j} \left(\frac{M}{P}\right)_{t-j}$$
$$\left(\frac{M}{P}\right)_t = \gamma_0 + \gamma_1 T_t + \sum_{k=1}^3 \gamma_k d_k + \sum_{i=1}^y \gamma_{t-i} \left(\frac{M}{P}\right)_{t-i} + \sum_{j=0}^z \lambda_{t-j} \Delta\left(\frac{U}{LF}\right)_{t-j}$$

With:  $\Delta$ - change operator,  $U$  - unemployment,  $LF$  - labour force,  $T$  - linear time trend,  $d$  - quarterly dummy variable,  $M$  - net migration and  $P$  - population.

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<sup>10</sup> See Chapman, Pope and Withers (1985), p.22.

**Table 1: Tests for statistical causality between Migration and Australian Unemployment 1948(1)-1982(3)<sup>11</sup>.**

*The results show that the hypothesis of causality between unemployment and migration cannot be rejected at the 1% level, but the opposite causality can be rejected.*

Dependent	Causal	Total Migration	Permanent and Long-Term Migration				Unemployment / Vacancies Ratio
		F-Statistic	F-Statistic	Wald Statistic	Lagrange Multiplier	Likelihood Ratio	F-Statistic
Unemployment	0-12	2.10	0.78	13.43	12.13	12.76	0.55
Unemployment	0-6	1.84	0.48	4.16	4.03	4.09	0.32
Unemployment	1-12	2.24	0.83	13.03	11.81	12.40	0.54
Unemployment	1-6	2.14	0.51	3.80	3.68	3.74	0.32
Migration	0-12	5.29**	6.44**	109.85**	58.68**	78.99**	3.13**
Migration	0-6	6.73**	10.01**	86.56**	51.31**	65.89**	4.67*
Migration	1-12	5.70**	7.00**	109.17**	58.49**	78.63**	3.34**
Migration	1-6	7.63**	11.45**	84.04**	50.41**	64.39**	5.25*

\* significant at 5% level, \*\* significant at 1% level.

### Israel

For Israel, which faced very large inflows of immigrants in the 1990's from the former USSR, Hercowitz and Yashiv (2002) found that immigration has a negative impact on the native born population's employment rate which is lagged by a few periods<sup>12</sup>.

They used the following equations for their analysis:

$$\ln \frac{L_{N,t}}{P_{N,t}} = a + bX_t + \sum_{q=1}^Q c_q \frac{\Delta P_{1,t-q}}{P_{N,t}} + \varepsilon_t$$

$$\ln p_{m,t} = a' + b' X_t + \sum_{q=1}^Q c'_q \frac{\Delta P_{1,t-q}}{P_{N,t}} + \varepsilon'_t$$

where  $X$  is a vector of controls,  $\varepsilon$  are error terms and  $c_q$  and  $c'_q$  were the terms that showed the different participations of the immigrant cohorts on the goods and labour markets. Additionally they used a methodology to capture the influence of tourism and changing oil prices in their estimation.

<sup>11</sup> Results taken from Chapman, Poe and Withers (1985), p.23.

<sup>12</sup> See Hercowitz and Yashiv (2002), p.13f.

The following table shows the results for the estimations with all control variables, without insignificant controls and the unrestricted estimation:

**Table 2: Test results for Israel, sample period 1990:1-1999:4<sup>13</sup>.**

	All controls	Only significant controls	Unrestricted
<i>Constant</i>	-0.73*	-0.74*	-0.74*
<i>time</i>	0.007*	0.008*	0.008*
<i>time</i> <sup>2</sup> · 10 <sup>2</sup>	-0.011*	-0.012	-0.012*
<i>tourists</i>	5.93*	9.13*	9.63*
<i>d_pol</i>	0.007		
$\frac{\Delta P_{I,t-1}}{P_{N,t}}$	-0.12	0.33	2.39
$\frac{\Delta P_{I,t-2}}{P_{N,t}}$	0.11	0.26	0.66
$\frac{\Delta P_{I,t-3}}{P_{N,t}}$	0.07	0.03	-1.86
$\frac{\Delta P_{I,t-4}}{P_{N,t}}$	-0.15	-0.28	0.09
$\frac{\Delta P_{I,t-5}}{P_{N,t}}$	-0.49	-0.62*	0.01
$\frac{\Delta P_{I,t-6}}{P_{N,t}}$	-0.86	-0.92*	-5.78
$\frac{\Delta P_{I,t-7}}{P_{N,t}}$	-1.17	-1.12*	-3.50
$\frac{\Delta P_{I,t-8}}{P_{N,t}}$	-1.35	-1.16*	-3.82
$\frac{\Delta P_{I,t-9}}{P_{N,t}}$	-1.33	-0.97	-3.46
<i>R</i> <sup>2</sup>	0.94	0.93	0.94
<i>D.W.</i>	1.62	1.70	1.72

<sup>13</sup> See Hercowitz and Yashiv (2002), p.21.

### *The Netherlands*

For the Netherlands, Zorlu and Hartog (2001) found that the expected effects of immigration on the wages of the native born population are significantly negative for all tested possible immigration politics and all types of skills<sup>14</sup>:

**Table 3: Predicted effect of increase in immigration by 5% of total labour force on wages of different skill groups.**<sup>15</sup>

Change in the log wage of	Recruitment policy	Balanced immigration policy	Selective immigration policy
Low skilled wages	-0,200	-0,027	-0,005
Medium skilled wages	-0,039	-0,024	-0,005
High skilled wages	-0,005	-0,020	-0,072

### *United States*

For the United States, LaLonde and Topel estimated the effects of increased immigration on the wages of different immigrant cohorts (cohorts are groups of immigrants who arrived in a special time period). They used the following equation to estimate these effects:

$$w_{cjl} = \beta_c + \beta_j + \beta_0 + X_{cjl} \delta + \sum_i \gamma_{ji} \ln M_{ci} + \varepsilon_{cjl}$$

With:  $w_{cjl}$  - log wage of individual l in city c member of immigrant cohort j,  $\beta_c$  - local effect,  $\beta_j$  - cohort effects,  $\beta_0$  - control variable for differences in average immigrant characteristics between broadly defined places of origin,  $X_{cjl} \delta$  - define the characteristics of the individual immigrant and his contribution to the human capital stock  $M_{ci}$  and  $\varepsilon_{cjl}$  - error term.

<sup>14</sup> This result is similar to their result presented in Zorlu and Hartog (2000).

<sup>15</sup> Table taken from Zorlu and Hartog (2001), p.20. Recruitment policy means that there is a higher share of lows skilled immigratns in the immigration flows than in the native population, balanced immigration policy means that the shares of the different skills in immigration flows equal those in the native born population. Selective immigration policy means a higher share of high skilled immigrants than the share in the native born population. In their paper, no estimation equations were given.

**Table 4: Estimated Effects on Log Weekly Wages of a Proportional Increase ( $d \ln M_i = 1$ ) in All Immigrant Cohorts, Unrestricted Substitution Effects, 1980<sup>16</sup>.**

Model	Years since Immigration				
	0-5	6-10	11-15	16-20	21-30
<b>Regression includes: Occupation controls, Industry controls and Place of origin controls</b>	-0.091 (0.28)	-0.046 (0.029)	-0.054 (0.030)	-0.040 (0.032)	-0.006 (0.028)
<b>Regression includes: Industry controls and Place of origin controls</b>	-0.096 (0.029)	-0.059 (0.029)	-0.065 (0.030)	-0.046 (0.032)	0 (0.029)
<b>Regression includes: Place of origin controls</b>	-0.098 (0.029)	-0.057 (0.030)	-0.060 (0.031)	-0.039 (0.033)	-0.004 (0.029)

These results show that the effects on the wages of former immigrants are decreasing with the length of time they are in the country. The effects for the native born population are not analysed, but I think this effect can be derived by looking at the oldest cohort of immigrants, the effect for this cohort should be similar for the native born population.

## 5 Conclusion

The model results show a positive effect of immigration on the employment rate of the native born population in the short run for perfect and imperfect capital mobility. In the long run the effect is negative for the case of imperfect capital mobility. The main result of the model is that there are two effects of immigration which have to be analysed: The effect of immigration on the goods markets and the effects on the labour market.

Some of the empirical results also show negative impacts on the employment rate or the wages of the native born population caused by allowing immigration. These effects seem

<sup>16</sup> See LaLonde and Topel (1991), p.180.

to be quite small compared to the overall effects of immigration on other sectors of an economy.

In my opinion, these results cannot lead to the conclusion that immigration has a negative effect on the whole economy, because only the labour market aspects were analysed in the model and the empirical studies. If other effects, like contributions to the welfare systems (pension and health systems) by the immigrants are taken into account the results are not clear. Borjas (1994, 1998) comes to the conclusion that the overall effects of immigration on welfare are negative, because the contributions to the welfare systems of the immigrants are in their sum negative, which means that immigrants receive more than they contribute to these systems<sup>17</sup>.

Concluding from the model and the empirical results that immigration would have a positive or a negative effect on the German employment rate is difficult, because all studies used data from countries with a working labour market mechanism. Looking at the present discussion about the public pension system in Germany I think an immigration policy which will lead to more immigration can provide solutions to the problems of the system only if we allow our labour market to adjust the wages as a reaction to an increased immigration.

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<sup>17</sup> |See Borjas (1994), p.28f and Borjas (1998), p.29f.



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