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Abstract. This study investigates the extent of labour market competition among native Dutch workers and ethnic minorities, using national survey of the SEO and the Population statistics of the CBS. Firstly, the direct e¤ect of immigrants on local labour markets is considered. It is shown that ethnic minorities from developing countries have a positive e¤ect on the earnings of high skilled natives and an adverse e¤ect on the earning of low skilled native workers. On the other hand, ethnic minorities from EU-countries may have a negative e¤ect on the earnings of high skilled natives and a positive e¤ect on the earnings of low skilled natives. Secondly, the e¤ect of an immigration ‡ow by 5% of the total labour force on native earnings is examined along three scenarios using a general equilibrium model. It is found that immigration has a large negative e¤ect on the wages of less skilled natives and a small positive e¤ect on the wages of high skilled workers as new immigrants are less skilled than natives. In the case that immigration ‡ow is mainly composed of high skilled workers, immigration has a relative large adverse e¤ect on high skilled natives and a small negative e¤ect on low skilled natives. In all cases, medium skilled natives are a little adversely a¤ected by immigrants.

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1 Introduction

The socio-economic status of ethnic minorities in the Netherlands has been an important research interest of social scientists in the last twenty years. Most of this research has concentrated on documenting the disadvantaged position and progress of ethnic minorities in the Dutch society. The economic research on the e¤ect of immigration on the Dutch economy is limited to analysis of the impact of 'guest workers' (Heijke 1979, Hartog and Vriend 1989) and with documentation of the labour market position of ethnic minorities. Kee (1993) and van Beek (1993) provide strong evidence that ethnic minorities face resistance on the Dutch society, which results in unproportionally high unemployment and disadvantaged earning pro…les amongst them.

The popular belief that immigrants induce a large additional burden for national economies of receiving countries is more frequently argued for the Dutch case in the 1990s whilst the immigration policy is increasingly strengthened. High structural unemployment in the lower segment of the Dutch labour market where immigrants are highly concentrated gives cause for this argument. However, no empirical study has been conducted in the Netherlands to study the e¤ect of immigration on the labour market. We do not know how the Dutch labour market reacts to immigration, where we strictly interpret as an extension of labour supply. Do immigrants compete with the native Dutch workers, displace them in production or push down their wages? This study a contribution to answering these questions.

In the United States, a number of empirical studies have been conducted to identify the e¤ect of immigration on the labour market outcomes (Grant and Hamermesh 1981,Chiswick 1982, Grossman 1982, Borjas 1987, 1994, 1995, Borjas et al. 1997, Abowd and Freeman 1991). These studies analyse the impact of immigration in the context of multifactor production functions in which immigrant labour and labour of various gender and age groups are separately incorporated. In this conceptual framework, the e¤ect of immigration on labour market depends on the composition of skills between native and immigrant population. If immigrants are less skilled than the natives, immigration will have an adverse e¤ect on low skilled natives and the income distribution will change in advantage of high skilled labour. If immigrants have the same skill distribution as natives, the relative supply of skills and thus relative wages remain unchanged. Empirical research reveals that immigration does not a¤ect native population uniformly: some native groups which are close substitutes for immigrants lose and others gain. Friedberg and Hunt (1995) conclude in their overview article that no substantial evidence is found for a large adverse impact of immigration on the wages and employment of the native-born population in all those empirical studies.

In the American tradition, a few studies are carried out in European Union countries (New and Zimmerman 1994, Gang and Rivera-Batiz 1994, Venturini 1999, Zorlu 1999). As in the United States, immigrants have been found to have a little or no e¤ect on wages and employment of natives in EU countries.

This paper investigates whether immigrants have an e¤ect on native earn-

ings, and what is the magnitude of the reaction of the Dutch labour market to immigration ‡ows. First, the theoretical framework used to analyse the e¤ect of immigration on the host country labour market is discussed. Section 3 gives a short description of ethnic minorities in the Netherlands. Section 4 presents the estimation of earning functions of the native Dutch workers for low, medium and high skill categories using the national survey data designed by the Foundation for Economic Research (SEO) and the population statistics of the Central Bureau for Statistics (CBS). In section 5, demand for low, medium and high skilled labour is derived by a translog production function and elasticities of complementarity are estimated. The reaction of the Dutch labour market on immigration is predicted by wage determination equations derived in section 2 around three scenarios using the results of earning functions and elasticities of complementarity. Section 6 concludes.

2 Theory

Empirical studies concerning e¤ects of immigration on labour market outcomes in receiving countries have started after the works of Johnson (1980), Grossman (1982). These analyses base on a key mechanism: whether immigrants and natives are substitutes or complements in production. We consider an equilibrium concept of a three-sector labour market in which low, medium and high skilled labour are production factors in local labour markets. The demand for each type labour is assumed to be a decreasing function of its wages and the prices of capital and other inputs are assumed to be exogenous in the local labour market, cities. An increase in the supply of a certain category labour is regarded as an outward shift in the supply of this category labour, which implies a decrease in the wages and an increase in the employment of this labour-type. Increases in the supply of one category labour a¤ect wages and employment of other categories of labour by cross-elasticities. Increases in the labour supply may due to both native and immigrant labour. Newly arriving labour also generates demand for locally produced goods so that labour and production markets reach a new equilibrium at new wage and employment rates.

Altonji and Card (1991) develop a theoretical framework to study e¤ect of immigration on the wages of unskilled and skilled labour. We extend their model by adding a third production factor, namely medium skilled labour. Suppose that a single competitive industry produces Y units of goods by a linear production function with a constant return to scale employing low skilled, medium skilled and high skilled labour and other inputs. Total labour force, L, consists of low skilled L_u , medium skilled, L_m and high skilled, L_s, and people,; $L = L_u + L_m + L_h$ and proportion of low, medium and high skilled labour is respectively $u = L_u=L; m = L_m=L$ and $h = L_h=L; u + m + h = 1$. Total costs in industry is given as

$$C(w_u; w_m; w_h) = Y\, c(w_u; w_m; w_h) \tag{1}$$

where $w_u; w_m$ and w_h are wages of low skilled, medium skilled and high skilled

labour respectively and $c(w_u; w_m; w_h)$ is the unit labour costs. Perfect competition suggests that the unit labour costs, in the absence of capital, is equal to the price of output, $p = c(w_u; w_m; w_h)$.

Goods produced are consumed by low skilled, medium skilled and high skilled workers and some part of goods is exported. Product market equilibrium is given

$$Y = L_u D_u(p; w_u) + L_m D_m(p; w_m) + L_h D_h(p; w_h) + D_x(p) \qquad (2)$$

Where Y is units of goods produced and D_x is export demand. Labour supply functions of low skilled, medium skilled and high skilled workers are given by $S_u(w_u; p)$; $S_m(w_m; p)$ and $S_h(w_h; p)$. Labour market equilibrium occurs when

$$P_i S_i(w_i; p) = Y c_i(w_u; w_m; w_h) \qquad (3)$$

where $c_i = \frac{@c}{@w_i}$ are marginal labour costs of low, medium and high skilled labour.

Suppose that an immigrant ‡ow of size ¢I occurs and new immigrants are composed by di¤erent skill levels: a fraction of immigrants, $®_u$, is low skilled workers, another fraction, $®_m$, is medium skilled and the rest is high skilled, $®_h$. The e¤ects of immigration ‡ow on the wages of low, medium and high skilled workers can be obtained by di¤erentiating equations (2) and (3), and assuming that the cross-elasticities of the output demand and labour supply are zero $\frac{@D_i}{@w_i} = 0$ and that the cross-elasticities of factor demand are zero. $\frac{@S_i}{@p} = 0$. The proportional changes in wage rates of each type labour are de…ned as

$$,_u \left[\frac{®_u}{u}\right] \frac{¢I}{L} = (´_{uu} ¡ "_u) ¢ \log w_u + ´_{um} ¢ \log w_m + ´_{uh} ¢ \log w_h \qquad (4)$$

$$,_m \left[\frac{®_m}{m}\right] \frac{¢I}{L} = ´_{mu} ¢ \log w_u + (´_{mm} ¡ "_m) ¢ \log w_m + ´_{mh} ¢ \log w_h \qquad (5)$$

$$,_h \left[\frac{1 ¡ ®_u ¡ ®_m}{1 ¡ u ¡ m}\right] \frac{¢I}{L} = ´_{hu} ¢ \log w_u + ´_{hm} ¢ \log w_m + (´_{hh} ¡ "_h) ¢ \log w_h \qquad (6)$$

where $´_{ij}$ is the elasticity of labour demand for skill group i with respect to the wage of group j, $"_i$ indicates the elasticity of labour supply of skill group i and $,_i$ is a number between zero and one. It is the fraction of output demanded by skill group i, i.e. ($,_i = \frac{L_i D_i(w_i; p)}{Y}$), and it adjusts changes in labour supply and demand for goods produced in local labour markets. Suppose that some

part of output is consumed locally and another part is exported, and the skill composition of the immigration flow is the same as the skill composition of the existing population, then $\lambda_u = \lambda_m = \lambda_h = \frac{Yx}{Y}$. If the immigration flow is less skilled, i.e. $\theta_u > u; \theta_m < m$ and $\theta_h < h$, then $\lambda_u > \frac{Yx}{Y} > \lambda_m > \lambda_h$. If the immigration flow is higher skilled than the existing population, i.e. $\theta_u < u; \theta_m > m$ and $\theta_h > h$, then $\lambda_u < \lambda_m < \frac{Yx}{Y} < \lambda_h$. The left-hand sides of the equations (4)-(6) indicate the effective proportional increase in the supply of labour for the skill groups as a result of immigration flow.

If the demand for a certain skill group labour is independent of the wage rate of another skill group, i.e. cross-demand elasticities are zero ($\eta_{ij} = 0; i = u; m; h$ and $i \neq j$), we can rewrite equations (4), (5) and (6) in terms of changes in log wages of each skill group as

$$\Delta \log w_u = \frac{-\lambda_u}{(\sigma_u - \eta_{uu})} \left[\frac{\theta_u}{u} - \frac{\Delta L}{L} \right] \tag{7}$$

$$\Delta \log w_m = \frac{-\lambda_m}{(\sigma_m - \eta_{mm})} \left[\frac{\theta_m}{m} - \frac{\Delta L}{L} \right] \tag{8}$$

$$\Delta \log w_h = \frac{-\lambda_m}{(\sigma_h - \eta_{hh})} \left[\frac{1 - \theta_u - \theta_m}{1 - u - m} - \frac{\Delta L}{L} \right] \tag{9}$$

If the skill composition of workers in immigration flow is equal to the skill composition of workers in the native population, linear homogeneity of the production function implies that relative wages of skill groups will not change as a result of immigration flow. In an alternative case, if workers in immigration flow are less skilled than the skill composition of the existing population, $\theta_u > u$, immigration increases the skilled wage and decreases the unskilled wage.

If demand for a certain skill group is related to wages of other skill groups, in addition to its own wage rate, i.e. the cross-elasticities of factor demand differ from zero ($\eta_{ij} = 0$), the reduced-form impact of immigration on the wages of low, medium and high skilled workers can be written as, by solving the equation system (4)-(6) for $\log w_u; \log w_m$ and $\log w_h$:

$$\Delta \log w_u = B - \frac{1}{\eta_{mu}} \left[A - \frac{\left[\frac{(K\theta_m \eta_{hu} \lambda_m)}{m} - \frac{(K(-\theta_u - \theta_m + 1)\eta_{mu} \lambda_h)}{(-u - m + 1)} \right]}{(\eta_{hm}\eta_{mu} + \eta_{hu}(\sigma_m - \eta_{mm}))} - \frac{C}{D} \right] \tag{10}$$

where

$A = (\sigma_m - \eta_{mm})$

$B = \frac{(K\theta_m \lambda_m)/(m\eta_{mu}) + (\eta_{mh}(b_1(\eta_{um}\eta_{mu} - (\sigma_u - \eta_{uu})(\sigma_m - \eta_{mm})))b_1)}{(\eta_{mu}(((\sigma_u - \eta_{uu})\eta_{mh} + \eta_{uh}\eta_{mu})(\eta_{hm}\eta_{mu} + \eta_{hu}(\sigma_u - \eta_{uu})(\sigma_m - \eta_{mm}))))}$

where

$$b = \begin{pmatrix} \theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_m - \theta_{mm}) \\ -(K\alpha_u\theta_{mu,u})/u \\ -(K\alpha_m(\sigma^2_u - \theta_{uu}),_m)/m \end{pmatrix}$$

$$b_1 = \begin{pmatrix} \frac{(K\alpha_m\theta_{hu,m})}{m} - \frac{(K(-\alpha_u-\alpha_m+1)\theta_{mu,h})}{(-u-m+1)} \\ c_1(\theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_m - \theta_{mm}))c_2 \\ -(\theta_{um}\theta_{mu} - (\sigma^2_u - \theta_{uu})(\sigma^2_m - \theta_{mm}))c_3 \end{pmatrix}$$

where

$$c = (-\theta_{hu}\theta_{mh} - (\sigma^2_h - \theta_{hh})\theta_{mu})$$
$$c_1 = (-\theta_{hu}\theta_{mh} - (\sigma^2_h - \theta_{hh})\theta_{mu})$$
$$c_2 = (-(K\alpha_u\theta_{mu,u})/u - (K\alpha_m(\sigma^2_u - \theta_{uu}),_m)/m)$$
$$c_3 = \frac{(K\alpha_m\theta_{hu,m})}{m} - \frac{(K(-\alpha_u-\alpha_m+1)\theta_{mu,h})}{(-u-m+1)}$$

$$D = \begin{pmatrix} (d(\theta_{um}\theta_{mu} - (\sigma^2_u - \theta_{uu})(\sigma^2_m - \theta_{mm}))) \\ (\theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_m - \theta_{mm})) \end{pmatrix}$$

where

$$d = ((\sigma^2_u - \theta_{uu})\theta_{mh} + \theta_{uh}\theta_{mu})(\theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_m - \theta_{mm})) - (-\theta_{hu}\theta_{mh} - (\sigma^2_h - \theta_{hh})\theta_{mu})$$

$$\partial \log w_m = \frac{(E((\theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_m - \theta_{mm}))F - MG))}{(H(\theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_m - \theta_{mm})))} - N \qquad (11)$$

where

$$E = (-\theta_{hu}\theta_{mh} - (\sigma^2_h - \theta_{hh})\theta_{mu})$$
$$F = -\frac{(K\alpha_u\theta_{mu,u})}{u} - \frac{(K\alpha_m(\sigma^2_u - \theta_{uu}),_m)}{m}$$
$$M = (\theta_{um}\theta_{mu} - (\sigma^2_u - \theta_{uu})(\sigma^2_m - \theta_{mm}))$$
$$G = \frac{(K\alpha_m\theta_{hu,m})}{m} - \frac{(K(-\alpha_u-\alpha_m+1)\theta_{mu,h})}{(-u-m+1)}$$
$$H = ((\sigma^2_u - \theta_{uu})\theta_{mh} + \theta_{uh}\theta_{mu})(\theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_u - \theta_{uu})(\sigma^2_m - \theta_{mm})) - (-\theta_{hu}\theta_{mh} - (\sigma^2_h - \theta_{hh})\theta_{mu})(\theta_{um}\theta_{mu} - (\sigma^2_u - \theta_{uu})(\sigma^2_m - \theta_{mm}))$$
$$N = \frac{((K\alpha_m\theta_{hu,m})/m - (K(-\alpha_u-\alpha_m+1)\theta_{mu,h})/(-u-m+1))}{(\theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_m - \theta_{mm}))}$$

$$\partial \log w_h = \begin{pmatrix} J - \frac{Y\left(\frac{(K\alpha_m\theta_{hu,m})}{m} - \frac{(K(-\alpha_u-\alpha_m+1)\theta_{mu,h})}{(-u-m+1)}\right)}{(Z - (-\theta_{hu}\theta_{mh} - (\sigma^2_h - \theta_{hh})\theta_{mu})X)} \end{pmatrix} \qquad (12)$$

where

$$J = (\theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_m - \theta_{mm})) - \frac{(K\alpha_u\theta_{mu,u})}{u} - \frac{(K\alpha_m(\sigma^2_u - \theta_{uu}),_m)}{m}$$
$$Y = (\theta_{um}\theta_{mu} - (\sigma^2_u - \theta_{uu})(\sigma^2_m - \theta_{mm}))$$
$$X = (\theta_{um}\theta_{mu} - (\sigma^2_u - \theta_{uu})(\sigma^2_m - \theta_{mm}))$$
$$Z = ((\sigma^2_u - \theta_{uu})\theta_{mh} + \theta_{uh}\theta_{mu})(\theta_{hm}\theta_{mu} + \theta_{hu}(\sigma^2_m - \theta_{mm}))$$

3 Ethnic minorities

Labour market position of ethnic minorities di¤ers per group in the Netherlands depending on their quali…cations, which they have brought along as well as on the performance of the Dutch economy in the period when they have arrived (Penninx et al. 1994). However, one can observe some similarities between ethnic groups concerning their labour market position. On the basis of their social-economic position, we deal with ethnic minority groups as two major categories: people from EU-countries and other industrialised countries are de…ned as one category and people from developing countries are de…ned as another category. Main groups from the …rst category are German, Belgian and British people.

Immigration from current EU countries have started with the recruitment of guest workers from Italy, Greece, Spain and Portugal after the WW II when these countries, except Italy, were not yet a member of the European Economic Community, former name of the EU. After the seventies, immigration from these recruitment countries has continuously decreased and a large share of guest workers has returned in with advancing integration of EU countries. Immigration from other EU countries has gradually increased after the 1960s (Penninx et al. 1994) and has taken up the largest share in immigration ‡ows in the 1990s. At the same time, the emigration of Dutch people to these countries has increased as well. The share of working permits issued to people from industrialised countries in the total permits increased from 16,2 percent to 39.8 percent between 1979-1992 while the share of working permits issued to the immigrants from ex-colonies, Turkey, Morocco, Algeria and Tunisia decreased from 62 percent to 8.1 percent in the same period[1]. Immigrants from EU countries are more likely to be white-collar and highly quali…ed than blue-collar and poorly quali…ed (Ode 1996). The composition of labour force and labour market position of these groups show similar patterns as the native Dutch. Even, they may have better labour market position than the native Dutch. In the rest of this paper, we assume that labour supply from category 'immigrants' is low skilled while labour supply from 'EU' category is higher skilled.

On the other hand, people from the second category are from

1. former Dutch colonies such as Suriname, Indonesia and current Dutch Antillians /Aruba,
2. Mediterranean countries that provided guest workers in the sixties such as Turkey, Morocco
3. Eastern European countries and other developing countries that have got more importance as a source of especially political refugees in the nineties .

The second category ethnic minorities are called target group concerning the government policy and are reported separately in statistics, except Indonesian people who have relative better labour market position. This category has generally a disadvantaged position in the Dutch labour market that is correlated with their immigration history. Most of the people from former colonies immigrated when the colonies were independent and people from Mediterranean

[1] Penninx et al. (1994) give a comprehensive description of post-war immigration to the Netherlands.

countries are recruited as guest workers for unskilled jobs. Indonesian people immigrated right after the WW II and have somehow a better labour market position. Therefore, they are not reported in statistics.

Table 1 indicates relevant characteristics of ethnic minorities from the second category, connected with the labour market performance. One can easily observe that the ethnic minorities strongly di¤er from the native Dutch people. They are younger, less educated, more frequently unemployed, more concentrated in large cities and their participation rate is considerably lower, compared to the native Dutch population.

Table 1. Population and labour force by nationality, age and education level in the Netherlands 1995/1997

	nativ Dutc	non-native dutch						total
		Total	Target groups					
			total	Turks	Moro	Suri	An/A	others	
Total Population x1000									
Populat. 15-64	9410	1120	573	143	110	182	45	94	10530
Labour force	6080	626	307	63	47	116	26	54	6705
employed	5703	514	241	47	34	97	21	43	6217
unemployed	377	112	66	17	13	19	5	11	488
Non-lab. force	3330	495	267	79	63	65	18	40	3825
Participation rate %									
gross	65	56	53	44	42	64	59	57	64
net	61	46	42	33	30	53	47	46	59
Age									
15-24	13	12	15	19	23	12	12	11	13
25-44	59	63	67	70	62	69	65	67	59
45-64	28	25	18	11	15	19	23	22	28
Education level %									
bao	7	19	29	46	49	18	12	22	8
ibo/mavo	22	23	27	25	23	29	31	26	22
mbo/havo/vwo	46	35	31	23	22	37	34	35	45
hbo/wo	25	23	13	6	6	16	23	17	25
Registered unemployment %									
4 large cities	8	23	25	46	27	17	42	20	12
=100000 inhabs	6	19	23	31	30	14	23	20	8
<100000 inhabs	5	14	20	31	22	10	17	20	6
Total	5	18	23	36	25	15	27	20	6

bao: primary education. ibo/mavo: extended primary education. mbo/havo/vwo: secondary education. hbo/wo: higher education. Bao/ibo/mavo is described as low skilled. Mbo/havo/vwo is described as medium skilled. Hbo/wo is described as high skilled. Gross participation rate indicates the proportion of labour force, which is

employed or seek a job for minimal 12 hours per week and Net participation represents the percentage of labour force which is employed.

Source: CBS

Table 2 shows that ethnic minorities are concentrated in certain regions/cities. The standard deviations indicate that the concentration of ethnic minorities belonging to the category immigrants is higher compared to the category EU. They are especially concentrated in large cities. Immigrants compose an average of 13,5 percent of population in large cities. This percentage is 6 in semi-large cities and 2.6 in small cities. On the other hand, ethnic minorities from the EU category are more spread over the Netherlands. The unequal distribution of separate ethnic minorities is easily observable from standard deviations that Surinamese and Moroccan people are more concentrated while the concentrations of Indonesian and Turkish people are relatively small.

Since ethnic minorities are concentrated in certain areas, the potential e¤ect of immigration may be correspondingly concentrated in these local labour markets. In that sense, geographical distribution of skills gains more importance in explaining the e¤ect of immigrants on the local labour market.

Table 2 Means of population in 548 Dutch municipalities by country of origin (of parents), 1998.

	N	Mean	Std. D.	Min.	Max.
EU	548	556.4	1676.32	0	28105
Belgian	548	71.0	198.73	0	2045
German[1]	548	239.5	652.98	0	8230
English	548	78.13	306.16	0	5725
Immigrants	548	2362	13022.4	0	215020
Turkish	548	509.7	2480.00	0	36770
Moroccan[2]	548	425.6	2688.49	0	49445
Surinamese	548	468.5	3807.75	0	64855
Antillian	548	129.3	704.33	0	11460
Others	548	828.9	3660.41	0	60950
Indonesian[3]	548	392.1	1046.83	0	14780
Total non-native pop.	548	3313.9	15516.2	0	257905
TOTAL POPULATION	548	28537	51034	1000	717304
% non-Dutch					
% EU in Total Pop.	548	.01650	.02294	0	.36487
% in large cities[4]	25	1.31e-7	6.00e-8	4.37e-8	3.05e-7
% in semi-large cities[5]	195	4.96e-7	4.72e-7	0	3.24e-6
% in small cities[6]	328	1.84e-6	3.45e-6	6.54e-8	.000034
% Immigs in Total Pop.	548	.044232	.039750	0	.320366
% in large cities	25	.135745	.071842	.038056	.320366
% in semi-large cities	195	.061556	.036668	0	.195356
% in small cities	328	.026958	.018657	0	.144840

1) Germany including Germany before 1949; German Democratic Republic and Saarland.

2) Morocco including French Morocco, Ifni, Spanish Morocco, Spanish Shara, and Western Shara.

3) Indonesia including former Dutch East-indies, former Dutch New-Guinea and Portugese Timor.

4) Large cities: city population >100 000

5) Semi-large cities: 100 000 <city population >10 000

6) Small cities: city population < 10 000

Source: calculated on basis of CBS population statistics, 1998

4 Data and Estimation

The data used is taken from a newspaper inquiry conducted by the Foundation for Economic Research (Stichting voor Economische Onderzoek, SEO) at the University of Amsterdam in co-operation with de Geassoceerde Pers Diensten, GPD which is the owner of about 20 local newspapers. The questionnaire was published in 20 local newspapers on Saturday, January 17, 1998 called 'the state of the country' (in Dutch; de Staat van het Land) and hypothetically came in the hands of 1.7 million households in the whole country. Unfortunately, Amsterdam is excluded. The vast majority of questionnaires returned come from the native Dutch residents. Very few responses are obtained from ethnic minority groups. The inquiry covers 104 questions related to various subjects from personal characteristics to politics and environment. Additionally, we used the population statistics gathered by the Dutch Central Bureau for Statistics (CBS) for 1998. These statistics cover the number of residents in 548 municipalities and are reported by ethnicity. For ethnic minorities, a narrow de…nition is used: …rst and second generation (anyone belongs to an ethnic group if s/he is born in the country of origin mentioned, and if s/he has a mother who was born abroad.). The data is combined with the population statistics using postal codes and city codes of municipalities where individuals are living.

Table 3 gives mean weekly earnings by gender and educational level, and hourly wages by terms of employment obtained from the data. We selected individuals who earn a labour income and combine their labour income with holiday payments, bonuses, dividends and thirteenth month payments. Then we calculated weekly earnings. The upper part of table shows that there are substantial di¤erences between earnings of female and male per education level. These di¤erences can be attributed to some underlying determinants of income, such as working hours, terms of employment. A speci…cation of people according to these determinants provides better insight. The lower part of table 3 gives hourly earnings of people who are employed full-time, part-time and irregularly, presented by education level and gender. Earning di¤erences are still clearly large.

Table 3. Mean weekly and hourly earnings by education, gender and terms of employment

	Female			Male		
	Obs.	Mean	Std. Dev	Obs	Mean	Std. Dev
Education level						
Low educated	629	492.06	378.58	1447	852.60	580.24
Primary	34	415.60	205.46	106	812.39	569.43
Extended primary	202	457.00	408.43	633	807.38	547.34
mulo/mavo	393	516.69	372.52	708	899.05	606.97
Medium educated	1177	539.14	329.65	2273	928.53	570.87
havo/mms/3y-hbs	196	559.19	307.23	305	934.06	521.17
hbs/gymn./vwo	100	650.57	453.77	294	1127.44	857.40
Secondary voca.	881	522.03	315.19	1674	891.98	505.81
High educated	1396	719.46	461.00	2726	1162.35	656.57
high school	1145	688.00	420.58	2135	1111.35	578.63
university	251	862.96	592.61	591	1348.31	857.99
Mean hourly earnings by terms of employment						
Full-time	1246	19.77	11.27	5515	25.01	19.72
Low educated	169	17.54	5.74	1208	21.64	14.47
Medium educated	434	18.42	8.88	1971	23.31	20.58
High educated	643	21.27	13.40	2336	28.19	20.85
Part-time	1645	20.83	21.35	450	24.55	23.14
Low	353	20.01	28.17	57	22.82	13.97
Medium	629	18.52	11.08	146	23.88	29.86
High	663	23.45	24.11	247	25.35	20.13
Irregular	249	17.39	18.82	190	22.12	28.68
Low	58	13.42	11.52	40	17.12	9.27
Medium	96	20.29	26.99	77	25.08	40.970
High	95	16.87	9.932	73	21.74	17.81

Using the combined data, we estimate the earnings equation. For the earnings equation, the human capital model of earnings determination is used. In this model, observed wage differentials among individuals are a result of differences in their human capital endowment (education and training), work experience, some individual and socio-economic characteristics. We extend this simple model by adding the percentage of ethnic minorities in residential areas where observed individuals are living.

$$\ln w_i = \beta_0 + \beta_1 EXP_i + \beta_2 EXP^2 + \gamma X_i + \delta_1 IMMIG_i + \delta_2 EU + \varepsilon_i \quad (13)$$

Where w is logarithm of weekly earning, EXP is experience and, X covers a vector of individual characteristics (like age, tenure, working hours) and control

variables (like function, form of employment), and other relevant socio-economic characteristics. Also the percentages of ethnic minorities from EU-countries and from developing countries are separately included in the model because the average education level for these groups di¤ers strongly. Immigrants from EU countries have a comparable education level with the native Dutch population while immigrants from non-EU-countries have a considerable lower education level than the native Dutch. For sectors where individuals work, functions they posses and for current position of individuals, dummy variables are created.

Experience is calculated on a basis of the year that an individual really started to work. We estimated the model separately for three skill levels: low, medium and high using the Stata package.

Low skill involves primary and extended primary education (in Dutch; BO, ULO, UBO, ITS and huishoudschool). Medium skill level covers secondary (vocational) education (in Dutch; HVO, MMS, HBS, gymnasium, MBO and VWO). High skill level is de…ned as higher vocational and university education.

First, we estimated the model by OLS. However, the test for heteroscedasticity shows that the assumption of homoscedasticity is violated in the model. That means the estimated variances and covariances of coe¢cients are biased and inconsistent. OLS estimates seem to be ine¢cient Therefore, we apply a heteroskedasticity-consistent estimation technique, Newey and West's method. This method gives consistent estimates of the covariance matrix in the presence of both heteroskedasticity and autocorrelation.

The results of estimations are presented in Table 4. Estimations of the earnings function provide expected results for tenure, working hours, experience, experience squared and gender dummy. Those are all signi…cant at the 5 percent level for the three skill levels. The coe¢cient of Age is signi…cant at the 10 percent level for the low skilled and is not signi…cant for the medium skilled labour. In this table, especially the last two variables are of interest. The variable % people from EU shows the e¤ect of concentration of people from EU countries in local areas on the wages of native workers from three skill levels. The coe¢cients for this variable indicate that the percentage of ethnic minorities from EU-countries may have a positive e¤ect on low skilled natives and a negative e¤ect on medium and high skilled natrives. Note that the coe¢cient for high skilled natives has a highest signi…cant level but none of coe¢cients are signi…cant. The last variable, % immigrants, shows the e¤ect of concentration of people from developing countries on the wages of natives from three skill categories. The estimated coe¢cients clearly shows that the concentarion of people from developing countries has a signi…cant negative e¤ect on the wages of low skilled workers and a signi…cant positive e¤ect on the wages of high skilled native workers. The coe¢cient for medium skilled workers is not signi…cant. These outcomes can be expressed in terms of the …gures in Table 4 as follows: a 1 percent increase in the percentage of ethnic minorities from developing countries decreases the earnings of low skilled workers by 37.23% and increases the earnings of high skilled workers by 23.14%. These results imply that immigrants from developing countries are substitutes for the low skilled and complements with the high skilled native Dutch workers while People from EU-

countries may be complementary to low skilled and substitute for high skilled native Dutch workers. Medium skilled natives may be a weak complements for all non-natives.

Tabble 4. Estimates of logarithmic weekly wages for low, medium and high skilled labour, Netherlands, 1998.

	low skilled		medium skilled		high skilled	
	Coe¤.	t-stat	Coe¤.	t-stat	Coe¤.	t-stat
Constant	5.244	37.00	5.396	48.36	5.305	56.671
Age	.0083	1.88	.0036	1.66	.0124	4.83
Tenure	.0073	5.66	.0074	6.80	.0045	4.32
Working hours	.0137	7.78	.0159	11.36	.0121	10.04
Experience	.0223	4.36	.0155	3.98	.0224	6.61
Experience^2	-.0005	6.39	-.003	-3.69	-.0006	-7.41
D-single	.0153	0.50	-.0421	-2.28	-.0360	-1.86
D-gender	-.2384	-7.01	-.1662	-7.88	-.1705	-9.74
D-full-time	.1514	2.80	.2298	4.60	.3440	5.92
D-irregular	-.3266	-4.25	-.0342	-0.66	-.1128	-1.97
D-part-time	-.1223	-1.89	-.0536	-1.04	.0855	1.49
D-in education	-.0103	-0.11	-.0386	-0.52	-.0727	-1.69
D-unskilled worker	-.0561	-0.72	-.1257	-0.80	-.2803	-1.87
D-skilled worker	.0431	0.69	-.0269	-0.44	.0363	0.42
D-low employee	.0063	0.09	-.1244	-1.63	-.3744	-3.52
D-medium employee	.1431	2.34	.6467	1.09	.0379	0.89
D-high employee	.3152	4.21	.2374	3.86	.1857	4.42
D-low o¢cial	.0208	0.30	.0799	1.02	-.1301	-1.55
D-medium o¢cial	.1636	2.55	.1088	1.73	.0886	2.12
D-high o¢cial	.2168	1.73	.3512	4.53	.2088	4.74
D-starting entrepreneur	.4430	1.55	-.1215	-0.87	-.1011	-0.60
D-retail trade	.0377	0.34	.0966	1.14	.0692	0.32
D-manager/owner company	.3080	2.41	.3198	3.88	.2328	2.85
D-manager employee	.6655	5.84	.4274	3.39	.3423	6.42
D-student	.0102	0.09	-.3380	-1.99	-.5790	-4.37
D-private sector	-.0105	-0.35	.0236	1.18	.0568	2.73
D-large city	.0324	1.19	.0079	0.42	.0038	0.22
D-small city	-.0018	-0.06	-.0079	-0.40	.0086	0.44
% people from EU	.6995	0.65	-.0063	-0.02	-.8743	-1.37
% immigrants	-.3723	-2.26	-.0584	-0.50	.2314	2.010
R^2	0.45		0.51		0.47	
N	1682		2809		3424	

Variables beginning with initial D are all dummy variables. For instance, D-single =1 if single and dummy =0 if otherwise.

D-gender=1 if female and D-gender =0 if otherwise, so on.

% of EU is the percentage of people from the EU-countries in total population in municipalities. % of immigrants is the percentage of people from Turkey, Morocco, Suriname, Dutch Antillian and others in total population in municipalities.

Large city is the dummy for large cities having more than 100 000 residents. Small city is the dummy for small cities having fewer than 20 000 residents. Dummy for semi-large cities is omitted

D-private sector is the dummy variable for public sector: D-private sector=1 if worker is employed in industry, temping agency, retail trade and another pro…t organisation. D-public sector is omitted. Public sector covers workers who are employed in the national government, municipality, police, army, education, health sector and another non-pro…t organisation.

5 Estimation of elasticities of complementarity

In order to understand how the three-types of labour interact with each other, we estimate the degree of substitutability or complementarity among low, medium and high skilled labour. Grant and Hamermesh (1981) argue that production function approximation rather than the cost function provides better results because factor quantities are more likely viewed as exogenous than factor prices. Therefore, we prefer the production function approach.

Suppose that an economy produces Y units of goods using three-type labour: low skilled labour, L_u, medium skilled labour, L_m and high skilled labour, L_h. The production function is given by:

$$Y = F(L_u; L_m; L_h) \tag{14}$$

We assume that production function satis…es standard neo-classical assumptions so that …rms in the factor markets are price takers and production factors are awarded equally their marginal productivity.

$$\frac{@Y}{@L_i} = w_i , \quad i = u; m:h \tag{15}$$

Goods are produced by a transcendental logarithmic (translog) production technology (see Christensen et al. (1973), Grant and Hamermesh (1981), Grossman (1982), and Gang and Rivera-Batiz (1994).

$$\ln Y = \ln ®_0 + \sum_i ®_i \ln L_i + \frac{1}{2} \sum_i \sum_j ¯_{ij} \ln L_i L_j , \qquad i = u; m; h \tag{16}$$

Where Y is output. Where $®_0$, $®_1$ and $¯_{ij}$ are technology parameters. The production function is characterised by constant returns to scale implying that the following relation holds.

$$\ln Y(\pm L_u; \pm L_m; \pm L_h) = \ln Y(L_u; L_m; L_h) + \ln \pm \tag{17}$$

Constant return to scale implies that the production function is linearly homogeneous in L, which is given as $\sum_i \beta_i = 1$ and $\sum_i \gamma_{ij} = 0$

The three factor share equations are derived from the three output elasticity equations, using equation (14).

$$\frac{\partial \ln Y}{\partial \ln L_i} = \frac{\partial Y}{\partial L_i}\frac{L_i}{Y} = \frac{w_i L_i}{Y} = S_i \quad \text{for all } j \tag{18}$$

where w_i is the wage rate and S_i is the share of input i in the value of output, with $S_u + S_m + S_h = 1$. The factor share equations can be derived from equation (16), imposing linear homogeneity.

$$S_u = \frac{\partial \ln Y}{\partial \ln L_u} = \beta_u + \gamma_{uu} \ln L_u + \gamma_{um} \ln L_m + \gamma_{uh} \ln L_h + u_u \tag{19}$$

$$S_m = \frac{\partial \ln Y}{\partial \ln L_m} = \beta_m + \gamma_{mu} \ln L_u + \gamma_{mm} \ln L_m + \gamma_{mh} \ln L_h + u_m \tag{20}$$

$$S_h = \frac{\partial \ln Y}{\partial \ln L_h} = \beta_h + \gamma_{hu} \ln L_u + \gamma_{hm} \ln L_m + \gamma_{hh} \ln L_h + u_h \tag{21}$$

Where u is the error term. Demand theory requires symmetry which implies cross-equation restrictions on the technology coefficients, i.e. $\gamma_{um} = \gamma_{mu}$, $\gamma_{uh} = \gamma_{hu}$ and $\gamma_{mh} = \gamma_{hm}$. Since homogeneity is assumed, one of the factor share equations becomes unnecessary. Because wages of the three skill groups, $w_u; w_m$ and w_h, are estimated by the earning functions, we can estimate the factor share equations, (19), (20) and (21). Since perfect competition is assumed, output may be equal to the sum of income generated by the production factors employed, in this case $Y = \sum_i w_i L_i$. Then we may construct the factor share equations as follows:

$$S_i = \frac{w_i L_i}{\sum_i w_i L_i} \tag{22}$$

By choice of production function instead of the cost function, we assumed that factor quantities are exogenous, rather than factor prices. Therefore, the Hicks partial elasticities of complimentarity are appropriate measure of factor substitutability. The Hicks partial elasticities of complementarity between factors L_i and L_j, σ_{ij}, is defined as the proportional change in factor price i as a

result of exogenous changes in factor j's supply, holding the output price and other input quantities constant.

$$\acute{}_{ij} = \frac{FF_{ij}}{F_i F_j} \tag{23}$$

where F_i is the …rst derivative of the production function F with respect to factor i, i.e. $F_i = \frac{@F}{@L_i}$. and F_{ij} is the second derivative of the production function F, i.e. $F_{ij} = \frac{@^2F}{@L_i@L_j}$

In terms of the translog share equations, the Hicks partial elasticity of complementarity is given by (Hamermesh 1986)[2] :

$$\acute{}_{ij} = \frac{d(\ln w_i)}{d(\ln L_j)} = \frac{(\bar{}_{ij} + S_i S_j)}{S_i} \tag{24}$$

$$\acute{}_{ii} = \frac{d(\ln w_i)}{d(\ln L_i)} = \frac{\left(\bar{}_{ij} + S_i^2 \; i \; S_i\right)}{S_i} \tag{25}$$

If an increase in input j rises price of i, i.e. $\acute{}_{ij} > 0$, factors i and j are complements. If an increase in input j decreases price of i, i.e. $\acute{}_{ij} < 0$, factors i and j are substitutes.

Estimation procedure of elasticities of complementarity is as follows. Firstly, mean wages and factor shares are calculated for 46 municipalities per skill category. Then, a new sample is created including mean wages and employment level per municipality. Finally, the system of the factor share equations (19), (20) and (21) is estimated. We apply Zellner's seemingly unrelated regression technique to take into account possible correlation among the error terms, $u_u; u_m$ and u_h. Because cross-section restrictions are imposed on the model, the factor share equations of low and high skilled labour are estimated. The medium skilled share equation is deleted for estimation. The estimated technology coe¢cients of factor share equations are presented in table 5. Almost all coe¢cients are highly signi…cant, except the coe¢cient indicating technology between low and medium skilled labour, $\bar{}_{um}$.

[2] The relationship between the complementary and substitution elasticities is demonstrated by Sato and Koizumi (1973)

Table 5. Translog coe¢cients for the production function

	Coe¢cient	Std. Error	t-statistic
α_u	0.1822	0.019	9.53
α_m	0.3449	0.016	21.21
α_h	0.4729	0.020	23.46
β_{uu}	0.1083	0.013	8.04
β_{um}	-0.0024	0.018	-0.13
β_{uh}	-0.0892	0.015	-6.07
β_{mm}	-0.2052	0.015	13.43
β_{hm}	-0.2028	0.019	-10.71
β_{hh}	0.2543	0.015	16.40
	equation 19	equation 21	
R^2	0.68	0.86	
N	46	46	

On basis of the technology coe¢cients and mean values of each factor in production, partial elasticities of complementarity are calculated using equations (21) and (22), and reported in Table 6. As expected, the own-price elasticities for low and medium skilled labour are negative but the own-price elasticity of high skilled labour is surprisingly positive. This implies that a possible increase in high skilled labour supply has no negative e¤ect on high skilled wages. The cross-elasticities among the three-type labour show both substitution and complementarity relationships. Low skilled labour seems to be substitute for high skilled labour and complementary to medium skilled labour. Medium and high skilled labour aree substitute for each other.This means that low skilled labour is a poor substitute for high skilled labour and stronly complement with medium skilled labour. High skilled labour and high skilled labour seem to be strongly complement with each other.

Table 6. Partial elasticities of factor complementarity

	With respect to quantity of		
wage of	L_u	L_m	L_h
w_u	-0.2184	0.3167	-0.0053
w_m		-0.0482	-0.0838
w_h			0.0090
Average factor shares			
	0.18	0.33	0.49

These results are generally in line with economic theory except the positive own elasticity for high skilled labour. They con…rm in some degree the earlier empirical work on the Dutch labour market conducted in the last decade. Broer and Jansen (1989) estimate small substitution elasticity between high skilled labour and other production factors using time series data. They also

…nd strong substitution elasticity between low skilled labour and capital, but low substitution elasticity between low skilled labour and high skilled labour. Hebbink (1991) uses cross-section data covering two years and …nd that high skilled labour and capital are complementary, such as low and medium skilled labour. The recent study of Draper and Manders (1997) report a strong substitutability between low and high skilled labour in the sheltered sector and low substitution elasticity in the market sector while modest substitution elasticity between low skilled labour and capital. Our estimates are considerably low compared to these studies. One possible reason may be the lack of production factor capital in our production function. We implicitly assume that capital and other production factors are strongly separable. We ignore thus a possible shift of demand towards capital as a result of an increase in price of one of production factors.

Table 7 presents the price elasticities amoung the three types of labour. In terms of …gures, one percent increase in the supply of low educated labour may reduce the wages of this category labour by roughly 0.4 percent. Straightforwardly, a one percent increase in medium skilled labour supply leads to a circa 0,2 percent decrease in the wages medium skilled while same increase in the supply of high skilled labour increases high skilled wages by about 0,04 percent. Concerning cross-elasticities, one precent increase in the supply of low skilled labour increases medium skilled wages by 0.5 percent and decreases high skilled wages by 0,01 percent (…rst column). One precent increase in the supply of medium skilled labour increases the wages of low skilled labour by 10 percent decreases the wages of high skilled workers by 0,2 percent (second column). The last column shows that one precent increase in the supply of high skilled labour decreases the wages of low skilled labour by roughly 0.03 percent and also decreases the wages of medium skilled workers by 0,4 percent.

Table 7. Own- and cross wage elasticities*

	With respect to quantity of		
change in the wage of	L_u	L_m	L_h
w_u	-0.039	0.1045	-0.0026
w_m	0.057	-0.0159	-0.0411
w_h	-0.001	-0.0277	0.0044

* The elasticities are calculated on basis of Table 6 using the formula for the price elasticitty $\frac{d(\log w_i)}{d(\log L_i)} = S_i \acute{} _{ij}$

5.1 Three scenarios

In the previous part of this paper, we have created enough instruments to identify the e¤ect of immigration on the Dutch labour market using equations (7a), (8a) and (9a) as we assume some arbitrary values to develop three scenarios for the Netherlands. Then, we calculate changes in wages of the skill groups as a result of increasing immigration. In addition to the own- and cross-elaticities

in Table 7, we need some assumptions. Supply elasticities of labour, ε_i, are assumed to be 0.70, 0.75 and 0.80 for low, medium and high skilled labour respectively. The composition of immigrant labour, θ_i, and the fraction of output demanded by the three skill groups, γ_i, are assumed to be different for the scenarios. The percentage of production demanded by the low skilled labour is assumed to be lower than the share of this skill group in the immigration flow, i.e. $\gamma_u < \theta_u$ while that is accounted for the high skilled labour higher than its percentage in the immigartion flow, i.e. $\gamma_h > \theta_h$. That is because high skilled workers earn relatively high. They may consume relatively more while the other way around may be true for low skilled workers.

Suppose that immigration increases with 5% of the total Dutch population. Additionally we assume that the labour supply behaviour of newly entering immigrants are the same with natives, and demand for labour is determined by only economic considerations of employers. Discrimination on any basis does not exist. Then we imagine three scenarios. In the first scenario, 75 percent of immigrant flow is low skilled, 20 percent is medium skilled and only 5% is high skilled., We assume also that the new immigrant population may not generate an enough proportional demand for goods produced but 25% of output is exported, so that $\gamma_u > (Y_x=Y) > \gamma_m > \gamma_h$. This scenario is called recruitment policy.

In the scenario II, skill composition of immigrants is exactly same as the skill composition of the Dutch labour force and 25 percent of output is exported, $\gamma_u = (Y_x=Y) = \gamma_m = \gamma_h$. This scenario is called balanced immigration policy, which may be associated with an increasing labour mobility within the European Union, since skill composition of labour force may be similar among the EU-countries.

In the scenario III, we assume that government policy is designed to allow only high skilled immigrants, so that only a small portion of immigrants is low skilled, 10%. Further, immigrants generate demand for goods or export increases so that product markets may not form a constraint for employment, i.e. $\gamma_u < \gamma_m < (Y_x=Y) < \gamma_h$. This scenario is called selective immigration policy.

Table 7 shows the effect of the 5 percent increase of labour supply by immigration on the logarithmic wages of the skill groups. Notice that the effect of immigration on the wages of the natives from the skill groups is determined by the skill distribution of immigration flow. If immigrants are less skilled than the natives as suggested by the first scnario, immigration has a large negative effect on the wages of less skilled workers and a small positive effect on the wages of high skilled workers (first column). If the skill composition of immigrants is the same as the natives, immigration still has a small negative effect on all skill groups, but this effect is relatively small and is distributed more and less equally over the skill groups (second column). As entering immigrants are higher skilled than the natives, immigration hurts especially high skilled workers (the last column).

From our predictions, it is clear that immigration has the largest negative effect on the wages of skill group, which is a closer substitute for new immigrants but this effect is small. This result is in line with the predictions of Kuhn

and Wooten (1991) who estimate the impact of immigration on the US labour market by a general equilibrium model . In the literature, strong evidence is found that new immigrants are more likely a closer substitute of old immigrants and female workers (Grant and Hamermesh 1981, Grossman 1982, Borjas 1983, 1987). Therefore, the negative e¤ect of immigration ‡ows is captured mainly by immigrants arrived earlier. The e¤ect on natives is negligible (LaLonde and Topel 1991). Moreover, immigrants assimilate rapidly in the labour market so that shock e¤ect of immigration ‡ow is smoothed over years and likely disappears after some time. Altonji and Card (1991) …nd even a small positive e¤ect of immigration on the U.S. economy. Unfortunately, the data used does not allow us to estimate substitution elasticities of separate group ethnic minorities. We aggregate the labour force on three skill levels and implicitly assume that labour is a homogenous production factor in each skill categories and the labour market behaviour of immigrants are same with natives. A desegregation of each skill categories can give more insight to understand the e¤ect of immigration ‡ow.

Tabel 7. Predicted e¤ect of 5% increase in immigration, ¢I=L = 0:05, on wages of the skill groups.

	Recruitment policy	Balanced imm. policy	Selective imm. policy
	$\delta_u = :75; \delta_m = :2;$ $\delta_h = :05$ $\varepsilon_u = :7; \varepsilon_m = :75;$ $\varepsilon_h = :8$ $\gamma_u = :45; \gamma_m = :2;$	$\delta_u = :18; \delta_m = :33;$ $\delta_h = :49$ $\varepsilon_u = :7; \varepsilon_m = :75;$ $\varepsilon_h = :8$ $\gamma_u = :25; \gamma_m = :25;$	$\delta_u = :1; \delta_m = :25;$ $\delta_h = :65$ $\varepsilon_u = :7; \varepsilon_m = :75;$ $\varepsilon_h = :8$ $\gamma_u = :05; \gamma_m = :2;$
	$\gamma_h = :1$	$\gamma_h = :25$	$\gamma_h = :4$
Log w_u	-0.1293	-0.0193	-0.0048
Log w_m	-0.0175	-0.0170	-0.0083
Log w_h	0.0001	-0.0151	-0.0331

The negative e¤ect on wages predicted refers to a short run outcome of the labour market. In the long run, these e¤ects may be smaller by two mechanisms: First, the model assumes that the local labour market is perfectly competitive. This means that wages are completely elastic. In the Dutch labour market, this assumption may be violated. Wages in the Netherlands are downwardly inelastic because of the existence of a binding minimum wage level, unemployment bene…t and other social security arrangements. In the Dutch context, one might expect that the e¤ect of immigration ‡ow will be mainly on (un)employment of the existing labour force. The e¤ect on wages predicted by equations (7a)-(9a) that might be expected to be smaller.

Second, we have implicitly assumed that the existing labour force is immobile between geographical areas. However, the existing labour force in local labour markets may adjust to conditions, which arise after immigration ‡ow. For instance, if immigration ‡ow to a certain region is dominated by low skilled

workers, one may expect that some of the existing low skilled labour will move to other regions. This internal migration may reduce the e¤ect of immigration ‡ow on wages and employment. Borjas et al. (1997) shows that the native ‡ow to California has been drastically limited by the increasing immigration to this state since 1970.

In the highly regulated Dutch labour market, the e¤ect of immigration ‡ows may be mainly concentrated on employment outcome. Unemployment rate among those who are a close substitute of new immigrants may increase in the formal labour market. Additionally, a growth of informal employment in labour intensive sectors where immigrants are involved may be a reaction. Catering, cleaning and horticulture are examples for such a phenomenon. Moreover, immigrants act not only as employees, but also as employers in the labour market. They preserve or even re-create some labour intensive sector by their small …rms such as grocers and clothing industry which were disappearing in the 1980s (Hartog and Zorlu 1999).

6 Conclusions

Data about ethnic minorities is still scarce and existing data does not allow us to carry out a more advanced study in the Netherlands. In this study, two data sets are used: the national survey data collected by the SEO and Population Statistics of the CBS. Ethnic minorities in the Netherlands are divided into two major categories on basis of their national origin: immigrants from EU countries and immigrants from developing countries. This study provides some empirical evidence for the e¤ect of immigrants on the earning of natives, and for the impact of a possible immigration ‡ow. It is shown that the proportion of people from developing countries in cities has a positive e¤ect on the earning of the high skilled native workers and a negative e¤ect on wages of the low skilled native workers. The proportion of people from EU countries has a negative e¤ect on the earnings of the high and medium skilled native Dutch labour force and a positive e¤ect on the earnings of the low skilled natives. The proportion of ethnic minorities in cities has no e¤ect on the earnings of native Dutch labour.

The wage determination process in a labour market is given by a translog production function, which provides estimable factor share equations. We estimate factor share equations using mean wage predictions derived from earning functions for 46 geographical areas. Then, elasticities of complementarity are estimated for the three skill categories. Low skilled is a substitute for medium and high skilled workers; medium skilled labour is a substitute for low skilled labour and a compliment of high skilled labour while high skilled seems to be complementary with medium and low skilled labour in production.

It is predicted, assuming the three scenarios, that a possible immigration ‡ow of 5 percent of the existing labour force may cause a small decline in wages of all skill categories. However, this inverse e¤ect is, in general, small and it di¤ers per skill categories in connection with the skill distribution of new immigrants. If immigrants are less skilled that the native labour force, immigration ‡ow

has a larger inverse e¤ect on wages of the less skilled natives and a smaller inverse e¤ect on the medium skilled natives. It has a small positive e¤ect on the wages of high skilled workers. If immigrants are higher skilled than the natives, immigration has a larger negative e¤ect on the high skilled natives and a small negative e¤ect on the less skilled workers. If the immigration ‡ow has a similar skill distribution with natives, it has an almost equal inverse e¤ect on three skill categories.

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