Issues in Contemporary International Migration

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I dedicate this thesis to my grandmother, Asae Tamura (5 November 1909 — 11 April 2005), and father-in-law, Leong Loon Phang (17 October 1942 — 7 April 2006).

Declaration

I hereby declare that this dissertation is my own work and has not been submitted for a degree at any other university.

Abstract

ISSUES IN CONTEMPORARY INTERNATIONAL MIGRATION

YUJI TAMURA

Broadly speaking, we deal with government activities and their migration-related consequences in this dissertation. There are two parts. The first part examines the influence of social welfare provision on individual demands for immigration. In the second part, we study the impact of tight border control on the incidence of labour exploitation in the migrant smuggling market.

In Part 1, we theoretically show that the existence of redistributive welfare programmes reduces the difference between individual demands for immigration by creating a common economic interest among heterogeneous citizens. By analysing a survey data set that contains individual responses to immigration-related questions in the European Union, we also study the importance of the perceived impact of immigration on the national labour market and the domestic public finance for the desirable level of immigration.

In Part 2, our theoretical model suggests that the government's battle against migrant smuggling may increase the labour exploitation of migrants on average. Furthermore, the common use of social networks by which the information about reliable smugglers is transmitted to potential migrants suggests that the migrant smuggling market may converge to an exploitative state in the long run if smugglers are impatient.

Part 1

Citizen's Demand for Immigration in the Welfare State

CHAPTER 1

Economically Motivated Preferences

This chapter's contribution to the literature is to analyse economically motivated preferences of citizens with respect to immigration in the welfare state where both intra- and intergenerational redistribution schemes exist. These schemes are systematically introduced into an economy where the labour market clears by wage adjustments. The chapter shows how the existence of social welfare programmes influences a citizen's economically motivated demand for immigration. The difference between the preferences of heterogeneous citizens is likely to be reduced in the welfare state particularly when both intra- and intergenerational redistribution schemes exist.

1.1. Introduction

Economic costs and benefits of immigration do not fall equally on different persons who live in the host country. Hence individual demands for immigration differ from each other, while immigration policy is a national decision. Economic motivation is one of the factors that gives rise to contention over immigration, and the nature of contention is likely to be affected by the host country's environment. How is the conflict of interest in immigration shaped by the welfare system in the host country? This chapter systematically answers the question. The innovation is to derive individual demands for immigration under both intra- and intergenerational redistribution programmes. The economic impact of immigration on the host country has been discussed in the context of each type of social welfare redistribution. However, individual demands for immigration have not been analysed in the

light of a combination of these, even though a typical welfare state carries out both types of redistribution.

In order to highlight the influence of social welfare provision on the preferences of heterogeneous citizens, we begin with an economy where no government intervention exists. We then introduce intra- and intergenerational redistribution separately into the economy. Finally, both types of redistribution are simultaneously introduced into the economy. Under each environment, we derive individual demands for immigration. We show that the existence of social welfare provision is likely to reduce the difference between individual demands for immigration, as compared to the laissez-faire. This is more likely when there is both intra- and intergenerational social welfare redistribution. The results are summarised in the last section for ease of comparison between different settings.

1.2. Literature

We theoretically study individual demands for immigration in the welfare state in a single-country setting by simply assuming that the country attracts immigration as much as its government permits.[1] Therefore, we concentrate our discussion on theoretical work of immigration in the welfare state in a single-country setting. We can separate the past studies into two strands according to how the welfare state is defined. One defines it as intragenerational redistribution, and the other as intergenerational redistribution.

1.2.1. Welfare state as intergenerational redistribution

Theoretical studies that examine immigration under intergenerational redistribution include Scholten and Thum (1996), Haupt and Peters (1998), Razin and Sadka (2000), Casarico and Devillanova (2003) and Krieger (2003). Intergenerational redistribution is represented by a balanced pay-as-you-go pension scheme in these studies. That is, defined benefits for the elderly are financed by taxing the young.

[1] Our study is partial and limited in the sense that we do not deal with the issue of welfare magnet and fiscal competition, ie, agents reveal their preferences by choosing the country to live as Tiebout (1956) suggested.

Scholten and Thum (1996) have examined individual demands for immigration in a three-period overlapping-generations model where young, middle-aged and old citizens co-exist in each period. Each agent inelastically supplies one unit of labour in each of the first two lifetime periods and receives a pension benefit in the last period. Agents are heterogeneous only in one dimension, ie, age. Labour is perfectly substitutable between the young and the middle-aged and between citizens and immigrants, and there is only one wage rate that perfectly adjusts to full employment. The wage rate then captures the negative impact of immigration on the labour market.

The pension benefit in their model is defined as a fixed fraction of the prevailing wage rate. Accordingly, the tax rate adjusts to immigration in order to maintain the balanced government budget constraint, while immigration reduces the size of the per capita benefit via the wage rate. Immigration thus affects pensioners negatively via the wage rate even though they are not labour-market participants. Its impact on workers via the tax rate of the wage-linked pay-as-you-go pension scheme is positive. On the one hand, immigration increases the number of taxpayers. On the other hand, it reduces the total expenditure for the pension scheme by making the per capita benefit smaller via the wage rate.

Under this setting, retired citizens are against immigration. Young and middle-aged citizens face two opposing effects of immigration in each period: its negative impact on the labour market and its fiscal effect that reduces the per capita burden of running the pension scheme. They found that the net wage income is concave in immigration, implying that a working citizen desires a quantitatively restrictive policy that allows immigration to the point where the net wage income is maximised. Note that, assuming that immigrants are young, young citizens desire more immigration than the middle-aged because young immigrants continue to contribute to the pension scheme in the following period when they are middle-aged. Accordingly, the median voter is a middle-aged citizen.[2] The median voter in the study is myopic in the sense that middle-aged citizens do not anticipate that tomorrow's policy will be chosen in response to today's policy. However, since today's young

[2]More precisely, this is true if $1+n < 1+\frac{1}{1+n}$ or $(1+n)\,n < 1$ holds where $n > 0$ is the constant population growth rate. Otherwise, the median voter is young in every period.

immigrants continue to contribute to tomorrow's pension scheme, they affect the utility of the middle-aged median voter tomorrow.

Haupt and Peters (1998) extended Scholten and Thum's (1996) analysis within the same framework. They introduced a strategic interaction between the middle-aged median voters in current and subsequent periods by assuming that the median voter in the current period is fully aware of the impact of today's policy choice on the choice in the subsequent period. As a result, the median voter in the current period desires a less restrictive policy than the one that Scholten and Thum (1996) found. The reason is that, by allowing more immigration today, the median voter is able to lower tomorrow's immigration, which results in a smaller fall in tomorrow's pension benefit per capita than otherwise.

They further analysed individual demands for immigration by fixing the tax rate instead of the replacement rate in the balanced budget constraint for the pension scheme. In this case, immigration affects workers only via the depressed wage rate, while pensioners face two effects on the wage-linked benefit. On the one hand, the per capita benefit is reduced via the depressed wage rate. On the other, it is increased via the replacement rate that adjusts to the number of taxpayers and the wage rate. The net impact of immigration on the size of the per capita benefit turned out to be strictly positive, implying that pensioners are pro-immigration.

Working citizens take into account the fact that young immigrants today continue to contribute to the pension scheme and hold the wage rate depressed in the following period. In addition, young citizens and young immigrants become retired in the same period so that young citizens cannot benefit from immigration through the pension scheme. Accordingly, young citizens are against immigration. Middle-aged citizens evaluate the impact of their choice on today's wage rate and tomorrow's pension benefit. The authors found that their utility is strictly convex in immigration, and a higher tax rate tends to lower the utility from closed-border policy relative to the utility from open-border policy. Note that the median voter is still a middle-aged citizen even though the preference is not single-peaked because the other two groups are unambiguously split into two opposing extremes.

Razin and Sadka (2000), Casarico and Devillanova (2003) and Krieger (2003) also define intergenerational redistribution as a balanced pay-as-you-go pension scheme. However, their analyses were conducted in a two-period overlapping-generations model. While there is one less lifetime period as compared to Scholten and Thum (1996) and Haupt and Peters (1998), they allow for an additional dimension of heterogeneity among citizens, ie, factor endowment. The benefit is common to all the elderly and is not linked to the wage rate in the first two of the three studies.

In Razin and Sadka's (2000) framework, the production requires two complementary inputs: capital and labour. Young citizens have different amounts of perfectly substitutable labour as a result of the exogenously distributed heterogeneous costs of human capital investment. An immigrant is young and has a small amount of the perfectly substitutable labour, which is their definition of low skill. Capital is provided by old citizens via their savings. The wage rate and the interest rate adjust for full employment of these production factors under constant-returns-to-scale technology. In their analysis, the tax rate is fixed, and hence the per capita benefit adjusts to maintain the fiscal balance. Accordingly, pensioners are in favour of immigration because it increases not only the size of the per capita benefit but also the rate of interest accruing to their savings. On the other hand, working citizens are against immigration because it depresses not only the wage rate in the period of entry but also the interest rate in the following period by increasing the supply of capital.

In Casarico and Devillanova (2003), two complementary production inputs are skilled and unskilled labour. Capital is assumed away by setting their model as a small open economy. Young citizens acquire skilled labour if the net gain from human capital investment is positive. Otherwise, they remain unskilled. Immigrants are young, have perfectly substitutable unskilled labour and cannot acquire skilled labour. The wage rates for skilled and unskilled labour perfectly adjust for full employment of these labour inputs under the constant-returns-to-scale technology. As in Razin and Sadka (2000), the tax rate is fixed in the balanced government budget constraint. Immigrants depress the wage rate for unskilled labour but increase the wage rate for skilled labour as well as the number of taxpayers. The

net effect on the pension scheme is found to be an increase in tax revenue, suggesting that pensioners are pro-immigration.

At first sight, one might expect that, among young citizens, owners of skilled labour are pro-immigration, and owners of unskilled labour are anti-immigration because immigrants are assumed to be young and unskilled. However, the authors note that owners of unskilled labour must be split into three groups. The first group consists of those who remain unskilled regardless of immigration that increases the skill premium. These are anti-immigration. The second group consists of those whose income from the unskilled wage without immigration is lower than the income from the skilled wage with immigration. They are better off permitting immigration and becoming skilled than banning immigration and remaining unskilled. Hence they are pro-immigration. The third group consists of those whose income from the unskilled wage without immigration is higher than the income from the skilled wage with immigration. These are forced to become skilled to minimise the loss if immigration takes place, but are better off banning immigration and remaining unskilled. Hence they are against immigration. The implication is that there are those who are pro- and anti-immigration among currently unskilled workers. The authors are aware that the use of a fixed tax rate in their analysis is arbitrary but are unable to derive results under a fixed per capita benefit.

Krieger's (2003) framework is similar to Casarico and Devillanova's (2003). The difference is that he assumed the per capita pension benefit to be wage-linked. More specifically, individual demands for unskilled immigrants are examined under two types of pay-as-you-go pension. One is the scheme which defines the per capita benefit as a fraction of the prevailing average wage. The other is the scheme where it is defined as a fraction of the previous wage. In the former, all pensioners receive the same benefit. In the latter, the pension benefit is perfectly correlated to the type of labour supplied in the working period. The author examined both cases of a fixed tax rate and a fixed replacement rate. However, the study ignored young citizens' human capital investment responses to immigration. When the tax rate is assumed as fixed, skilled workers and pensioners are pro-immigration, while

unskilled workers are against immigration, whichever type of pension scheme is in operation. In a sense, this finding reinforces what Casarico and Devillanova (2003) and Razin and Sadka (2000) suggest.

When the replacement rate is assumed fixed, some citizens' demands for immigration depend on the definition of pension benefit. With the per capita benefit being defined as a fraction of the prevailing average wage, old citizens are anti-immigration because immigration of unskilled young workers monotonically lowers the average wage. Skilled young citizens are pro-immigration, for such immigration not only raises the wage rate for skilled labour but also reduces the tax rate. Unskilled young citizens face two opposing effects on their net income: a reduction in the tax rate and a fall in the unskilled wage rate. It turns out that the maximisation of their net wage income with respect to unskilled immigration is likely to yield an interior quantity of immigration as the maximiser, implying that the median voter is young and unskilled.

With the pension benefit being defined as a fraction of the previously received wage, old citizens are indifferent, for today's immigration cannot affect the wage rates in the previous period. Under this setting, skilled young citizens are pro-immigration for three reasons: a higher wage rate today , a lower tax rate today and a higher pension benefit tomorrow which is due to a higher wage rate today. Unskilled young citizens are likely to desire an intermediate amount of immigration that is lower than under the average-wage-linked pension because a lower wage rate today also means a lower pension benefit tomorrow.

1.2.2. Welfare state as intragenerational redistribution

Theoretical studies that examine immigration under intragenerational redistribution include Schmidt, Stilz and Zimmermann (1994), Razin and Sadka (1995) and Epstein and Hillman (2003). In contrast to the previous subsection where all the four studies used an overlapping-generations model for the workhorse, these studies indicate that researchers take fairly different modelling approaches when the time dimension is not explicitly incorporated.

In Schmidt, Stilz and Zimmermann (1994), intragenerational redistribution is defined as an unemployment benefit. The production requires three factors: skilled labour, unskilled

labour and capital. They assume that the host country faces an unlimited supply of unskilled immigrant workers. A single trade union exists and determines the wage rate for unskilled labour, while the wage rate for skilled labour is competitively determined. Since the trade union's choice of the unskilled wage rate is not necessarily the market-clearing rate, unskilled workers face an unemployment risk. Unemployed unskilled workers receive an unemployment benefit that is financed by taxing the returns to all the employed factors. Under this setting, if we assume skilled and unskilled labour are complementary, the directions of the labour-market impacts of immigration are the same as without the trade union. That is, skilled workers benefit, while unskilled workers lose. Since immigration causes an increase in the unemployment of unskilled citizens, the trade union lowers the relevant wage rate in an attempt to cut this unemployment down. As a result, the employment of unskilled labour increases, and hence the wage rate for skilled labour rises. The authors do not explicitly analyse the impact of immigration on citizens via the unemployment insurance scheme. However, the model suggests the two fiscal effects of immigration: an increase in the number of unemployed beneficiaries and an increase in the tax revenue via an increase in the returns to complementary factors.

Razin and Sadka (1995) set up a model which is almost the same as Razin and Sadka's (2000) except that the lifetime dimension is compressed from two to one period. The wage rate and the interest rate perfectly adjust for full employment. Workers have different amounts of perfectly substitutable labour due to exogenously distributed heterogeneous costs of human capital investment. If human capital investment is too costly, the workers choose not to invest and will have a small amount of labour, which is their definition of unskilled labour. Immigrants have the small amount of perfectly substitutable labour. Redistribution is defined such that all workers receive a common benefit that is financed by applying a common tax rate to all the returns to labour and capital. Moreover, the size of the per capita benefit adjusts to immigration so that the pre-immigration level of net income is guaranteed for unskilled workers. Under this setting, they show that, while unskilled workers are indifferent because of the redistribution scheme that fixes their net

income, all skilled workers have less net income with immigration than without it. Skilled workers are hence anti-immigration.

Epstein and Hillman (2003) showed the possibility that individual demands for immigration are positive, even though immigrants become unemployed and receive unemployment benefits. The unemployment insurance scheme is financed by taxing all wage earnings. The production requires capital and labour, and owners of capital employ labour in an efficiency-wage economy where unemployment deliverately exists to extract work effort from employees. Employers are pro-immigration because immigrant workers increase the returns to capital and also extract more effort from employees by increasing the unemployment risk. However, immigrants also increase the tax rate by increasing the number of the unemployed. This affects employers because, although the returns to capital are not taxed in the model, lower net income for each worker gives less incentive to exert work efforts. Hence there exists an intermediate quantity of immigration that maximises the utility of employers. Workers face two opposing effects of immigration. On the one hand, immigration negatively affects them via an increase in the tax rate and a fall in the wage rate. On the other hand, a fall in the wage rate increases employers' demand for labour. Overall, workers may desire some immigrants if the unemployment benefit is low and if immigrants can take over the disciplinary unemployed posts. However, workers' demand for immigration is not as high as that of employers.

1.2.3. This study

The contribution of this study is to analyse individual demands for immigration in the welfare state where both intra- and intergenerational redistribution programmes are carried out. While a typical welfare state runs both types of transfer schemes, the theoretical literature on the political economy of immigration in the welfare state has not had a study under a setting like ours.[3] We systematically introduce two social welfare programmes to a

[3]Kemnitz's (2003) framework does contain both intra- and intergenerational redistribution, namely, an unemployment insurance scheme and a pay-as-you-go pension scheme. However, in his model, intragenerational redistribution takes place not between different groups but within a group. Unskilled workers are the only ones who can be unemployed, and the unemployment insurance scheme is financed by contributions from these identical workers only. In our model, intragenerational redistribution take place between skilled and unskilled workers. Furthermore, his study does not deal with scenarios where benefits are fixed. Note that

benchmark model where no government intervention exists. This enables us to show how these programmes shape individual demands for immigration in the host country.[4]

We find that, in comparison with the laissez-faire, the existence of social welfare provision is likely to reduce the difference between individual demands for immigration. This is more likely to happen when there are both intra- and intergenerational social welfare redistribution.

We study a two-period overlapping-generations economy where citizens are heterogeneous in two dimensions: age and labour quality. As in the literature, we concentrate on individual preferences with respect to the quantity of immigrants with unskilled labour. Intergenerational redistribution is represented by a pay-as-you-go pension scheme with a common benefit, eg, Razin and Sadka (2000) and Casarico and Devillanova (2003). Intragenerational redistribution is represented by an income-support scheme that ensures every low-income earners a target level of gross income per capita, eg, Razin and Sadka (1995). Throughout this chapter, we assume that citizens are unsure of how the immigration quota is determined in every period. This is because we would like to see how the introduction of majority voting to decide on the immigration quota might affect their demands in the next chapter. We also delay the inclusion of endogenous human capital investment until the next chapter, for this endogeneity becomes important when immigration policy can be anticipated.

1.3. Benchmark

In this section, we set up a single-country model where no government intervention exists. In the subsequent sections, we introduce social welfare programmes to this benchmark model. Throughout the chapter, we focus on each citizen's demand for unskilled immigration in period t. In order to simplify the notation, we do not label variables related to this period. We will use subscript -1 to label variables related to period $t-1$ and subscript $+1$ for variables related to period $t+1$ when necessary.

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empirical studies that attempt to evaluate the net fiscal impact of immigration do deal with both intra- and intergenerational redistribution, but the framework is complex and requires numerical simulation. See for instance Storesletten (2000), Auerbach and Orespoulos (2000) and Lee and Miller (2000) for the US case.

[4] A few results based on this chapter appear in Tamura (2006).

The country is inhabited by overlapping generations of individuals who live for two consecutive periods. In the first period of life, each person supplies labour to earn wage income, saves a fraction of the disposable income for the second period and spends the rest on consumption. In the second lifetime period, the person does not work and withdraws the savings that have earned interest over one period. All the second-period income is spent on consumption, and hence no bequest is left.

Figure 1.1 Timing of the benchmark model

Lifetime period		Action sequence			
1st	born	⋆ → work	→ receive wage	→ save	→ consume
2nd	reproduce	⋆	→ withdraw savings plus interest		→ consume

⋆ Time point at which we evaluate each citizen's demand for immigration

1.3.1. Production

The production in the country requires three inputs: low- and high-quality labour and capital. We follow the literature and represent the production by a Cobb-Douglas function. Let Y denote the gross domestic product of the economy, and H and L denote the total quantities of high- and low-quality labour respectively. By assuming the country is a small open economy, we have[5]

$$Y(H,L) = H^{\alpha}L^{1-\alpha}$$

where we assume constant returns to scale, ie, $\alpha \in (0,1)$. Let w_H and w_L denote the wage rates for high- and low-quality labour respectively. We define the wage rate as the marginal

[5]Let $Y(K,H,L) \equiv K^{\varsigma}H^{\xi}L^{\zeta}$ where K is the quantity of capital input and $\varsigma + \xi + \zeta = 1$. If the interest rate is defined as the marginal product of capital, $r \equiv \partial Y/\partial K = \varsigma K^{\varsigma-1}H^{\xi}L^{\zeta}$. By assuming the perfect international mobility of capital and the small size of the economy relative to the rest of the world, we fix the interest rate to obtain $K = (\varsigma/r)^{\frac{1}{1-\varsigma}} H^{\frac{\xi}{1-\varsigma}} L^{\frac{\zeta}{1-\varsigma}}$. The amount of capital thus perfectly adjusts to H and L under the given interest rate. By substituting this last expression into the production function at the beginning, we obtain $Y(H,L) = AH^{\alpha}L^{1-\alpha}$ where $A \equiv (\varsigma/r)^{\frac{1}{1-\varsigma}}$ and $\alpha \equiv \frac{\xi}{\xi+\zeta} \in (0,1)$. We normalise $A = 1$ for ease of exposition.

product of labour.

$$(1.1) \qquad w_H(H,L) \equiv \partial Y/\partial H = \alpha H^{\alpha-1} L^{1-\alpha}$$

$$(1.2) \qquad w_L(H,L) \equiv \partial Y/\partial L = (1-\alpha) H^{\alpha} L^{-\alpha}$$

We thus assume that the wage rates perfectly adjust for full employment. The wage functions are homogeneous of degree zero: it is the ratio between the stocks of high- and low-quality labour that influences the wage rates. Given the stock of high-quality labour, an increase in the stock of low-quality labour raises the wage rate for the former type at a decreasing rate and depresses that for the latter at an increasing rate, ie,

$$(1.3) \qquad \partial w_H/\partial L = \alpha(1-\alpha) H^{\alpha-1} L^{-\alpha} > 0, \qquad \partial^2 w_H/\partial L^2 < 0$$

$$(1.4) \qquad \partial w_L/\partial L = -\alpha(1-\alpha) H^{\alpha} L^{-\alpha-1} < 0, \qquad \partial^2 w_L/\partial L^2 > 0$$

indicating that high- and low-quality labour are complementary in the production.

Note that, in our analysis, it does not matter whether we use the wage rates or employment opportunities as the transmission mechanism of immigration's labour-market impact because, in either case, the expected effect is continuous.

1.3.2. Citizens

Let N denote the total number of young individuals who are born in the country in period t. We call them citizens. We assume that citizens do not emigrate. By denoting the population growth rate by $n > 0$, we have $N/(1+n)$ old citizens who are born in the country in period $t-1$. We assume the population growth rate of the country is a constant.

Each individual is endowed with one unit of labour at birth and supplies it exogenously in the first period of life. We assume that the quality of a person's labour is determined by exogenous factors, eg, schooling norms, that prevail in the country.[6] Let $h \in (0,1)$ denote the share of high-quality labour in the total stock of young citizens' labour. Accordingly,

[6]This assumption will be relaxed in the next chapter.

there are hN and $(1-h)N$ young citizens with high- and low-quality labour respectively in period t.

1.3.3. Immigrants

We define immigration as the entry of young individuals who are born with one unit of labour outside the country and have not supplied labour yet. We assume the country attracts an infinite number of such immigrants. Immigrants stay in the country until death. They acquire the country's citizenship during their labour supply. The precise timing of the last assumption matters when we subsequently introduce social welfare programmes into the economy, for we assume that the access to social welfare benefits is conditional on the aquisition of the citizenship.

The quality of their labour is exogenously low in the sense that it can be perfectly substituted for young citizens' low-quality labour. Let M denote the total number of immigrants entering the country in period t. Let us define immigration policy as the ratio of immigrants to young citizens:

$$m \equiv M/N \tag{1.5}$$

Finally, we assume that, by the time they retire, immigrants perfectly assimilate citizens in terms of fertility. Blau (1992) for instance found that the fertility rate of female migrants from high-fertility countries to the United States was almost the same as native Americans because of self-selection and assimilation. Anyone who is born in the country is automatically given citizenship. Hence immigrants' children are citizens of the country. They are indistinguishable from those whose parents are born in the country, ie, the quality of their labour is exogenously determined in the same way as natives' children's.[7]

[7]These assumptions are often employed to keep analysis tractable because it implies the impact of immigration lasts for the entry period only: see the next subsection. Krieger (2004) for instance relaxed one of these assimilation assumption in the benchmark model of Razin and Sadka (2000) by observing that immigrants tend to have more children than citizens. His analysis is conducted under a constant wage rate with a pay-as-you-go pension scheme only. We do not examine the case of different fertility rates among citizens and immigrants, for we have non-constant wage rates and later introduce two social welfare programmes rather than only one.

1.3.4. Labour market

The labour force in the country in period t is the sum of the following:

$$H = hN \tag{1.6}$$

$$L = (1-h)N + M = (1-h+m)N \tag{1.7}$$

where we used definition (1.5) in equation (1.7).

Since immigrants acquire citizenship during their labour supply, there are $N + M$ old citizens in period $t + 1$. The perfect assimilation assumption results in $h(1+n)(N+M)$ and $(1-h)(1+n)(N+M)$ young citizens with high- and low-quality labour respectively in that period. This suggests that the impact of immigration lasts for the entry period only: both the ratio between the old and the young and the ratio between the skilled and the unskilled are affected by immigration only contemporaneously.

By substituting expressions (1.6) and (1.7) into (1.1) to (1.4), we rewrite them as

$$w_H(m) = \alpha h^{\alpha-1}(1-h+m)^{1-\alpha}, \quad w'_H = \alpha(1-\alpha)h^{\alpha-1}(1-h+m)^{-\alpha} > 0 \tag{1.8}$$

$$w_L(m) = (1-\alpha)h^{\alpha}(1-h+m)^{-\alpha}, \quad w'_L = -\alpha(1-\alpha)h^{\alpha}(1-h+m)^{-\alpha-1} < 0 \tag{1.9}$$

where we used a single prime to label the first derivative with respect to immigration policy. Immigration thus depresses the wage rate for unskilled working citizens and raises that for the skilled.[8]

[8]LaLonde and Topel (1991) found that the impact of immigration on natives' earnings is insignificant in the United States. Altonji and Card (1991) found a significantly negative but small effect of immigration on natives' wages in the country. Borjas, Freeman and Katz (1992: Tables 7.7 and 7.8) found that immigration reduced earnings of unskilled workers relative to skilled workers in the country by increasing the supply of unskilled labour. Friedberg and Hunt (1995) reviewed these and other studies on the labour-market impact of immigration in the United States in detail and concluded that it is negative but trivial. See also LaLonde and Topel (1997: 819-827) for another review. The past studies typically examined correlations between native wages and the presence of immigrants by location, eg, US metropolitan areas, and found them negative but weak or insignificant. This might be because of natives' reactions to immigration, eg, moving to another location or industry. Winter-Ebmer and Zweimüller (1996) separated their data by native mobility and found that the growth of foreign workers slowed the growth of wages for unskilled native workers who stayed with the same firm, while the wage growth among those who moved to another firm was not affected in Austria. Borjas (2003) defined labour skill in terms of both education and work experience and made the size of the native workforce in each skill group stable over time, lessening the complication that arises from natives' reactions to immigration in the labour market. He then found a 10% increase in immigration in a skill group depressed the corresponding wage by 3 to 4 percent in the United States. De New and Zimmermann (1994) found not only a negative wage impact on unskilled natives but also a small positive wage effect on skilled natives in Germany. Gang and Rivera-Batiz (1994) suggest that education,

We assume the wage rate for low-quality labour is lower than that for high-quality labour in the country without immigration.

Assumption 1.1 $w_L(0) < w_H(0)$ or equivalently

$$h < \alpha \tag{1.10}$$

Inequality (1.10) states that the share of young citizens with high-quality labour in the gross domestic product is higher than their share in the pre-immigration labour force. Expressions (1.8) and (1.9) imply $w_L(m) < w_H(m)\ \forall\ m \in [0, \infty)$ if Assumption 1.1 holds.

1.3.5. Consumption

Let c_1 and c_2 denote the first- and the second-period consumption by an individual respectively. A young person maximises the following Cobb-Douglas lifetime utility function:

$$u(c_1, c_2) \equiv c_1^{\beta} c_2^{1-\beta}$$

where $\beta \in (0, 1)$ represents the preference for the first-period consumption.

Let z denote the lifetime income of an individual. The maximisation of the utility then yields the optimal first-period consumption equal to βz and the optimal second-period consumption equal to $(1-\beta)(1+r)z$ where $r > 0$ is the rate of interest.[9] By substituting these into u, we obtain the indirect utility, $\beta^{\beta}[(1-\beta)(1+r)]^{1-\beta} z$, where $\beta^{\beta}[(1-\beta)(1+r)]^{1-\beta}$ is a positive constant. Hence we focus on the lifetime income when we examine the preference of a young citizen.

The utility of an old citizen depends only on the second-period consumption. Since there is no bequest, all the second period income is spent on consumption. We can then focus on the second-period income when we examine the preference of an old citizen.

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work experience and unskilled labour are complementary inputs. Ottaviano and Peri (2006) show that the positive wage effect is likely to be dominant because immigrants and natives are imperfect substitutes. These studies then indirectly support our wage equations (1.8) and (1.9).

[9] Form the Lagrangian, $\mathcal{L}(c_1, c_2, \lambda) \equiv u(c_1, c_2) + \lambda[z - c_1 - c_2/(1+r)]$. Due to the monotonicity assumption on the individual utility, we can treat the consumer budget constraint as equality rather than inequality.

1.3.6. Income

Without the government sector, the lifetime income of an individual is simply

$$(1.11) \qquad z = y - s + \frac{(1+r)\,s}{1+r} = y$$

where y denotes the gross income in the first lifetime period and s denotes the amount saved in that period. Since each young person is endowed with one unit of labour, we have $y_L = w_L$ and $y_H = w_H$. The reason why we introduce an additional notation, y, is because we will have $y_L \neq w_L$ when we introduce intragenerational redistribution later on.

An old citizen lives on his/her savings plus interest, ie,

$$(1.12) \qquad x = (1+r)\,s_{-1}$$

where x denotes the second-period income.

1.3.7. Preferences without a social welfare programme

Our first proposition states policy preferences of citizens in this benchmark setting where there is no social welfare provision. We examine their preferences before young ones work and old ones withdraw savings. The precise timing is given in Figure 1.1 at the beginning of this section.

Proposition 1.1 *Without social welfare redistribution, young citizens with high-quality labour desire an open-border policy, while young citizens with low-quality labour desire a closed-border policy. Retired citizens are indifferent.*

Proof. Immigration affects young citizens' preferences according to expressions (1.8) and (1.9), as equation (1.11) shows. Equation (1.12) suggests that immigration does not affect retirees because they made their savings decisions in period $t-1$ and hence cannot change these in the second lifetime period. □

This result is purely a consequence of the labour-market impact of immigration. These polarised extreme preferences of workers are the characteristics of the standard factor-proportion model.

1.4. Income Support

Let us introduce an income-support scheme to the economy. The scheme financially supports those workers who earn less than adequately. Let $\omega > 0$ denote the minimum level of gross income that the government would like to ensure every worker has. We assume it is higher than the wage rate for low-quality labour and lower than that for high-quality labour in the economy without immigration, ie, $\omega(0) \in (w_L(0), w_H(0))$. Accordingly, in the pre-immigration economy, any worker endowed with low-quality labour receives

$$b(0) = \omega(0) - w_L(0) > 0, \tag{1.13}$$

while workers with high-quality labour do not. Therefore, $y_L(0) = \omega(0)$ and $y_H(0) = w_H(0)$.

The income-support scheme is financed by applying a common tax rate, denoted by μ, to the gross income of all workers. The balanced government budget is therefore given by

$$(w_H H + \omega L)\mu = Lb \tag{1.14}$$

where we have the total revenue on the left hand side and the total expenditure on the right. Equation (1.14) suggests that the income-suppport scheme intragenerationally redistributes income from skilled to unskilled workers.[10]

[10]We do not tax interest earnings of old citizens. Such taxation clearly makes the scheme both intra- and intergenerationally redistributive. As a result, old citizens will be affected by immigration via the tax rate. The taxation of interest earnings leads to ambiguity in many cases that we consider in this chapter because the savings decision depends on it in the next period.

Figure 1.2 Timing of the income-support model

Lifetime period		Action sequence				
1st	born	⋆ → work	→ receive net wage (incl. benefit)		→ save	→ consume
2nd	reproduce	⋆	→ withdraw savings plus interest			→ consume

⋆ Time point at which we evaluate each citizen's demand for immigration

1.4.1. Income

Under the income-support scheme, the lifetime income of an individual is given by

$$(1.15) \qquad z = (1-\mu)\,y - s + \frac{(1+r)\,s}{1+r} = (1-\mu)\,y$$

where we observe that, compared to the benchmark, gross income is now reduced by taxation. In addition, a worker with low-quality labour has a fixed level of gross income, for the person receives b given in expression (1.13). An old citizen lives on his/her savings plus interest, ie, equation (1.12) in the benchmark model.

1.4.2. Preferences under a fixed tax rate

If the tax rate is fixed at some positive fraction, we can rearrange the government budget constraint (1.14) as

$$(1.16) \qquad \omega = \frac{\mu w_H H + w_L L}{(1-\mu)\,L}$$

By substituting the equilibrium conditions (1.6) to (1.9) into it, we obtain

$$(1.17) \qquad \omega = \frac{1-\alpha\,(1-\mu)}{1-\mu}\left(\frac{h}{1-h+m}\right)^{\alpha}$$

which implies that the target level of gross income per capita is strictly decreasing in immigration policy at an increasing rate, ie,

$$(1.18) \qquad \omega' = \frac{-\alpha h^{\alpha}}{(1-h+m)^{1+\alpha}}\,\frac{1-\alpha\,(1-\mu)}{1-\mu} < 0$$

$$(1.19) \quad \omega'' = \frac{\alpha(1+\alpha)h^{\alpha}}{(1-h+m)^{2+\alpha}} \frac{1-\alpha(1-\mu)}{1-\mu} > 0$$

In the beginning of this section, we made an assumption that $\omega(0) \in (w_L(0), w_H(0))$ holds. By substituting expressions (1.8), (1.9) and (1.17) into this assumption, we can rewrite it as $\mu \in \left(0, \frac{\alpha-h}{\alpha}\right)$ where $\frac{\alpha-h}{\alpha} \in (0,1)$ by Assumption 1.1. Accordingly, by fixing the tax rate at some $\mu \in \left(0, \frac{\alpha-h}{\alpha}\right)$, expressions (1.8) and (1.18) imply $\omega(m) < w_H(m)$ $\forall$ $m \in [0,\infty)$. We also guarantee $\omega(m) > w_L(m)$ $\forall$ $m \in [0,\infty)$ because $\omega(m) > w_L(m) \Rightarrow$ $\mu > 0$ $\forall$ $m \in [0,\infty)$. Hence expression (1.13) is true for all $m \in [0,\infty)$. We then have $y_L(m) = \omega(m)$ and $y_H(m) = w_H(m)$ $\forall$ $m \in [0,\infty)$.

Proposition 1.2 *Under the income-support scheme with the tax rate being fixed at some* $\mu \in \left(0, \frac{\alpha-h}{\alpha}\right)$, *retired citizens are indifferent, young citizens with high-quality labour desire an open-border policy, and young citizens with low-quality labour desire a closed-border policy.*

Proof. Expression (1.12) implies the income of a retiree is unaffected by immigration. By expression (1.15), we have $z'_H = (1-\mu)w'_H > 0$ as expression (1.8) implies, and $z'_L = (1-\mu)\omega' < 0$ as expression (1.18) implies. □

The preference outcome is the same as for the benchmark. However, notice that the desire of unskilled young citizens for closed-border policy arises not simply because of the negative labour-market impact of immigration. It is rather the consequence of intensified competition for a share in the income-support scheme's resource, for immigration increases the number of net beneficiaries.

1.4.3. Preferences under fixed target gross income

If the target level of gross income per capita is fixed at some $\omega \in (w_L(0), w_H(0))$, we can rewrite the government budget constraint (1.14) as

$$(1.20) \quad \mu = \frac{(\omega - w_L)L}{w_H H + \omega L} = \frac{\omega - w_L}{\alpha h^{\alpha}(1-h+m)^{-\alpha} + \omega}$$

which implies that the tax rate is strictly increasing in immigration policy at a decreasing rate, ie,

$$(1.21) \quad \mu' = \frac{\alpha h^{\alpha} (1-h+m)^{-\alpha-1} \omega}{\left[\alpha h^{\alpha} (1-h+m)^{-\alpha} + \omega\right]^2} > 0$$

$$(1.22) \quad \mu'' = \frac{-\alpha h^{\alpha} (1-h+m)^{-\alpha-2} [\alpha w_L + (1+\alpha)\omega]\omega}{\left[\alpha h^{\alpha} (1-h+m)^{-\alpha} + \omega\right]^3} < 0$$

Proposition 1.3 *Under the income-support scheme with the target level of per capita gross income being fixed at some* $\omega \in (w_L(0), w_H(0))$*, retired citizens are indifferent, and young citizens with low-quality labour desire closed-border policy. If* $\alpha \leq 1/2$*, young citizens with high-quality labour desire an open-border policy. Otherwise, they desire either a closed-border or a restrictive policy.*

Proof. Expression (1.12) implies the income of a retiree is unaffected by immigration. By expression (1.15), we have $z_L' = -\omega\mu' < 0$ as expression (1.21) implies, and $z_H' = (1-\mu) w_H' - w_H \mu'$. By substituting expressions (1.8), (1.20) and (1.21) into the latter, we obtain

$$z_H' = \frac{\alpha h^{2\alpha-1} (1-h+m)^{-2\alpha} [\alpha w_L - (2\alpha-1)\omega]}{\left[\alpha h^{\alpha} (1-h+m)^{-\alpha} + \omega\right]^2}$$

The sign of this derivative is determined by the sum of the two terms in the square brackets in the numerator. If $\alpha \leq 1/2$, it is positive. If $\alpha > 1/2$ and $\alpha w_L(0) \leq (2\alpha-1)\omega$, we have $z_H' \leq 0 \; \forall \; m \in [0, \infty)$ as expression (1.9) implies. If $\alpha > 1/2$ and $\alpha w_L(0) > (2\alpha-1)\omega$,

$$\arg\max z_H(m) = \left(\frac{(1-\alpha)\alpha}{(2\alpha-1)\omega}\right)^{\frac{1}{\alpha}} h - (1-h) > 0$$

is the ideal policy for young citizens with high-quality labour. □

We now observe that skilled young citizens may no longer desire an open-border policy. The intuition is that the positive impact of immigration on the returns to high-quality

labour may be offset by the corresponding increase in the per capita burden of running the income-support scheme.

We observe that $\arg\max z_H(m)$ is strictly decreasing in ω when $\alpha > 1/2$ and $\alpha w_L(0) > (2\alpha - 1)\omega$. A higher target level of gross income per capita implies that the impact of immigration on the tax rate is larger.

1.5. Pension

Let us remove the income-support scheme for the moment and introduce a pay-as-you-go pension scheme to the benchmark economy.[11] Young citizens pay for the provision of pension benefits to old citizens. The pension benefit per capita is common to all old citizens and is denoted by $p \geq 0$. The scheme is financed by applying a common contribution rate, denoted by γ, to the gross earnings of all young workers. The balanced government budget for the pension scheme is given by

$$(1.23) \qquad (w_H H + w_L L)\gamma = (H_{-1} + L_{-1})p$$

where we have the total revenue on the left hand side and the total expenditure on the right.

Figure 1.3 Timing of the pension model

Lifetime period		Action sequence
1st	born	$\star \rightarrow$ work $\rightarrow$ receive net wage $\rightarrow$ save $\rightarrow$ consume
2nd	reproduce	$\star \rightarrow$ withdraw savings plus interest, receive pension $\rightarrow$ consume

$\star$ Time point at which we evaluate each citizen's demand for immigration

1.5.1. Income

Under the pension scheme, the lifetime income of an individual is given by

$$(1.24) \qquad z = (1-\gamma)y - s + \frac{(1+r)s}{1+r} + \frac{p_{+1}}{1+r} = (1-\gamma)y + \frac{p_{+1}}{1+r}$$

[11] Even under this setting, ie, the welfare state is represented by the public pension only, the country may well attract immigrants sufficiently. Sana and Massey (2000) found that Mexican workers whose jobs do not provide them with old-age social security are more likely to migrate to the United States.

where we observe that the first-period gross income is reduced by the pension contribution, but there is a pension benefit received in the second lifetime period. Since we have removed the income-support scheme, $y_L = w_L$ and $y_H = w_H$.

The income of an old citizen is given by

$$x = (1+r)\, s_{-1} + p \tag{1.25}$$

1.5.2. Preferences under a fixed contribution rate

Suppose the contribution rate is fixed at some $\gamma \in (0,1)$ which results in $p(0) > 0$. We then rewrite the government budget constraint (1.23) as follows:

$$p = \frac{\gamma Y}{H_{-1} + L_{-1}} = \gamma (1+n)\, h^{\alpha} (1 - h + m)^{1-\alpha} \tag{1.26}$$

which implies that the per capita pension benefit is strictly increasing in immigration policy at a decreasing rate, ie,

$$p' = \gamma (1+n)\, w_L > 0 \tag{1.27}$$

$$p'' = \gamma (1+n)\, w_L' < 0 \tag{1.28}$$

Note that our assmuption of immigrants' perfect assimilation results in

$$p_{+1} = \frac{\gamma Y_{+1}}{H + L} = \gamma (1+n)\, h^{\alpha} (1 - h + m_{+1})^{1-\alpha} \tag{1.29}$$

which implies that the pension term in the lifetime-income expression (1.24) is unaffected by immigration policy in period t. In this chapter, we concentrate on policy preferences without paying attention to the determination of immigration policy in each period. In other words, m_{+1} is taken as given.

Proposition 1.4 *Under the pension scheme with the contribution rate being fixed at some $\gamma \in (0,1)$, retired citizens and young citizens with high-quality labour desire an open-border policy, and young citizens with low-quality labour desire a closed-border policy.*

Proof. Expressions (1.25) and (1.27) imply $x' = p' > 0$. By expression (1.24), we have $z'_H = (1-\gamma)\,w'_H > 0$ and $z'_L = (1-\gamma)\,w'_L < 0$. □

The introduction of a pay-as-you-go pension scheme with a fixed contribution rate thus makes retirees pro-immigration rather than indifferent. The proposition suggests that citizens are divided into two extreme opinions.

1.5.3. Preferences under fixed per capita pension

If the per capita pension benefit is fixed at some positive value, we can rearrange the government budget constraint (1.23) as follows:

$$\gamma = \frac{(H_{-1}+L_{-1})\,p}{Y} = \frac{p}{(1+n)\,h^{\alpha}\,(1-h+m)^{1-\alpha}} \tag{1.30}$$

which implies that the contribution rate is strictly decreasing in immigration policy at an increasing rate, ie,

$$\gamma' = \frac{-(1-\alpha)\,p}{(1+n)\,h^{\alpha}\,(1-h+m)^{2-\alpha}} < 0 \tag{1.31}$$

$$\gamma'' = \frac{(2-\alpha)\,(1-\alpha)\,p}{(1+n)\,h^{\alpha}\,(1-h+m)^{3-\alpha}} > 0 \tag{1.32}$$

It is reasonable to assume $\gamma(0) \in (0,1)$ which requires $p \in \left(0, \frac{Y(0)}{H_{-1}+L_{-1}}\right)$, ie, the per capita pension benefit is less than the pre-immigration gross domestic product divided by the number of old citizens.

Proposition 1.5 *Under the pension scheme with the per capita pension benefit being fixed at some* $p \in \left(0, (1+n)\,h^{\alpha}\,(1-h)^{1-\alpha}\right)$, *retired citizens are indifferent, young citizens with high-quality labour desire an open-border policy, and young citizens with low-quality labour desire either a closed-border or a restrictive policy.*

Proof. Expression (1.25) implies the income of a retiree is unaffected by immigration. By expression (1.24), we have $z'_H = (1-\gamma)\,w'_H - w_H\gamma' > 0$ as expressions (1.8) and (1.31)

imply, and $z'_L = (1-\gamma)\,w'_L - w_L\gamma'$. By substituting expressions (1.9), (1.30) and (1.31) into the latter, we get

$$z'_L = \frac{(1-\alpha)\left[p-(1+n)\,\alpha h^{\alpha}\,(1-h+m)^{1-\alpha}\right]}{(1+n)\,(1-h+m)^{2}}$$

The sign of this derivative is determined by the sum of the two terms in the square brackets. The following expression suggests that $z''_L < 0$ when $z'_L = 0$.

$$z''_L = \frac{2\,(1-\alpha)\left[-p+(1+n)\,\alpha h^{\alpha}\,(1-h+m)^{1-\alpha} - \frac{\alpha(1-\alpha)}{2}h^{\alpha}\,(1-h+m)^{1-\alpha}\right]}{(1+n)\,(1-h+m)^{3}}$$

Hence if $p > \alpha\,(1+n)\,h^{\alpha}\,(1-h)^{1-\alpha}$, we have

$$\arg\max z_L\,(m) = \left(\frac{p}{(1+n)\,\alpha h^{\alpha}}\right)^{\frac{1}{1-\alpha}} - (1-h) > 0.$$

Otherwise, $\arg\max z_L\,(m) = 0$. □

The introduction of a pay-as-you-go pension scheme with a fixed per capita benefit may thus make unskilled young citizens desire some positive quantity of immigration even though immigration has a negative labour-market impact on them. This is because the positive net fiscal contribution effect of immigration dominates the negative labour-market effect when the total welfare expenditure requirement is higher than the share of high-quality workers in the gross domestic product, ie, $(H_{-1}+L_{-1})\,p > \alpha Y$. We also observe that the ideal policy for unskilled workers is increasing in the size of the per capita pension benefit and decreasing in the population growth rate when $z'_L\,(0) > 0$.

1.6. Welfare State I

We now examine the cases where both the pay-as-you-go pension scheme and the income-support scheme operate in the country. To this end, we first assume that there is a balanced government budget constraint for each scheme.[12] The advantage of this approach for our

[12]This modelling approach is used for example by Conde-Ruiz and Galasso (2005) and Van Groezen, Leers and Meijdam (2003).

analysis is that we can distinguish between the effects of intra- and intergenerational social welfare redistribution.

The balanced budget constraint for the income-support scheme is given by equation (1.14). As for the pension scheme, we need to modify equation (1.23) because the gross income of a young citizen with low-quality labour is not w_L but ω due to the income-support scheme, ie,

$$(1.33) \qquad (w_H H + \omega L)\,\gamma = (H_{-1} + L_{-1})\,p.$$

Figure 1.4 Timing of the model with both income support and pension

Lifetime period		Action sequence				
1st	born	$\star \longrightarrow$ work	$\longrightarrow$ receive net wage (incl. benefit)		$\longrightarrow$ save	$\longrightarrow$ consume
2nd	reproduce	$\star \longrightarrow$ withdraw savings plus interest, receive pension				$\longrightarrow$ consume

$\star$ Time point at which we evaluate each citizen's demand for immigration

1.6.1. Income

The lifetime income of an individual is given by

$$(1.34) \qquad z = (1-\mu-\gamma)y - s + \frac{(1+r)\,s}{1+r} + \frac{p_{+1}}{1+r} = (1-\mu-\gamma)y + \frac{p_{+1}}{1+r}$$

where $y_H = w_H$ and $y_L = \omega$. The income of an old citizen is given by expression (1.25).

1.6.2. Preferences under a fixed tax rate and a fixed contribution rate

Suppose first that the tax rate for the income-support scheme and the contribution rate for the pension scheme are respectively fixed at some $\mu \in \left(0, \frac{\alpha-h}{\alpha}\right)$ and $\gamma \in (0,1)$ such that $\mu + \gamma < 1$ holds. With a fixed tax rate, the relevant budget constraint for the income-support scheme is given by expression (1.17). As for the pension scheme, since the budget constraint (1.33) contains ω which is endogenous in m in this subsection, we substitute

(1.16) into (1.33) to obtain

$$(1.35) \quad p = \frac{\gamma}{1-\mu}(1+n)\,h^{\alpha}(1-h+m)^{1-\alpha}$$

which implies that the per capita pension benefit is strictly increasing in immigration policy at a decreasing rate, ie,

$$(1.36) \quad p' = \frac{\gamma}{1-\mu}(1+n)\,w_L > 0$$

$$(1.37) \quad p'' = \frac{\gamma}{1-\mu}(1+n)\,w_L' < 0$$

Compared to expression (1.26), the per capita pension benefit (1.35) is larger because the income-support scheme results in a higher contribution by each unskilled young citizen than without the scheme.

Proposition 1.6 *Under the income-support scheme with the tax rate being fixed at some* $\mu \in \left(0, \frac{\alpha-h}{\alpha}\right)$ *and the pension scheme with the contribution rate being fixed at some* $\gamma \in (0,1)$ *such that* $\mu+\gamma < 1$ *holds, retired citizens and young citizens with high-quality labour desire an open-border policy, and young citizens with low-quality labour desire a closed-border policy.*

Proof. Expressions (1.25) and (1.36) imply $x' = p' > 0$. By expression (1.34), we have $z_H' = (1-\mu-\gamma)w_H' > 0$ as expression (1.8) implies, and $z_L' = (1-\mu-\gamma)\omega' < 0$ as expression (1.18) implies. □

The result is the combination of Propositions 1.2 and 1.4. At a glance, it appears identical to the case where only the pension scheme exists with a fixed contribution rate. However, the difference is that unskilled young citizens desire zero immigration not because the relevant wage rate is depressed but because the generosity of income support in terms of the target level of gross income per capita is reduced by the entry of low-income earners.

1.6.3. Preferences under a fixed tax rate and fixed per capita pension

Let us continue to assume that the tax rate for the income-support scheme is fixed at some $\mu \in \left(0, \frac{\alpha - h}{\alpha}\right)$. Now suppose that, instead of the contribution rate, the pension benefit per capita is fixed at some $p \in \left(0, (1+n)\, h^{\alpha} (1-h)^{1-\alpha}\right)$ which implies $\gamma(0) \in (0,1)$. Let us also assume $\mu + \gamma(0) < 1$. The relevant government budget constraint for the income-support scheme is given by expression (1.17). As for the pension scheme, we substitute (1.16) into (1.33) to obtain

$$(1.38) \qquad \gamma = \frac{(1-\mu)\, p}{(1+n)\, h^{\alpha} (1-h+m)^{1-\alpha}}$$

which implies the contribution rate is strictly decreasing in immigration policy at an increasing rate, ie,

$$(1.39) \qquad \gamma' = \frac{-(1-\mu)(1-\alpha)\, p}{(1+n)\, h^{\alpha} (1-h+m)^{2-\alpha}} < 0$$

$$(1.40) \qquad \gamma'' = \frac{(1-\mu)(2-\alpha)(1-\alpha)\, p}{(1+n)\, h^{\alpha} (1-h+m)^{3-\alpha}} > 0$$

Compared to expression (1.30), the contribution rate (1.38) is smaller again because the income-support scheme results in a higher contribution by each unskilled young citizen than without the scheme.

Proposition 1.7 *Under the income-support scheme with the tax rate being fixed at some* $\mu \in \left(0, \frac{\alpha - h}{\alpha}\right)$ *and the pension scheme with the per capita pension benefit being fixed at some* $p \in \left(0, (1+n)\, h^{\alpha} (1-h)^{1-\alpha}\right)$ *such that* $\mu + \gamma(0) < 1$ *holds, retired citizens are indifferent, and young citizens with high-quality labour desire an open-border policy. Young citizens with low-quality labour desire either a closed-border or a restrictive policy.*

Proof. Expression (1.25) implies the income of a pensioner is unaffected by immigration. By expression (1.34), we have $z'_H = (1-\mu-\gamma)\, w'_H - w_H \gamma' > 0$ as expressions (1.8) and (1.39) imply, and $z'_L = (1-\mu-\gamma)\, \omega' - \omega\gamma'$. By substituting expressions (1.17), (1.18),

(1.38) and (1.39) into the latter, we obtain

$$z_L' = \frac{[1-(1-\mu)\alpha]\left[p-(1+n)\alpha h^{\alpha}(1-h+m)^{1-\alpha}\right]}{(1+n)(1-h+m)^2}$$

The sign of this derivative is determined by the sum of the two terms in the second square brackets in the numerator. Since

$$z_L'' = \frac{2[1-(1-\mu)\alpha]\left[\frac{1+\alpha}{2}(1+n)\alpha h^{\alpha}(1-h+m)^{1-\alpha}-p\right]}{(1+n)(1-h+m)^3},$$

we have $z_L'' < 0$ when $z_L' = 0$. Hence if $p > (1+n)\alpha h^{\alpha}(1-h)^{1-\alpha}$, we have

$$\arg\max z_L(m) = \left(\frac{p}{(1+n)\alpha h^{\alpha}}\right)^{\frac{1}{1-\alpha}} - (1-h) > 0.$$

Otherwise, $\arg\max z_L(m) = 0$. □

The result is the combination of Propositions 1.2 and 1.5. Note that the preference of unskilled young citizens is the same as in Proposition 1.5 where only the pension scheme exists with a fixed per capita pension benefit. A comparison of the expressions for z_L' in this proposition and Proposition 1.5 indicates that the net income per capita for the unskilled young is made more sensitive to immigration by the income support scheme even if ω is endogenous, ie, $1-\alpha < 1-(1-\mu)\alpha$. However, the peak of z_L is given by the same immigration policy as in Proposition 1.5. As before, we observe $\arg\max z_L(m)$ is increasing in p and decreasing in n when $z_L'(0) > 0$.

1.6.4. Preferences under fixed target gross income and a fixed contribution rate

Suppose that the target level of gross income per capita is fixed at some $\omega \in (w_L(0), w_H(0))$ and the contribution rate for the pension scheme is fixed at some $\gamma \in (0,1)$ such that $\mu(0)+\gamma < 1$ holds. The relevant government budget constraint for the income-support scheme is given by expression (1.20). As for the pension scheme, expression (1.35) no longer applies because ω is not endogenous in immigration policy in this subsection. We rearrange

equation (1.33) as follows:

$$(1.41) \quad p = \gamma(1+n)[w_H h + \omega(1-h+m)]$$

which implies that the per capita pension benefit is strictly increasing in immigration policy at a decreasing rate, ie,

$$(1.42) \quad p' = \gamma(1+n)(w'_H h + \omega) > 0$$

$$(1.43) \quad p'' = \gamma(1+n) w''_H h < 0$$

Note that, compared to expression (1.35) for the case of a fixed tax rate for the income-support scheme, the per capita pension benefit (1.41) is larger only if $\omega > \frac{1-(1-\mu)\alpha}{(1-\mu)(1-\alpha)} w_L$ holds. Compared to expression (1.26) without the income-support scheme, the per capita pension benefit (1.41) is larger because $\omega > w_L$.

Proposition 1.8 *Under the income-support scheme with the target level of gross income per capita being fixed at some* $\omega \in (w_L(0), w_H(0))$ *and the pension scheme with the contribution rate being fixed at some* $\gamma \in (0,1)$ *such that* $\mu(0) + \gamma < 1$ *holds, retired citizens desire an open-border policy, and young citizens with low-quality labour desire a closed-border policy. The preference of young citizens with high-quality labour is either a closed-border or a restrictive policy.*

Proof. Expressions (1.25) and (1.42) imply $x' = p' > 0$. By expression (1.34), we have $z'_L = -\omega\mu' < 0$ as expression (1.21) implies, and $z'_H = (1-\mu-\gamma) w'_H - w_H \mu'$. The first positive term of z'_H is strictly decreasing in m, while expression (1.21) suggests that the second negative term is strictly increasing in it. By substituting expressions (1.8), (1.20) and (1.21), we get

$$z'_H = \frac{\alpha h^{\alpha-1}(1-h+m)^{-\alpha}}{\left[\alpha h^{\alpha}(1-h+m)^{-\alpha} + \omega\right]^2} \times \left\{(1-2\gamma\alpha)\omega w_L - \gamma(1-\alpha)\omega^2 - \alpha h^{\alpha}(1-h+m)^{-\alpha}[\omega - (1-\gamma\alpha) w_L]\right\}$$

The sign of this derivative is determined by the sum of the three terms in the braces. If $1 \leq 2\gamma\alpha$, it is unambiguously negative. Otherwise, it can be positive. The sign of the second derivative is unambiguously negative when evaluated at $z'_H = 0$, ie,

$$\begin{aligned} z''_H &= \frac{\alpha^2 h^{\alpha-1}(1-h+m)^{-\alpha-1}\omega}{\left[\alpha h^{\alpha}(1-h+m)^{-\alpha}+\omega\right]^3} \times \\ &\Big\{\alpha h^{\alpha}(1-h+m)^{-\alpha}[\omega-(1-\gamma\alpha)w_L]-(1-2\gamma\alpha)\omega w_L+\gamma(1-\alpha)\omega^2 \\ &+\alpha h^{\alpha}(1-h+m)^{-\alpha}[\omega-(1-\gamma\alpha)w_L]-(1-2\gamma\alpha)\omega w_L \\ &-\gamma\alpha(1-\alpha)h^{\alpha}(1-h+m)^{-\alpha}\omega \\ &-\alpha^2(1-\alpha)(2-\alpha)(1-\gamma\alpha)h^{3\alpha}(1-h+m)^{-3\alpha}\omega^{-1}\Big\} \end{aligned}$$

which suggests that the first three terms in the braces sum to zero when $z'_H = 0$. This in turn suggests the sum of the fourth and the fifth terms is negative. Hence $z''_H < 0$ when $z'_H = 0$. □

The result is the combination of Propositions 1.3 and 1.4. We are unable to explicitly solve for $\arg\max z_H(m)$ under the current setting and cannot compare the result with Proposition 1.3 where ω was fixed without the pension scheme. Note, however, that an open-border policy is no longer a possibility for skilled young citizens while it was a possibility in Proposition 1.3. This is because the existence of the pension scheme reduces the positive impact of immigration on the skilled wage rate by $\gamma w'_H$, and hence the first term of z'_H cannot continue to dominate the second term.

1.6.5. Preferences under fixed target gross income and fixed per capita pension

Finally we consider the case where the target level of gross income per capita is fixed at some $\omega \in (w_L(0), w_H(0))$ and the per capita pension benefit is fixed at some $p \in \left(0, (1+n)h^{\alpha}(1-h)^{1-\alpha}\right)$ such that $\mu(0)+\gamma(0) < 1$ holds. The relevant government budget constraint for the income-support scheme is given by (1.20). As for the pension scheme, expression (1.38) no longer applies because ω is not endogenous in m in this subsection. We

rearrange equation (1.33) as follows:

$$(1.44) \quad \gamma = \frac{p}{(1+n)\left[w_H h + \omega(1-h+m)\right]}$$

which implies that the contribution rate is strictly decreasing in immigration policy at an increasing rate, ie,

$$(1.45) \quad \gamma' = \frac{-p\left(w'_H h + \omega\right)}{(1+n)\left[w_H h + \omega(1-h+m)\right]^2} < 0$$

$$(1.46) \quad \gamma'' = \frac{2p\left(w'_H h + \omega\right)^2}{(1+n)\left[w_H h + \omega(1-h+m)\right]^3} - \frac{pw''_H h}{(1+n)\left[w_H h + \omega(1-h+m)\right]^2} > 0$$

Note that, compared to expression (1.38) for the case of a fixed tax rate for the income-support scheme, the contribution rate (1.44) is smaller only if $\omega > \frac{1-(1^*-\mu)\alpha}{(1-\mu)(1-\alpha)} w_L$ holds. Compared to expression (1.30) without the income-support scheme, the contribution rate (1.44) is smaller because $\omega > w_L$.

Proposition 1.9 *Under the income-support scheme with the target level of gross income per capita being fixed at some* $\omega \in (w_L(0), w_H(0))$ *and the pension scheme with the per capita pension benefit being fixed at some* $p \in \left(0, (1+n)h^\alpha(1-h)^{1-\alpha}\right)$ *such that* $\mu(0) + \gamma(0) < 1$ *holds, retired citizens are indifferent. Young citizens desire either a closed-border or a restrictive policy. Young citizens with high-quality labour desire at least as much immigration as young citizens with low-quality labour.*

Proof. Expression (1.25) implies that m does not affect the income of a pensioner. By expression (1.34), we have $z'_L = -(\mu' + \gamma')\omega$ and $z'_H = (1-\mu-\gamma)w'_H - (\mu' + \gamma')w_H$. By using expressions (1.21) and (1.45), we get

$$\mu' + \gamma' = \frac{(1+n)\alpha h^\alpha (1-h+m)^{1-\alpha}\omega - \left(w'_H h + \omega\right)p}{(1+n)(1-h+m)^2\left[\alpha h^\alpha (1-h+m)^{-\alpha} + \omega\right]^2}$$

where the two terms in the numerator are strictly increasing in m. Hence there exists $\arg\max z_L(m) > 0$ if $(1+n)\alpha h^\alpha (1-h)^{1-\alpha}\omega < \left(w'_H(0)h + \omega\right)p$. Otherwise, we have

$\arg\max z_L(m) = 0$. Since $(1-\mu-\gamma)\, w'_H(\arg\max z_L(m)) > 0 \;\forall\; m \in [0,\infty)$ and $w''_H < 0$, $\arg\max z_H(m) \geq \arg\max z_L(m) \;\forall\; m \in [0,\infty)$. □

The result is the combination of Propositions 1.3 and 1.5. If immigration's fiscal contribution to the pension scheme initially dominates its negative impact through the income-support scheme, the sum of the tax rate and the contribution rate is minimised at a certain value of m. While this is what young citizens with low-quality labour desire, young citizens with high-quality labour are likely to demand more immigration due to its positive impact on the wage rate for high-quality labour. However, this positive impact diminishes, and hence they do not desire an open-border policy.

1.7. Welfare State II

In the previous section, we assumed that there was a balanced budget constraint for each social welfare programme. This approach was useful for distinguishing between the two opposing effects of immigration: a positive effect via intergenerational redistribution and a negative effect via intragenerational redistribution. It illuminates the usual argument related to immigrants' fiscal impact: they use social welfare services but also contribute support to the aging population in developed countries.

Let us now combine the two government budget constraints (1.14) and (1.33) into one as follows:

$$(1.47) \qquad (w_H H + \omega L)\,\tau = Lb + (H_{-1} + L_{-1})\,p$$

where τ is the tax rate. We have the total revenue on the left hand side, and the total expenditure on the right hand side. This is the case where the distinction between the two tax rates is only a matter of formality, and the allocation of the total tax revenue to different programmes has nothing to do with the difference in these tax rates.[13] The timing of the model remains the same as in the previous section and is given in Figure 1.4.

[13]See for instance the Institute for Fiscal Studies Briefing Notes 9 (Adam, S., 2004, A survey of the UK tax system) and 13 (Crawford, C., Shaw, J., 2004, A survey of the UK benefit system) that suggest that the National Insurance Contribution is just another way of raising the tax revenue in the UK.

1.7.1. Income

The lifetime income of an individual is given by

$$(1.48) \quad z = (1-\tau)y - s + \frac{(1+r)s}{1+r} + \frac{p_{+1}}{1+r} = (1-\tau)y + \frac{p_{+1}}{1+r}$$

where $y_H = w_H$ and $y_L = \omega$. The income of an old citizen is given by expression (1.25).

1.7.2. Preferences under a fixed tax rate and fixed per capita pension

Suppose the tax rate is fixed at some $\tau \in (0,1)$, and the pension benefit at some $p \in \left(0,(1+n)h^{\alpha}(1-h)^{1-\alpha}\right)$ such that $\omega(0) \in (w_L(0), w_H(0))$ holds. We rewrite the balanced government budget constraint (1.47) as follows:

$$(1.49) \quad \omega = \frac{\tau w_H H + w_L L - (H_{-1} + L_{-1})p}{(1-\tau)L} = \frac{\tau w_H h + w_L(1-h+m) - \frac{p}{1+n}}{(1-\tau)(1-h+m)}$$

which implies

$$(1.50) \quad \omega' = \frac{p - (1+n)[1-(1-\tau)\alpha]\alpha h^{\alpha}(1-h+m)^{1-\alpha}}{(1-\tau)(1+n)(1-h+m)^2}$$

$$(1.51) \quad \omega'' = \frac{2\left\{\frac{1+\alpha}{2}(1+n)[1-(1-\tau)\alpha]\alpha h^{\alpha}(1-h+m)^{1-\alpha} - p\right\}}{(1-\tau)(1+n)(1-h+m)^3}$$

These expressions suggest $\omega'' < 0$ when $\omega' = 0$. Compared to expression (1.16) for the case without the pension scheme, the target gross income per capita (1.49) is either smaller or larger, depending on the size of τ relative to μ and the total expenditure for the pension scheme.

Proposition 1.10 *Under the income-support and pension schemes with the tax rate being fixed at some $\tau \in (0,1)$ and the per capita pension benefit being fixed at some $p \in \left(0,(1+n)h^{\alpha}(1-h)^{1-\alpha}\right)$ such that $\omega(0) \in (w_L(0), w_H(0))$ holds, retired citizens are indifferent, young citizens with high-quality labour desire an open-border policy, and young citizens with low-quality labour desire either a closed-border or a restrictive policy.*

Proof. Expression (1.25) implies the income of a retiree is unaffected by immigration. By expression (1.48), we have $z'_H = (1-\tau)\,w'_H > 0$ as expression (1.8) implies, and $z'_L = (1-\tau)\,\omega'$. Expressions (1.50) and (1.51) imply $\omega'' < 0$ when $\omega' = 0$. Hence if $p > (1+n)\,[1-(1-\tau)\,\alpha]\,\alpha h^{\alpha}\,(1-h)^{1-\alpha}$, we have $\arg\max \omega\,(m) =$

$$\arg\max z_L\,(m) = \left(\frac{p}{(1+n)\,[1-(1-\tau)\,\alpha]\,\alpha h^{\alpha}}\right)^{\frac{1}{1-\alpha}} - (1-h) > 0.$$

Otherwise, $\arg\max z_L\,(m) = 0$. □

The intuition is that immigration can increase the total tax revenue by increasing both the number of taxpayers and the returns to complementary production factors, ie, high-quality labour in this model. However, immigration also increases the number of income-support beneficiaries as well as the size of per capita income support as a result of a depressed unskilled wage rate. Accordingly, even if $\omega'(0) > 0$, the positive effect can dominate the negative effect only up to a certain m because the positive effect is diminishing while the negative effect is increasing in immigration.

Note that when $\omega'(0) > 0$ the ideal policy for young citizens with low-quality labour is increasing in the per capita pension benefit. Even young citizens who can be substituted by immigrants in the labour market become more pro-immigration under a more generous pension scheme. This is because, with a fixed tax rate, a larger per capita pension benefit implies a smaller income support benefit per capita. As a result, the required m to maximise ω is higher when p is larger with τ fixed.

The same ideal policy is strictly decreasing in the tax rate and also the population growth rate. When n is large, the per capita burden of the pension scheme is not large, which suggests that immigrants' fiscal contribution is not very important. When τ is large with a fixed per capita pension benefit, other things being equal, ω is already likely to be generous. Hence the maximisation of ω does not require much immigration. Notice that, compared to Propositions 1.5 and 1.7, $\arg\max z_L\,(m)$ when $\omega'(0) > 0$ is larger. It did not depend on the tax rate in those propositions, but it does so in Proposition 1.10 because the

tax revenue must be shared with the pension scheme under the current setting. In other words, because the per capita pension benefit is fixed, the positive impact of immigration on the pension scheme leaks to the income-support scheme through the single tax rate.

1.7.3. Preferences under a fixed tax rate and fixed target gross income

Let us now suppose that the tax rate is fixed at some $\tau \in (0,1)$, and the target gross income at some $\omega \in (w_L(0), w_H(0))$ such that $p(0) > 0$ holds. We can rewrite the balanced government budget constraint (1.47) as $p = \frac{(w_H H + \omega L)\tau - Lb}{H_{-1} + L_{-1}}$ or

$$(1.52) \quad p = (1+n)(1-h+m)\left\{[1-(1-\tau)\alpha]\left(\frac{h}{1-h+m}\right)^{\alpha} - (1-\tau)\omega\right\}$$

which suggests

$$(1.53) \quad p' = (1+n)\{[1-(1-\tau)\alpha]w_L - (1-\tau)\omega\}$$

$$(1.54) \quad p'' = (1+n)[1-(1-\tau)\alpha]w_L' < 0$$

That is, the per capita pension benefit is concave in immigration policy. Compared to expression (1.26) for the case without the income-support scheme, the pension benefit (1.52) is either smaller or larger because, while the tax revenue must be shared with the income-support scheme, the same scheme also prevents an unskilled young citizen's tax payment from falling.

Proposition 1.11 *Under the income-support and pension schemes with the tax rate being fixed at some $\tau \in (0,1)$ and the target level of gross income per capita being fixed at some $\omega \in (w_L(0), w_H(0))$ such that $p(0) > 0$ holds, young citizens with low-quality labour are indifferent, young citizens with high-quality labour desire an open-border policy, and old citizens desire either a closed-border or a restrictive policy.*

Proof. Expression (1.48) suggests the income of young citizens with low-quality labour is unaffected by immigration. It suggests $z_H' = (1-\tau)w_H' > 0$ as expression (1.8) implies. Expression (1.25) implies $x' = p'$, and expressions (1.53) and (1.54) suggest that, if

$[1-(1-\tau)\alpha]w_L(0) > (1-\tau)\omega$, we have $\arg\max p(m) =$

$$\arg\max x(m) = \left(\frac{[1-(1-\tau)\alpha](1-\alpha)}{(1-\tau)\omega}\right)^{\frac{1}{\alpha}} h - (1-h) > 0.$$

Otherwise, $\arg\max x(m) = 0$. □

Note that old citizens is neither indifferent nor in favour of an open-border policy, which has not been observed so far. This is because of an increasing burden that immigration imposes on the income-support scheme which then requires a larger and larger share of the tax revenue as immigration increases. In fact, the ideal policy for pensioners when $p'(0) > 0$ is strictly decreasing in the generosity of the income support programme. Furthermore, it is strictly increasing in the tax rate because immigrants' fiscal contribution becomes larger under a higher tax rate through their impact on w_H and by increasing the number of taxpayers. Notice also that unskilled young citizens are indifferent because their net income is not affected by immigration with τ and ω fixed.

1.7.4. Preferences under fixed target gross income and fixed per capita pension

Finally let us assume the per capita pension benefit and the target level of gross income per capita are respectively fixed at some $p \in \left(0, (1+n)h^{\alpha}(1-h)^{1-\alpha}\right)$ and $\omega \in (w_L(0), w_H(0))$ such that $\tau(0) \in (0,1)$. We rewrite the balanced government budget constraint (1.47) as follows:

$$(1.55) \qquad \tau = \frac{Lb + (H_{-1} + L_{-1})p}{w_H H + \omega L} = \frac{(\omega - w_L)(1-h+m) + \frac{p}{1+n}}{w_H h + \omega(1-h+m)}$$

which implies

$$(1.56) \qquad \tau' = \frac{\alpha h^{\alpha}(1-h+m)^{1-\alpha}\omega - \frac{p}{1+n}(w'_H h + \omega)}{[w_H h + \omega(1-h+m)]^2}$$

The two terms in the numerator are strictly increasing in m. That is, the tax rate is convex in m. Notice that expression (1.56) is equal to $\mu' + \gamma'$ in Proposition 1.9 where both per

capita benefits are fixed in the two government budget constraints. With ω and p fixed, we have $\tau(m) = \mu(m) + \gamma(m)$.

Proposition 1.12 *Under the income-support and pension schemes with the target level of gross income per capita being fixed at some* $\omega \in (w_L(0), w_H(0))$ *and the per capita pension benefit being fixed at some* $p \in \left(0, (1+n)h^{\alpha}(1-h)^{1-\alpha}\right)$ *such that* $\tau(0) \in (0,1)$ *holds, old citizens are indifferent, and young citizens desire either a closed-border or a restrictive policy. Young citizens with high-quality labour desire at least as much immigration as young citizens with low-quality labour.*

Proof. Expression (1.25) implies the income of a retiree is unaffected by immigration. By expression (1.48), we have $z_L' = -\omega\tau'$ and $z_H' = (1-\tau)w_H' - w_H\tau'$. Expression (1.56) suggests that, if $\alpha h^{\alpha}(1-h)^{1-\alpha}\omega < \frac{p}{1+n}(w_H'(0)h + \omega)$ holds, we have $\arg\min \tau(m) = \arg\max z_L(m) > 0$. Otherwise, $\arg\max z_L(m) = 0$. Since expression (1.8) implies $(1-\tau)w_H'(m) > 0 \ \forall\ m \in [0,\infty)$ and $w_H'' < 0$, we have $\arg\max z_H(m) \geq \arg\max z_L(m)$. □

As expected from expression (1.56), we obtain the same result as in Proposition 1.9 under the two government budget constraints.

1.8. Summary

This chapter has demonstrated how individual demands for immigration might be affected by the existence of welfare programmes and also different institutional settings, eg, fixed benefits vs fixed tax rates. Table 1.1 summarises all the results for ease of comparison. The main conclusion is that the existence of social welfare provision makes the preferences of heterogeneous citizens less polarised.

When there is no government transfer, the factor-market impact of immigration polarises young citizens' preferences into two extremes: unrestricted immigration and zero immigration, while leaving retired citizens indifferent (Proposition 1.1).

When there is only intragenerational redistribution from high- to low-income earners, young citizens' preferences are again polarised while leaving retired citizens indifferent if only the expenditure side of this redistributive scheme adjusts to immigration (Proposition 1.2). However, if the revenue side adjusts to immigration, the preference of skilled young citizens may tend to that of the unskilled young, while retired citizens still remain indifferent (Proposition 1.3).

When there is only intergenerational redistribution from young to old citizens, skilled young citizens and old citizens desire unrestricted immigration if only the expenditure side of the redistribution scheme adjusts to immigration. Their preference opposes to that of the unskilled young who desire zero immigration (Proposition 1.4). However, if the revenue side adjusts to immigration, the preference of unskilled young citizens may tend to that of the skilled young, while retired citizens become indifferent (Proposition 1.5).

When there are both intra- and intergenerational redistribution schemes, skilled young citizens and retired citizens desire unrestricted immigration if each scheme has its own budget, and if only the expenditure side adjusts to immigration in both schemes. Their preference opposes that of the unskilled young who desire zero immigration (Proposition 1.6).

If the expenditure side of the intragenerational redistribution scheme adjusts to immigration, and if the revenue side of the intergenerational redistribution scheme does so, then retired citizens become indifferent, while the preference of unskilled young citizens may tend to that of the skilled young (Proposition 1.7).

If the revenue side of the intragenerational redistribution scheme adjusts to immigration, and if the expenditure side of the intergenerational redistribution scheme does so, then the preferences of retired citizens and unskilled young citizens become polarised, while the preference of skilled young citizens tend to that of the unskilled young (Proposition 1.8). This implies that the median voter is likely to be skilled young.

If only the revenue side adjusts to immigration in both schemes, the preferences of both skilled and unskilled young citizens may tend towards each other, while leaving the retired

indifferent (Proposition 1.9). This case is the same as when both schemes are managed under a single budget whose revenue side adjusts to immigration (Proposition 1.12).

If the intra- and intergenerational redistribution schemes are run under a single budget, and if only the expenditure for intragenerational redistribution adjusts to immigration, then the preference of unskilled young citizens may tend to that of the skilled young, while leaving retired citizens indifferent (Proposition 1.10). If only the expenditure for intergenerational redistribution adjusts to immigration, then the preference of retired citizens tend towards the preference of skilled young citizens, while leaving the unskilled young indifferent (Proposition 1.11).

Propositions 1.5, 1.7, 1.9 (1.12), 1.10 and 1.11 suggest the possibility that no one is completely against unskilled immigation due to the existence of social welfare provision. Among these, only Proposition 1.9 (1.12) implies that the two interest groups move closer to each other in terms of preference. In this case, the same public-finance impact of immigration is felt by heterogeneous young citizens via taxation, which causes them to share one common interest. In other words, the welfare state has the effect of causing individual demands for restrictive but not closed-border policy among individuals whose preferences are otherwise polarised to two opposite policy directions.

Although we examined scenarios where either the tax rate or the per capita benefit is fixed while the other is adjustable, both may adjust in practice. However, our results in Table 1.1. can easily suggest what would happen to individual preferences when both the tax rate and the per capita benefit adjust to immigration. For instance, Propositions 1.7 and 1.8 suggest that preferences of young citizens with different labour skills might become closer to each other.

In this chapter, we did not consider the determination of immigration policy. In some circumstances, it might be reasonable to assume that citizens can anticipate how national decisions are made regarding immigration. For instance, citizens might be able to anticipate a referendum to take place to decide on the immigration quota, eg, Switzerland. Therefore, in the next chapter, we examine the policy determination based on our analysis in this chapter.

Table 1.1 Citizen's ideal immigration policy

Welfare state[†]	Fixing[‡]	Citizens[§]			Prop[¶]
		Young		Old	
		High-quality labour	Low-quality labour		
None		O	C	~	1.1
IS only	μ	O	C	~	1.2
	ω	O if $\alpha \leq 1/2$; C if $\alpha > 1/2$ & $z'_H(0) \leq 0$; $\left(\frac{(1-\alpha)\alpha}{(2\alpha-1)\omega}\right)^{\frac{1}{\alpha}} h - (1-h)$ if $\alpha > 1/2$ & $z'_H(0) > 0$	C	~	1.3
PS only	γ	O	C	O	1.4
	p	O	$\left(\frac{p}{(1+n)\alpha h^\alpha}\right)^{\frac{1}{1-\alpha}} - (1-h)$ if $z'_L(0) > 0$; C otherwise	~	1.5
IS & PS (2 bc)	μ, γ	O	C	O	1.6
	μ, p	O	$\left(\frac{p}{(1+n)\alpha h^\alpha}\right)^{\frac{1}{1-\alpha}} - (1-h)$ if $z'_L(0) > 0$; C otherwise	~	1.7
	ω, γ	R if $z'_H(0) > 0$; C otherwise	C	O	1.8
	ω, p	At least as much as the unskilled young desire	R if $z'_L(0) > 0$; C otherwise	~	1.9

Continued ...

Table 1.1 (Continued)

(Welfare state†)	(Fixing‡)	(Citizens♯) (Young) (High-quality labour)	(Low-quality labour)	(Old)	(Prop♮)
IS & PS (1 bc)	τ, p	O	$\left(\frac{p}{(1+n)[1-(1-\tau)\alpha]\alpha h^{\alpha}}\right)^{\frac{1}{1-\alpha}} - (1-h)$ if $z_L'(0) > 0$; C otherwise	$\sim$	1.10
	τ, ω	O	$\sim$	$\left(\frac{[1-(1-\tau)\alpha](1-\alpha)}{(1-\tau)\omega}\right)^{\frac{1}{\alpha}} h - (1-h)$ if $x'(0) > 0$; C otherwise	1.11
	ω, p	At least as much as the unskilled young desire	R if $z_L'(0) > 0$; C otherwise	$\sim$	1.12 (= 1.9)

† IS = income support, PS = pension, bc = budget constraint(s)

‡ μ = income-support tax rate, ω = target gross income per capita for the young

γ = pension contribution rate, p = pension benefit per capita, τ = tax rate under a single budget constraint

♯ O = open border, C = closed border, R = restrictive (positive but not ∞), $\sim$ = indifferent

♮ proposition number

CHAPTER 2

Policymaking by Plebiscite

This chapter contributes to the literature by analysing referendum outcomes when citizens are allowed to vote on the immigration quota in the welfare state where both intra- and intergenerational redistribution schemes exist. The framework in the previous chapter is extended such that human capital investment decisions of citizens respond to the anticipated immigration quota. We find that an open-border policy is the stable majority voting equilibirum under endogenous human capital acquisition, assuming an unlimited supply of unskilled young immigrants and a positive population growth rate.

2.1. Introduction

Our analysis in the previous chapter showed that the existence of social welfare programmes can make individual demands for immigration less polarised among heterogeneous citizens. However, they hardly share the same ideal m defined by (1.5), and disagreement remains among them. Hence we are interested in the determination of immigration policy in this chapter. We will use the framework which we called Welfare State II (Section 1.7) in the previous chapter. That is, we have only one balanced government budget constraint for intra- and intergenerational redistribution schemes.

We introduce a simple rule for determining the unskilled immigration quota. We assume that the government unexpectedly introduces a referendum to determine it in period t. The time point of the referendum is the same as that at which we evaluated each citizen's demand for immigration in the previous chapter (Figure 1.4). That is, the quality of each young citizen's labour has been determined, but the labour has not been supplied yet. In addition,

we assume that, in period t when the referendum unexpectedly takes place, citizens come to know that majority voting is planned to take place at the same time point in every future period.[1]

Notice that, in our framework, the determination of future policy does not depend on the preceding policy. Young immigrants gain the citizenship of the country during their labour supply, which means that they become entitled to not only social welfare benefits but also the right to vote on immigration policy when they are retired. However, young immigrants assimilate the fertility behaviour that prevails in the country. Their children are citizens at birth and are indistinguishable from the children of natives. These assumptions yield the same composition of the citizen population in terms of both age and skill at the pre-referendum stage in every period. Accordingly, today's immigration policy does not change tomorrow's policy choice in our framework.

In the previous chapter, we reviewed Haupt and Peters (1998) whose three-period overlapping-generations structure introduced such dependency of policymaking over time. In their case, the age composition of the population changes because immigrants are young and continue to work in the following period. Changes in the age composition of the population can also be introduced in our two-period overlapping-generations framework by relaxing the assumption of a constant population growth rate. For instance, Krieger (2004) assumed different fertility behaviours among natives and immigrants within Razin and Sadka's (2000) framework where the welfare state is represented by a pay-as-you-go pension scheme only. We do not examine the importance of different fertility behaviours in this chapter, for we would like to keep our welfare-state model of intra- and intergenerational redistribution programmes analytically tractable.

As discussed by Benhabib (1996) and subsequently formalised by Ortega (2004), immigration is also likely to change the composition of the future electorate in terms of factor

[1]Tamura (2004) examined cases where only one referendum takes place in period t to determine the immigration quota which is applied to either that period only (temporary policy) or all the periods from t onwards (permanent policy). The approach has however been criticised by an anonymous referee of *Journal of Population Economics*. Permanent policy fixes m for the future, which is rather unrealistic. Temporary policy ignores the effect of policy determination on preferences. Majority voting outcomes for the latter are simply based on the preferences we derived in the previous chapter, which can also be interpreted as cases with myopic voters. To examine more realistic cases, we assume that a referendum takes place in every period.

endowment. This is the case, for instance, if there is a correlation between parents and their children in terms of skill endowment. The point they made is that immigration policy can be cyclic *ceteris paribus* because the initial majority demand immigrants with factors that are complementary to theirs, eg, the skilled majority demand unskilled immigration, which allows the unskilled to form the majority in the future. The future majority then demand skilled rather than unskilled immigration. This is an important issue in the political economy of immigration policymaking but is not analysed in this chapter. The reason is to reduce complexity and obtain results analytically under both intra- and intergenerational redistribution. In Ortega (2004), there is no government engaging in redistribution, but the model already exhibits complexity due to foresighted voting. We also assume that citizens are foresighted, but our perfect assimilation assumption makes our welfare state analysis simpler and enables us to introduce endogenous human capital investment subsequently. In Ortega (2004), each agent's skill is exogenous.

This chapter's main finding is that, when human capital investment decisions of natives respond to anticipated referendum outcomes, the young native population becomes predominantly high-skilled and opens the border for low-skilled immigration if such immigration is almost unlimitedly available and if the adjustment takes place only via the expenditure side of the intergenerational redistribution scheme. The intuition is simple. A young citizen would invest in human capital only if the net gain were positive. The net gain is positive for every young citizen as far as immigration continues to raise the wage rate for high-quality labour. This is because, under the income-support scheme, young citizens would not be affected by immigration if they remained low-skilled. Accordingly, if the supply of unskilled immigration is almost unlimited, most of young citizens desire a combination of investing in human capital and opening the border for immigration. With a positive population growth rate, young citizens form the majority against the elderly and make it happen.

We begin by maintaining the assumption that the quality of each citizen's labour is exogenously given. Under this assumption, we state majority voting outcomes. We will then relax the assumption by endogenising the quality of each young citizen's labour in

unskilled immigration. In the last section, we discuss our analysis in this and the previous chapters.

2.2. Majority Voting in Welfare State II

The framework we use in this section was introduced in section 1.7 of the previous chapter. That is, the welfare state is represented by the income-support and pension schemes, which are operated under one balanced budget constraint (1.47). The timing of the model is given in Figure 1.4 in section 1.6 of the previous chapter. The time horizon is infinite. An unlimited supply of immigrants with low-quality labour exists.

We assume that citizens have perfect foresight. Every citizen participates in a referendum except those who are indifferent. We also assume that they are able to vote for any $m \in [0, \infty)$. We do not consider $m < 0$, ie, no emigration.

2.2.1. When the target level of gross income per capita is endogenous

The first case is that of subsection 1.7.2 where the tax rate and the per capita pension benefit are fixed in the balanced government budget constraint (1.47). Accordingly, the target level of gross income per capita is the endogenous welfare-state variable, as given in expression (1.49).

Proposition 2.1 *When the tax rate and the per capita pension benefit are respectively fixed at some* $\tau \in (0,1)$ *and* $p \in \left(0, (1+n)\, h^{\alpha} (1-h)^{1-\alpha}\right)$ *such that* $\omega(0) \in (w_L(0), w_H(0))$ *holds, a referendum results in* (i) *an open-border policy if* $h > 1/2$ *and* (ii) *the policy that allows*

$$\arg\max \omega(m) = \begin{cases} \left(\frac{p}{(1+n)[1-(1-\tau)\alpha]\alpha h^{\alpha}}\right)^{\frac{1}{1-\alpha}} - (1-h) > 0 & \text{if } \omega'(0) > 0 \\ 0 & \text{otherwise} \end{cases} \tag{2.1}$$

if $h < 1/2$.

Proof. Expression (1.25) implies that retired citizens are indifferent. Hence the value of h determines the majority. The preferences of young citizens are implied by expression (1.48) and stated in Proposition 1.10. □

The result indicates that, with τ and p being fixed, the conflict of interest exists between young citizens of two different types. Immigration does not affect the income of an old citizen. Expression (2.1) suggests that when $\omega'(0) > 0$ the preferences of unskilled young citizens tend towards that of the skilled young when the pension scheme is generous. A high per capita pension benefit implies that immigrants' tax contribution becomes important. On the other hand, their preferences become polarised when the population growth rate and/or the tax rate are/is high.

2.2.2. When the per capita pension benefit is endogenous

In the case of subsection 1.7.3 where the per capita pension benefit is endogenous in immigration, the second-period component of the lifetime income (1.48) is affected by immigration policy which is determined in period $t+1$. However, as we emphasised in the introduction, the choice in period t does not affect the choice in period $t+1$ in our framework. In other words, young citizens are not able to manipulate m_{+1} by carefully selecting m.

Proposition 2.2 *When the tax rate and the target level of gross income per capita are respectively fixed at some* $\tau \in (0,1)$ *and* $\omega \in (w_L(0), w_H(0))$ *such that* $p(0) > 0$ *holds, a referendum results in* (i) *an open-border policy if* $h > \frac{1}{1+n}$ *and* (ii) *the policy that allows*

$$\arg\max p(m) = \begin{cases} \left(\frac{[1-(1-\tau)\alpha](1-\alpha)}{(1-\tau)\omega}\right)^{\frac{1}{\alpha}} h - (1-h) > 0 & \text{if } p'(0) > 0 \\ 0 & \text{otherwise} \end{cases} \tag{2.2}$$

if $h < \frac{1}{1+n}$.

Proof. Expression (1.25) suggests $x' = p'$. Expressions (1.53) and (1.54) imply that p is concave in m, and $N/(1+n)$ old citizens desire $\arg\max p(m)$. Proposition 1.11 suggests that hN young citizens with high-quality labour desire an open-border policy. □

The proposition suggests that disagreement exists between skilled young citizens and the elderly. With a fixed tax rate, the former receive only the positive wage impact of immigration. However, the latter receive the fiscal impact of immigration on both intra- and intergenerational redistribution schemes via the per capita pension benefit. We know from sections 1.4 and 1.5 that immigrants are net beneficiaries of the income-support scheme and net contributors of the pension scheme. The combined effect results in the per capita pension benefit being concave in immigration. Young citizens with low-quality labour are indifferent because both τ and ω are fixed.

2.2.3. When the tax rate is endogenous

In the case of subsection 1.7.4 where the target level of gross income per capita and the per capita pension benefit are fixed, the majority voting outcome is simply implied by Proposition 1.12.

Proposition 2.3 *When the target level of gross income per capita and the per capita pension benefit are respectively fixed at some* $\omega \in (w_L(0), w_H(0))$ *and* $p \in \left(0, (1+n)\, h^{\alpha} (1-h)^{1-\alpha}\right)$ *such that* $\tau(0) \in (0,1)$ *holds, a referendum results in* (i) *a closed-border policy unanimously if* $z'_H(0) \leq 0$, (ii) *the policy that allows* $\arg\max z_H(m) \in (0,1)$ *if* $z'_H(0) > 0$ *and* $h > 1/2$ *and* (iii) *the policy that allows* $\arg\min \tau(m) \in [0, \infty)$ *which is at most as large as* $\arg\max z_H(m)$ *if* $h < 1/2$.

Proof. Expression (1.25) implies that retired citizens are indifferent. Hence the value of h determines the majority. The preferences of young citizens are implied by expression (1.48) and stated in Proposition 1.12. □

The proposition suggests that no citizen desires an open-border policy when the tax rate absorbs the fiscal impact of unskilled immigration on both intra- and intergenerational redistribution schemes. It also suggests a possibility that a closed-border policy might be unanimously selected. This would be the case if the negative fiscal effect of immigration via the income-support scheme is dominant.

2.3. Majority Voting under Endogenous Skill Acquisition

We have so far assumed that the quality of each young citizen's labour is exogenously determined after the birth and before the referendum in each period. Since majority voting is unexpectedly introduced in period t, h continues to be fixed. However, the quality of each young citizen's labour in all the subsequent periods may be endogenous in immigration policy. Since a referendum is anticipated from period $t+1$ onwards, the human capital of a young citizen may be adjusted to anticipated immigration policy. Chiswick (1989) emphasised the importance of potential endogeneity that citizens' human capital investment decisions respond to immigration. Ignoring this endogeneity may under- or overestimate the potential impact of immigration. In her model, citizens adjust their human capital investment decisions to immigration *ex post*. In this chapter, this adjustment takes place *ex ante*. That is, we examine the case where young citizens make a human capital investment decision before a referendum takes place.[2]

Figure 2.1 Timing of the human capital model

Lifetime period	Action sequence			
1st	born, invest	$\star \longrightarrow$ work	$\longrightarrow$ receive net wage (incl. benefit)	$\longrightarrow$ save, consume
2nd	reproduce	$\star \longrightarrow$ withdraw savings plus interest, receive pension		$\longrightarrow$ consume

$\star$ Time point at which a referendum takes place

2.3.1. Human capital investment by young citizens

Let $i \in \{1, 2, ..., N\}$ be an index for young citizen i in period t. We assume that each citizen is born with an ability parameter, $\varepsilon_i \in [0, 1]$, that is uncorrelated with the quality of the parent's labour. The parameter represents the cost of human capital investment in terms of labour. The quality of young citizen i's labour becomes high-quality if ε_i is disposed out of the unit endowment before the labour supply (and before the referendum). Hence the

[2]If parents make this decision, we need to distinguish two cases. One is that of altruistic parents who maximise the utility of their children. The other is that of selfish parents who maximise their own utility. The former yields the same results as the case where young citizens make a human capital investment decision by themselves.

citizen can supply $1-\varepsilon_i$ units of high-quality labour if investing in human capital. Without human capital investment, the citizen can supply one unit of low-quality labour.

Accordingly, the lifetime income of a young citizen is given by

$$z_i = (1-\tau)(1-\theta_i\varepsilon_i)\,y_i + \frac{p_{+1}}{1+r} \tag{2.3}$$

where $\theta_i \in \{0,1\}$ indicates whether citizen i invests or not, and

$$y_i = \begin{cases} \omega & \text{if } \theta_i = 0 \\ w_H & \text{otherwise} \end{cases} \tag{2.4}$$

The investment decision function is given by

$$\theta_i = \begin{cases} 0 & \text{if } (1-\varepsilon_i)\,w_H < \omega \\ 1 & \text{otherwise} \end{cases} \tag{2.5}$$

which suggests that everyone likes to obtain high-quality labour if the net income is the same, ie, $\theta_i = 1$ when $(1-\varepsilon_i)\,w_H = \omega$. This last equation gives us the threshold value of the ability parameter: a parameter value above the threshold implies that human capital investment is too costly for the young citizen in the sense that an amount of high-quality labour becomes too small to benefit from a higher return. For ease of analysis, let us assume that the ability parameter is distributed uniformly within each cohort born in the country. Then, the threshold value of the ability parameter gives the proportion of high-quality workers in the young citizen population, ie,

$$h = \frac{w_H - \omega}{w_H} \tag{2.6}$$

which shows that h now responds to the labour-market condition as well as the welfare generosity through human capital investment decisions of young citizens.[3]

[3]Topel (1997: 69-72) for instance provides some evidence that human capital investment responds positively to the wage gap between skilled and unskilled labour in the United States and Sweden.

2.3.2. When the target level of gross income per capita is endogenous

When the tax rate and the per capita pension benefit is fixed, the introduction of a referendum in every period did not affect the preferences of citizens in subsection 2.2.1. This is because immigration affects only the contemporaneous income of young citizens, and its impact does not linger in the next period. Since the referendum in period t is unexpected, h has been fixed before the majority voting without taking into account the impact of immigration. This suggests that Proposition 2.1 remains true for the outcome in period t.

However, human capital investment decisions in the subsequent periods adjust to contemporaneous immigration because majority voting is then anticipated. Citizens take into consideration correctly anticipated referendum outcomes in making human capital investment decisions. That is, m_{+1} affects individual preferences not only directly but also indirectly via h_{+1}. At the same time, h_{+1} affects the referendum outcome in period $t+1$. Hence m_{+1} and h_{+1} are jointly determined even though the determination of h_{+1} preceeds that of m_{+1}.

The first task is to examine the behaviour of h_{+1} with respect to m_{+1}. Expression (2.6) contains ω which is endogenous under the current setting. Hence we rewrite it as $\omega = (1-h)\,w_H$ and substitute expression (1.49) into it, ie,

$$(1-h)\,w_H = \frac{\tau h w_H + (1-h+m)\,w_L - \frac{p}{1+n}}{(1-\tau)\,(1-h+m)}$$

where, since all the endogenous variables are contemporaneous, we drop the time subscript. But bear in mind that we are examining any future period but t. By substituting the wage expressions (1.8) and (1.9) into it and then rearranging the resulting expression, we get

$$\begin{aligned} G(m, h(m)) \;\equiv\; & (1-\tau)\,\alpha\,(1-h)\,h^{\alpha-1}\,(1-h+m)^{2-\alpha} \\ & -[1-(1-\tau)\,\alpha]\,h^{\alpha}\,(1-h+m)^{1-\alpha} + \tfrac{p}{1+n} \;=\; 0. \end{aligned}$$

We apply the implicit function theorem to this, ie, $h' = -(\partial G/\partial m)\,/\,(\partial G/\partial h)$. It turns out that the denominator is negative, ie,

$$\begin{aligned}\partial G/\partial h &= -(1-\tau)\,\alpha\,[1-(1-h)\,\alpha]\,h^{\alpha-2}\,(1-h+m)^{2-\alpha} \\ &\quad -(1-\tau)\,\alpha\,(2-\alpha)\,(1-h)\,h^{\alpha-1}\,(1-h+m)^{1-\alpha} \\ &\quad -[1-(1-\tau)\,\alpha]\,[(1+m)\,\alpha-h]\,h^{\alpha-1}\,(1-h+m)^{-\alpha}\end{aligned}$$

The third term is negative because the sum in its second square brackets is positive due to out assumption of $w_H(0) > w_L(0)$ or $\alpha > h(0)$.

The sign of h' then depends on the numerator, ie,

$$\frac{\partial G}{\partial m} = \left(\frac{h}{1-h+m}\right)^{\alpha}\left\{\frac{(1-\tau)\,\alpha\,(2-\alpha)\,(1-h)\,(1-h+m)}{h} - [1-(1-\tau)\,\alpha]\,(1-\alpha)\right\}$$

which can be either positive or negative. The second term in the braces is a negative constant. However, the first term is endogenous in immigration both directly and indirectly via h. Without knowing h', we do not know how this positive term changes with respect to m.

The ambiguity arises because, if the target level of gross income per capita is increasing in initial immigration as we found in the previous chapter, expression (2.6) suggests that the fraction of high-quality labour in the citizen workforce might increase or decrease, depending on how ω changes in relation to the wage rate for high-quality labour. However, to know the behaviour of ω and w_H with respect to m, we need to know the behaviour of h with respect to m. Hence the behaviour of h with respect to m remains ambiguous from periods $t+1$ onwards, and we are unable to derive the outcome for period $t+1$ onwards.

2.3.3. When the per capita pension benefit is endogenous

When ω is exogenously fixed, however, we can derive the sign of h' unambiguously.

Lemma 2.1 *If the target gross income per capita is fixed such that $\omega \in (w_L(0), w_H(0))$, the proportion of high-quality workers in the young citizen population is strictly increasing in immigration.*

Proof. We rearrange expression (2.6) as $(1-h)\,w_H - \omega = 0$ and define

$$F(m, h(m)) \equiv \alpha(1-h)\,h^{\alpha-1}(1-h+m)^{1-\alpha} - \omega$$

where we substituted expression (1.8). By the implicit function theorem, we have $h' = -(\partial F/\partial m)/(\partial F/\partial h)$ where

$$\frac{\partial F}{\partial m} = \alpha(1-\alpha)(1-h)\,h^{\alpha-1}(1-h+m)^{-\alpha} > 0$$

and

$$\frac{\partial F}{\partial h} = -\alpha h^{\alpha-2}(1-h+m)^{-\alpha}\{(1-\alpha)(1+m) + [(1+m)\alpha - h]\,h\} < 0$$

because we assume $\alpha > h(0)$. Hence $h' > 0$. □

Accordingly, we have

$$h' = \frac{(1-\alpha)(1-h)\,h}{(1-\alpha)(1+m) + [(1+m)\alpha - h]\,h} > 0. \tag{2.7}$$

The second derivative of h with respect to m is given by

$$\begin{aligned} h'' = \; & (1-\alpha)\{(1-\alpha)(1+m) + [(1+m)\alpha - h]\,h\}^{-2} \times \\ & \{(1-\alpha)(1-h)[(1+m)h' - h] - (1-\alpha)(1+m)\,hh' \\ & \quad - [(1+m)\alpha - h]\,h^2h' - (1-h)\,h^2(\alpha - h')\} \end{aligned} \tag{2.8}$$

The last term in the braces in the second to the third line is negative because expression (2.7) suggests $h > h'$ and we assume $\alpha > h(0)$. Expression (2.7) suggests that the first term is also negative. Hence we have $h'' < 0$.

Lemma 2.1 requires us to check whether $w'_H > 0$ and $w'_L < 0$ still hold because immigration now increases the supply of high-quality labour as well as that of low-quality labour. As discussed in subsection 1.3.1, it is the ratio between the stocks of high- and low-quality labour that determines the wage rates. Therefore, as far as $h' < 1$, $w'_H > 0$ and $w'_L < 0$ continue to hold. Expression (2.7) shows in fact $h' < 1$.

For later use, we derive the first derivatives of the wage expressions with respect to immigration. The first derivative of the wage rate for high-quality labour is given by $w'_H = \partial w_H/\partial m + (\partial w_H/\partial h)\, h'$ or

$$(2.9) \qquad w'_H = \alpha\,(1-\alpha)\, h^{\alpha-2}\,(1-h+m)^{-\alpha}\,[h-(1+m)\,h']$$

By substituting expression (2.7) into it, we get

$$(2.10) \qquad w'_H = \frac{\alpha\,(1-\alpha)\, h^{\alpha}\,(1-h+m)^{1-\alpha}}{(1-\alpha)\,(1+m)+[(1+m)\,\alpha-h]\,h} > 0$$

We thus confirm that the wage rate for high-quality labour is strictly increasing in immigration even though h is also strictly increasing in m.

Similarly, we have

$$(2.11) \qquad w'_L = \frac{-\alpha\,(1-\alpha)\, h^{1+\alpha}\,(1-h+m)^{-\alpha}}{(1-\alpha)\,(1+m)+[(1+m)\,\alpha-h]\,h} < 0$$

Expressions (2.10) and (2.11) ensure $w_H > w_L \;\forall\; m \in [0,\infty)$. A comparison between these expressions and expressions (1.8) and (1.9) reveals that the first derivatives under endogenous h are the corresponding first derivatives under exogenous h multiplied by $\frac{h(1-h+m)}{(1-\alpha)(1+m)+[(1+m)\alpha-h]h}$.

We would now like to know whether the per capita pension benefit remains concave in m as in subsection 1.7.3. Expression (1.52) implies

$$(2.12) \qquad p' = (1+n)\,\{[1-(1-\tau)\,\alpha]\,[(1-h')\,w_L + h'w_H] - (1-h')\,(1-\tau)\,\omega\}$$

$$(2.13) \qquad p'' = (1+n)\,\{[1-(1-\tau)\,\alpha]\,[(1-h')\,w'_L + (w_H-w_L)\,h'' + h'w'_H] + h''\,(1-\tau)\,\omega\}$$

The sign of the first derivative depends on the sum of the two terms in the braces in expression (2.12). The sign of the second derivative turns out to be negative. Expression (2.8) implies that the second term in the braces in expression (2.13) is negative. To find out the sign of the first term, we examine the sum of the three terms in its second square brackets. We have $(1-h')\,w'_L$ and $(w_H-w_L)\,h''$ negative and $h'w'_H$ positive. By substituting

expressions (1.8), (1.9), (2.7), (2.8), (2.10) and (2.11) as necessary, we manipulate the sum of these to get

$$\frac{-w_L\left\{(\alpha-h')\,h\,(1-h+m)+\frac{(1+m)\alpha-h}{(1-\alpha)(1+m)+[(1+m)\alpha-h]h}\right\}}{\{(1-\alpha)\,(1+m)+[(1+m)\,\alpha-h]\,h\}^2}$$

which proves $p'' < 0$ unambiguously. Hence p is concave in m.

It is clear from expression (2.12) that $\arg\max p\,(m)$ under endogenous h differs from that under exogenous h. By comparing it with expression (1.53), there is an additional positive term, $(1+n)\,[1-(1-\tau)\,\alpha]\,\frac{h'}{1-h'}w_H$, appearing in (2.12). This is the effect of immigration that induces human capital investment by young citizens who would otherwise remain unskilled. That is, immigration causes an additional contribution to the welfare system by increasing the supply of high-quality labour by young citizens.

We now turn to the preferences of citizens. First, expression (1.25) suggests that old citizens in period t desire $\arg\max p\,(m)$ that was implied by (1.53) and stated in Proposition 2.2 because h has been fixed by the time when the first referendum is introduced. However, from period $t+1$ onwards, rational old citizens take into consideration the response of human capital investment decisions to anticipated immigration. Therefore, for all these future periods, $\arg\max p\,(m)$ is implied by expression (2.12) rather than (1.53).

In the previous section, we reasoned that young citizens with low-quality labour remain indifferent because their action when young can change their income neither in the first- nor in the second-period of their life. In the current framework, the quality of labour is endogenous in the majority voting outcomes in the contemporaneous and the next periods from period $t+1$ onwards. With human capital investment decisions being endogenous in immigration policy, an open-border policy is the stable politico-economic equilibrium.

Proposition 2.4 *Suppose human capital investment decisionmaking is given by expression* (2.5). *If the tax rate and the target level of gross income per capita are respectively fixed at some* $\tau \in (0,1)$ *and* $\omega \in (w_L(0), w_H(0))$ *such that* $p(0) > 0$ *holds, the referendum in period* t *results in* (i) *an open-border policy if* $h(0) > \frac{1}{1+n}$ *and* (ii) *the policy that allows*

$\arg\max p(m)$ *that is given by expression* (2.2) *in* Proposition 2.2 *if* $h(0) < \frac{1}{1+n}$. (iii) *The referendum in every period after* t *results in an open-border policy.*

Proof. (i) and (ii) are due to the timing when the first referendum is unexpectedly introduced. As for (iii), consider period $t+1$. Lemma 2.1 and expression (2.6) suggest $h_{+1} \to 1$ as $m_{+1} \to \infty$. This implies that approximately[4] all young citizens desire an open-border policy because it increases their first-period income by increasing the returns to high-quality labour. Since $n > 0$, young citizens can form the majority. □

Note that we are assuming the existence of an unlimited supply of unskilled young immigrants. If this is true, almost all young citizens can have a higher first-period income through the combination of an open-border policy and human capital investment. Knowing that the population growth rate is a positive constant, young citizens know that they can form the majority. Hence they invest in human capital and vote for an open-border policy when a referendum takes place.

If the supply of unskilled young immigrants is limited to say $\bar{m}$, then an open-border policy is selected only if $h(\bar{m}) > \frac{1}{1+n}$. The proportion of young citizens who are indifferent will then be $1 - h(\bar{m})$.

Note that, with fixed ω, there is no young citizen who is forced to acquire high-quality labour as a consequence of immigration. In other words, when a young citizen decides to invest in human capital, there is always a positive gain. This is the reason why approximately all young citizens would like to invest in human capital and is different from the framework used by Casarico and Devillanova (2003) and Tamura (2004). In their framework, there is a situation where some young citizens become skilled even though they prefer to remain unskilled without immigration to becoming skilled with immigration because the net income for an unskilled worker without immigration can be higher than that for the same worker who becomes skilled with immigration. This is possible when the gross income of unskilled workers is decreasing immigration. However, it is fixed in this and the next subsections.

[4]For example, a young citizen who was born with the ability parameter equal to 1 will not invest in human capital, for that will leave the person no first-period income as expression (2.3) suggests.

2.3.4. When the tax rate is endogenous

We now assume that the per capita pension benefit and the target level of gross income per capita are exogenously given. Since ω is fixed, expressions (2.7) implies that h is increasing in m in every period after t. The balanced government budget constraint (1.55) implies

$$\tau' = \frac{(1-h')(\omega-w_L)-(1-h+m)w'_L}{hw_H+(1-h+m)\omega} - \frac{\left[(1-h+m)(\omega-w_L)+\frac{p}{1+n}\right]\left[hw'_H+h'w_H+(1-h')\omega\right]}{[hw_H+(1-h+m)\omega]^2} \tag{2.14}$$

where expression (2.11) implies that the first term is positive. The second term is negative. To check whether τ is convex in m, we get

$$\begin{aligned}\tau'' = {} & 2\frac{hw'_H+h'w_H+(1-h')\omega}{[hw_H+(1-h+m)\omega]^2}\left\{\frac{\left[(1-h+m)(\omega-w_L)+\frac{p}{1+n}\right]\left[hw'_H+h'w_H+(1-h')\omega\right]}{hw_H+(1-h+m)\omega}\right. \\ & \left. -(1-h')(\omega-w_L)-(1-h+m)w'_L\right\} \\ & -\frac{(\omega-w_L)h''+2(1-h')w'_L+(1-h+m)w''_L}{hw_H+(1-h+m)\omega} \\ & -\frac{\left[(1-h+m)(\omega-w_L)+\frac{p}{1+n}\right]\left(hw''_H+2h'w'_H+h''w_H-h''\omega\right)}{[hw_H+(1-h+m)\omega]^2}\end{aligned}$$

Expression (2.14) suggests that the first term is zero when $\tau' = 0$. Hence τ is convex in m if the sum of the second and the third terms is positive. However, the sign of this sum remains ambiguous. Expression (2.3) suggests $z'_{i_L} = -\omega\tau'$ for those who do not invest in human capital and $z'_{i_H} = (1-\varepsilon_i)\left[(1-\tau)w'_H - w_H\tau'\right]$ for those who acquire high-quality labour. Since we do not know the behaviour of the tax rate with respect to immigration, we are unable to obtain the outcome for period $t+1$ onwards.

In period t, the referendum is introduced unexpectedly after the quality of each citizen's labour is determined. Hence the outcome is the same as in Proposition 2.3.

2.4. Discussion

In this and the previous chapters, we examined individual demands for immigration in the welfare state where both intra- and intergenerational redistribution schemes exist. The previous chapter showed how the existence of these schemes might influence the demands. We found that heterogeneous citizens' demands for immigration could become less polarised under intra- and intergenerational redistribution programmes. Furthermore, no one might

be completely against immigration in the welfare state represented by both intra- and intergenerational redistribution schemes. The fiscal effects of immigration may create a common ground for different citizens in thinking of the costs and benefits of immigration.

In this chapter, we introduced majority voting as a rule for determining the immigration quota in every period. By construction, our framework in the previous chapter is not affected by this rule, whether citizens have foresight or not. This is because citizens are not able to take action in response to immigration: they are assumed to be immobile both geographically and occupationally. Accordingly, the introduction of majority voting does not change their preferences.

In order to introduce citizens' reactions to immigration, we extended our analysis by endogenising human capital investment decisions of young citizens in immigration. In the case where the per capita pension benefit is endogenous in immigration, we could solve the model. We found that approximately all young citizens would invest in human capital, acquire high-quality labour and vote for an open-border policy if the supply of unskilled young immigrants were unlimited. With a positive population growth rate, this is the stable equilibrium. If the supply of unskilled young immigrants is limited, this limit determines the proportion of skilled young workers in the citizen labour force.

This last point indicates the first limitation of our analysis. That is, the studies that assume an unlimited supply of immigrants, including ours, ignore a constraint imposed by the supply side. In reality, not only the availability is limited, but also the supply is endogenous in the conditions of origin and destination countries. Therefore, our analysis is partial in nature, and an open-border policy might not be the stable majority voting equilibrium even if all the other assumptions hold. Further research is necessary to examine general equilibrium in a model with more than one country where the overall supply of mobile workers is limited, although the existence of both intra- and intergenerational redistribution schemes is likely to make the analysis demanding.

Our analysis is also limited in the sense that skilled immigrants are not considered together with unskilled immigrants. Our focus on unskilled immigration follows the literature. However, the skill distribution of immigrants is often bimodal, ie, immigrants tend to be

either low-skilled or highly skilled, but not medium-skilled. Therefore, it would be fruitful to examine the determination of immigration policy in terms of both quantity and quality.

For ease of analysis, we followed the literature and assumed perfect assimilation by immigrants. With two-period lives, this assumption resulted in a framework where the policy choice in one period did not depend on the policy selection in the preceding period. However, perfect assimilation might be a too strong assumption. A model that exhibits such dependency might be more realistic.

Finally, the determination of immigration policy may not be independent of the determination of other policies, such as taxation and welfare provision. Analysing these together may lead to an insight into immigration policy in the welfare state. In Dolmas and Huffman (2004) and Kemnitz (2002), for example, immigrants may vote on tax policy. Hence the determination of immigration policy takes into account how immigrants may influence taxation by voting in the future. In these two chapters, we did not study this issue in order to focus on the influence of the welfare state on individual demands for immigration, rather than the influence of immigration on the welfare system.

Although the results are not presented in this thesis, we did analyse the case where citizens select on the tax rate, the per capita benefits and immigration by issue-by-issue majority voting. In doing this, we also introduced endogenous labour supply as in Meltzer and Richard (1981). In such a case, an equilibrium vector is likely to contain corner solutions such as zero pension benefit, and which corners arise depends on the ordering of issues.

In sum, although our analysis suffers from several limitations, we were able to examine individual preferences in a tractable framework where the welfare state was represented by both intra- and intergenerational redistribution schemes. Introducing more reality into our model would have made our analysis intractable, and we would have needed numerical simulation as did Dolmas and Huffman (2004) and Ortega (2004).

CHAPTER 3

EU15 Citizen's Demand for European Immigration

This chapter studies a survey data set that contains individual responses to immigration-related questions in the European Union on the eve of the 2004 expansion. We examine the importance of the perceived impact of immigration on the national labour market and the domestic public finance for individual opinions on the desirable level of immigration from poorer European countries. We find that the unemployed are different from the others neither in the perception of the labour-market impact of immigration nor in the opinion on the desirable level of immigration. Employers perceive a more positive impact of immigration on the national labour market and desire more immigration, but the positive perception is not a reason why they desire more immigration. The perceived fiscal impact of immigration is important for the desirable level of immigration among those citizens who depend on non-pension welfare benefits under a generous welfare system. This also applies among low-income citizens.

3.1. Introduction

In this chapter, we analyse individual demands for immigration in the context of the European Union enlargement in 2004. The main data we examine were collected in Round 1 of European Social Survey (ESS hereafter) which was conducted during the period 2002-2003. The timing of the survey makes the data interesting, for the European Union was expanded to include ten new member countries a year after the survey was completed. In

other words, the survey data provide us with an opportunity to retrospectively study the determinants of EU15 citizens' demands for immigration on the eve of the 2004 enlargement.

On 1 May 2004, the European Union's 2003 Accession Treaty entered into force, and the Union expanded to include ten new member countries—the Czech Republic, the Slovak Republic, the Republics of Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovenia. Citizens of these republics except Cyprus and Malta, however, were not given full access to the labour markets of all the fifteen pre-expansion member countries (EU15 hereafter). EU15 countries are able to control inflows from the eight new member countries (EU8 hereafter) until 30 April 2011 by relying on the Transitional Arrangements for the Free Movement of Workers set out in the treaty.

During the first phase of the Transitional Arrangements—1 May 2004 to 30 April 2006—Ireland and Sweden decided to open the national labour markets to all EU8 countries immediately. The United Kingdom also welcomed migrant workers from the new members, although they were subject to a compulsory registration scheme: EU8 workers were required to register with the Home Office within 30 days once they started their employment in the country. The other twelve of EU15 maintained a work permit regime, combined with quotas in some of them, against EU8 workers.[1]

The second phase of the Transitional Arrangements—1 May 2006 to 30 April 2009—has already began. While Ireland, Sweden and the UK decided not to introduce new restrictive measures, Greece, Italy, Portugal and Spain have lifted restrictions against EU8 workers. Finland has also opened its labour market to them, although they are subject to a registration scheme. Belgium, Denmark, France and Luxembourg remain restrictive but have announced their intentions to simplify the procedures for EU8 workers accessing their national labour markets. In the Netherlands, the government is planning to facilitate EU8 workers' access to certain sectors and professions. Austria and Germany have decided to maintain existing restrictions against EU8 workers.[2]

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[1]Commission of the European Communities (2006b)

[2]The information from http://ec.europa.eu/employment_social/free_movement/enlargement_en.htm (Updated: 21 June 2006) and the Commission's News: The European Commission welcomes Italy's decision to lift all restrictions on the free movement of workers (Released: 21 July 2006)

Did these decisions regarding the Transitional Arrangements reflect the citizens' opinions? ESS Round 1 provides a picture relevant to the first phase of the Transitional Arrangements. Figure 3.1 shows stacked bars for each EU15 country, representing the citizens' responses to the following question "To what extent do you think your country should allow people from poorer countries in Europe to come and live here?"[3] Since the 2004 enlargement to include the 10 countries was well known at the time of the survey, EU15 citizen respondents may well have referred to these countries when thinking of "poorer countries in Europe" in the question.[4]

The figure clearly indicates that the Swedish decision to liberalise its labour market to all the EU8 countries immediately reflected the citizens' general opinions about the permissible level of immigration from poorer countries of Europe. The Irish decision also seems to agree with the majority preference. It appears that the aggregated preferences of the citizens of Italy, Germany and Belgium were close to Ireland's, but the governments did not lift the restrictions against EU8 workers immediately. The UK's decision to maintain a compulsory registration scheme for EU8 workers may well reflect the fact that roughly half its citizens had more restrictive opinions than the other half. We also observe that restrictive opinions were fairly dominant in Greece, Portugal, Austria and Finland on the eve of the 2004 enlargement.

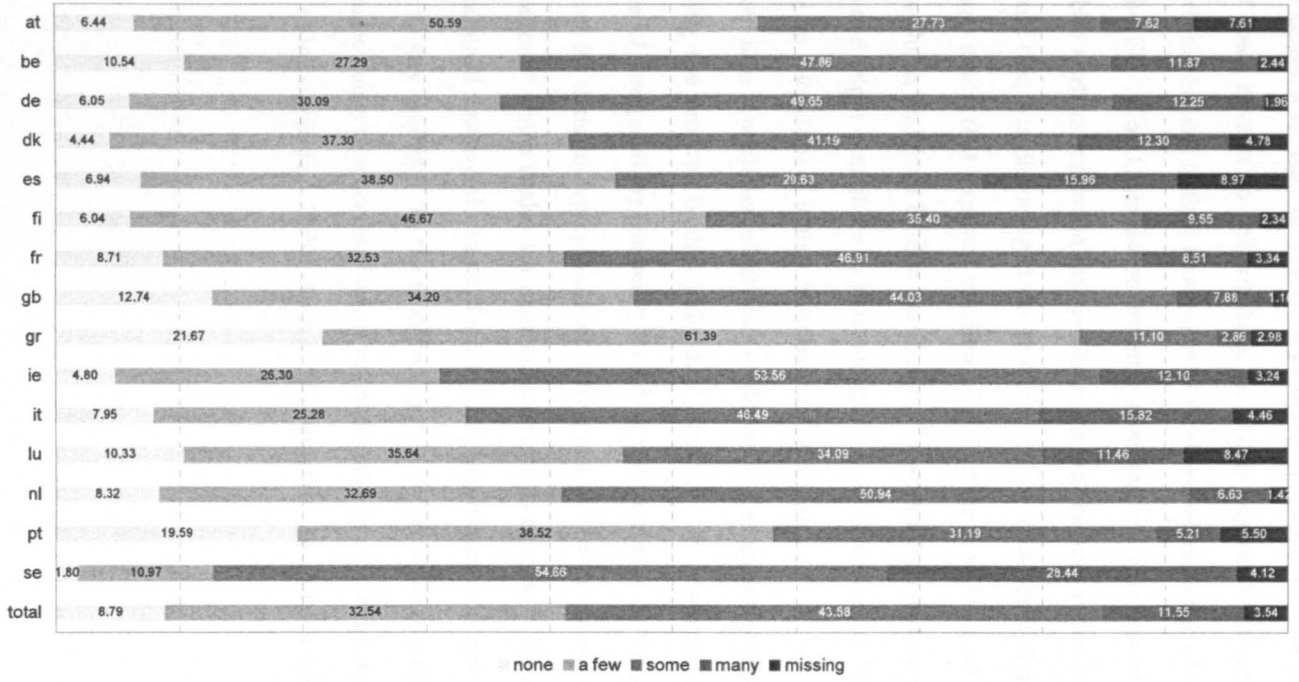
[3]In Figure 3.1, the category 'missing' contains responses 'refusal to answer', 'don't know' and 'no answer'. More details about the data are given in Section 3.3.

[4]In fact, Cyprus, one of the 10 new member countries, had a higher GDP per capita than Greece, Portugal and Spain, as Table A3.1 in the appendix shows. However, the country gained full access to the EU15 labour market on 1 May 2004 in any case.

Fig. 3.1

To what extent do you think your country should allow people from poorer countries in Europe to come and live here?

Share of each response category by country (%)



Source: ESS 2002-2003, Question D7

NB: at = Austria, be = Belgium, de = Germany, dk = Denmark, es = Spain, fi = Finalnd, fr = France, gb = GB, gr = Greece, ie = Ireland, it = Italy, lu = Luxembourg, nl = Netherlands, pt = Portugal, se = Sweden

This chapter attempts to explain the opinions of EU15 citizens in Figure 3.1 by utilising the rich survey data provided by ESS Round 1. Each of these responses implicitly indicates the extent of a citizen's support for the EU's Free-Movement-of-Workers principle. Hence our study is of some interest to policymakers, as it may suggest what should be done to increase support for the idea of Free Movement of Workers, which is one of the fundamental principles of the EU. The Commission recently analysed the opinions of EU citizens as potentially mobile workers and found that job insecurity in the destination is one of the most important factors that has discouraged the mobility of labour in the Union.[5] We provide a complementary study that explores opinions of EU citizens as hosts of mobile workers from within the Union and from EU8 in particular. Their opinions matter to policymaking in democracies and might contribute to preventing the Free-Movement-of-Workers principle from improving an allocation of labour resources in the Union.

This chapter also contributes additional evidence to the growing empirical literature on understanding the motives behind individual demands for immigration in developed countries. One of the questions frequently asked in the literature is "How important are economic motives for determining opinions of individuals in host countries on the desirable level of immigration?" which is also our main concern in this chapter.[6] Recent studies have additionally examined whether the signs of statistically significant economic factors support what economic theory predicts. In the next section, we review these empirical studies that examined the importance of economic factors to the formation of individual opinions on the desirable level of immigration. Table A3.2 in the appendix provides a summary of these studies.

[5]Commission of the European Communities (2006a)

[6]We recognise the importance of non-economic factors in the formation of opinions on the desirable level of immigration and hence will try to control these by referring to previous studies.

3.2. Literature

We concentrate on two economic factors because most of the previous studies are concerned with these, namely, the impact of immigration on the national labour market and the domestic public finance.[7]

3.2.1. Labour market concern

Almost all previous studies in the literature asked whether a respondent's concern with the labour-market impact of immigration in the host country matters to his/her willingness to allow immigrants to come and live in the country. For instance, Espenshade and Hempstead (1996) found that, in the US, those who thought that immigrants would mostly take jobs that the citizens did not want were more likely to indicate a preference for increased immigration. Citrin, Green, Muste and Wong (1997) found that those US citizens who thought that Hispanics and Asians would generally take jobs away from Americans were more likely to prefer reduced immigration. A similar result was obtained by Bauer, Lofstrom and Zimmermann's (2000) cross-country study. Dustmann and Preston (2004) derived a measure representing the labour-market concern of each white English respondent and found that a higher concern is associated with a preference for reduced immigration of ethnic minorities only among non-manual workers. Dustmann and Preston (2006) found that such a measure has no influence on opinions of Europeans about whether immigration is generally good or bad for the host economy. These studies relate perceptions, represented by either responses to certain questions or derived underlying concerns, to opinions, and the causal relation runs from the perceived concern to the expressed opinion.

Other studies often used a respondent's status of labour supply, skill-based occupational category, skill-based earning level, level of education or some combination of these as explanatory variables. Economic theory suggests that an increase in the supply of similarly skilled labour would intensify competition in the labour market, resulting in either an increased risk of unemployment or depressed returns to labour of the type in question. If

[7]We are not aware of any empirical study that deals with other economic effects of immigration, such as a change in demand for goods and services and the price effect of immigrant labour.

respondents use this reasoning in giving opinions as to the preferred level of immigration, we would find signs of coefficients on these variables as theory predicts.

Provided that respondents prefer employment to unemployment, the status of being unemployed may be expected to have a negative coefficient, for they might see immigration as contributing to increased labour-market competition. This is not confirmed in the cross-country studies by O'Rourke and Sinnot (2006) and Gang, Rivera-Batiz and Yun (2002) and the US study by Citrin, Green, Muste and Wong (1997). Kessler and Freeman (2005) found it statistically significant, but the sign of the coefficient changes across samples taken from different years. Bauer, Lofstrom and Zimmermann's (2000) cross-country study also found it insignificant with respect to the preferred level of immigration, but it had a significantly positive sign when the dependent variable was the agreement with the statement that immigrants take jobs away. Dustmann and Preston (2004) found that neither the county-level unemployment rate nor the experience of unemployment was a significant determinant of white English respondents' opinions about the desirable level of immigration. De Melo, Miguet and Müller (2004) did find that the canton-level unemployment rate had a negative influence on the Swiss vote against an immigration restriction proposal in 2000.

Mixed results as to the relationship between the status of being unemployed and the preferred level of immigration are probably due to ambiguity about labour substitutability arising in questions regarding the type of immigrants and the heterogeneity of the unemployed population. Skill-based occupational categories are perhaps better measures to analyse the influence of labour-market concern as to the desired level of immigration, although ambiguity still remains with respect to the type of immigrants generally. That is, questions are ambiguous with regard to the labour type of immigrants in asking for opinions on the preferred level of immigration. O'Rourke and Sinnot's (2006) cross-country study found that workers in high-skill occupations were likely to prefer more immigration. This is more likely to be true in countries with higher GDP per capita, but less likely to be so in countries under high income inequality. Mayda's (2006) cross-country study also found that workers in high-skill occupations were likely to prefer more immigration in countries with higher GDP. She also used the ratio between immigrants and natives by occupation as an

explanatory variable and found that workers in occupations with a high share of immigrants were likely to oppose immigration.

A respondent's level of skill-based earnings is another proxy used to examine the impact of labour-market concern. Evidence for its importance for the formation of opinions about the level of immigration is rather mixed. Scheve and Slaughter (2001) used the average occupational wage and found it significant among labour-force participants. Mayda (2006) used a measure of relative income and found statistical significance such that wealthier respondents preferred more immigration. Dustmann and Preston (2004) also used a relative income measure and found it significant only when asked about the immigration of ethnic minorities. Citrin, Green, Muste and Wong (1997) found that the level of income does not matter to opinions on the desirable level of immigration. Facchini and Mayda (2006) used the log of real personal income whose coefficient was found insignificant. Espenshade and Hempstead (1996) found the level of household income significant only among low-income earners.

A respondent's level of education appears as an explanatory variable in almost all past studies. The complication with this variable is that it is correlated with labour skill. Studies that specifically aimed to test predictions of economic theory used it as a proxy for labour skill, while the others interpreted it as education translating into, for instance, open-mindedness. Both arguments appear right. However, in our analysis, we will use educational attainment in addition to non-education measures of labour skill. In other words, we do not use education as a proxy for labour substitutability.

Bauer, Lofstrom and Zimmermann (2000), Gang, Rivera-Batiz and Yun (2002), Kessler and Freeman (2005) found the level of education significant: the more educated a respondent is, the more immigration the person preferred. Scheve and Slaughter (2001) argued that education is a proxy for labour skill by finding years of education significant only among labour-force participants. Hanson, Scheve and Slaughter (2005) used educational attainment as a proxy for the level of income and found it significant only among the educated in the US. Dustmann and Preston (2004) and Brenner and Fertig (2006) also found educational attainment significant only among the educated. On the other hand, Espenshade

and Hempstead (1996) found educational attainment statistically significant only among the less educated who preferred reduced immigration. Citrin, Green, Muste and Wong (1997) did not find years of education significant after controlling other factors.

Most interesting findings regarding the impact of education were given by Mayda (2006) and Facchini and Mayda (2006). Education and its interaction with the country-level native-to-immigrant education-level ratio were used in these studies. Education itself was found significantly negative, while the interaction term was found significantly positive with a larger magnitude than the former. Assuming that education represents labour skill, this finding seems to support the theoretical prediction that respondents oppose immigration of similarly skilled labour, eg, the educated are less restrictive if immigrants are less skilled on average than natives.

3.2.2. Public finance concern

In addition to the labour market, immigration has also been thought to influence natives economically via social welfare programmes in developed countries. The concern is that immigrants might be net beneficiaries in the welfare state. Tax burden per capita might then increase, or benefit per capita might be reduced. In the former case, an increased burden might fall disproportionately on high-income households under progressive tax systems. In the latter, current beneficiaries might be given smaller shares of a pie to accommodate newly joining beneficiaries. Fertig and Schmidt (2002) found that less educated respondents in Germany are more concerned with immigrants being a tax burden. They also found that this concern is stronger in regions with a lower share of foreigners. Does public-finance concern matter to the formation of opinions on the preferred level of immigration?

Espenshade and Hempstead (1996) found no significant influence of a respondent's perception that most new immigrants do not end up on welfare. Citrin, Green, Muste and Wong (1997) on the other hand found a significant coefficient on the agreement with the statement that Hispanics and Asians cause higher taxes due to more demands for public

services. Dustmann and Preston (2004) derived a measure representing public-finance concern and found it significant with respect to the immigration of ethnic minorities, but not among uneducated respondents.

Hanson, Scheve and Slaughter (2005) used educational attainment as a proxy for the level of income. They first interacted it with an indicator that the state where a respondent lived was characterised by both a generous welfare system and high presence of immigrants. This interaction term was found significant only among the educated (interpreted as high-income earners) particularly in states under a progressive tax system. They found a similar result by interacting education with an indicator that the state where a respondent lived had relatively many immigrant households receiving cash benefits. These findings may suggest that public-finance concern is equivalent to a worry about an increase in tax burden per capita rather than a reduction in benefit per capita, assuming that education represents the level of income.

Facchini and Mayda (2006) also used education as a proxy for the level of income. They interacted it with both the country-level average skill level of immigrants relative to that of natives and the country-level average labour tax rate. The sign of the coefficient was significantly negative, suggesting that more educated respondents (interpreted as high-income earners) prefer less immigration in a state where the tax rate is high and immigrants are unskilled relative to natives. They also interacted education with both the country-level average skill level of immigrants relative to that of natives and a country-level measure of tax progressivity. The sign of the coefficient was again significantly negative, suggesting that more educated respondents prefer less immigration in a state where the tax system is progressive and immigrants are unskilled relative to natives. However, when they used the country-level average public transfer instead of the tax-related measures, the interacted term was found insignificant. These results seem to confirm that the public-finance concern is equivalent to a worry about an increase in tax burden per capita rather than a reduction in benefit per capita, assuming that education represents the level of income.

3.2.3. This study

This chapter examines the importance of both labour-market and public-finance concerns for determining individual opinions on the permissible level of immigration in the context of the pre-expansion European Union. It is close to Hanson, Scheve and Slaughter (2005) and Facchini and Mayda (2006) in its inquiry, but we also use relevant immigration-related perceptions as explanatory variables as did Espenshade and Hempstead (1996), Citrin, Green, Muste and Wong (1997) and Bauer, Lofstrom and Zimmermann (2000).

Our main findings are the following. The status of being unemployed explains neither the opinion on the desirable level of immigration from poorer countries nor the perception of immigration's labour-market impact. Employers do not care about immigrants' impact on the national job market in giving their opinions on the desirable level of immigration even though they tend to perceive it as positive. However, they do prefer more immigration from poorer countries than the other citizens. We find some evidence that citizens who are more exposed to labour-market competition with immigrants tend to perceive a more negative impact of immigration on the number of job opportunities. This concern may partially explain why they prefer less immigration than the others.

Among those citizens who rely on non-pension welfare benefits, the generosity of welfare provision contributes positively to the relationship between the perceived fiscal impact of immigration and the desirable level of immigration. However, among pensioners, it seems to contribute negatively to the relationship. We also find some evidence that the perceived fiscal impact of immigration matters to the desirable level of immigration among low-income citizens under a generous welfare system. We remain inconclusive regarding the effect of tax progressivity on the importance of public finance concern for the desirable level of immigration.

3.3. Data

Round 1 of European Social Survey conducted in 2002 to 2003 is the main source of the data we analyse.[8] ESS is a biennial survey that covers more than 20 countries. The

[8]Edition 5.1 released at http://ess.nsd.uib.no/ on 15 December 2004

target population of each country contains all persons at the age of 15 or over who reside in the country. The survey consists of core and rotating modules, and one of Round 1's two rotating modules is dedicated to revealing immigration-related opinions by using almost 60 questions.[9] The immigration module was framed by giving each respondent the following introduction: "People come to live in [your country] from other countries for different reasons. Some have ancestral ties. Others come to work here, or to join their families. Others come because they're under threat. Here are some questions about this issue."[10]

As is common in many survey data, all the information related to a respondent were given by the person in question, have not been verified and are hence prone to subjective bias and errors. We simply assume that all the collected information are correct. As listed in Table A3.2, this data set has already been analysed by a few studies in the literature, ie, Dustmann and Preston (2006), Hainmueller and Hiscox (forthcoming) and Brenner and Fertig (2006).

We concentrate on the then member countries of the European Union. The subset contains 29,110 observations. We focus on the citizens in each of these 15 countries by discarding 1,362 observations.[11] We additionally eliminated 2 observations in Italy whose ages were recorded 5 and 14 respectively, ie, deviations from the survey's target population. Accordingly, we have 27,746 observations left for analysis. We use listwise deletion to maximise the sample size, and hence the number of observations in estimated models are not always the same.

3.3.1. Explained variable

Our dependent variable is measured by responses to the following question: "To what extent do you think your country should allow people from poorer countries in Europe to come and

[9]See Chapter 3 (Part 1) of ESS Round 1 2002/2003 Technical Report (Edition 2, June 2004) for the aim and outline of these questions, available at the website.

[10]By the use of "live", the permanency of immigrants' stay is deliverately made ambiguous.

[11]We use the responses to question C18 that asked each respondent whether the person was a citizen of the country where he/she was subjected to the questionnaire. The citizenship of a respondent is thus based on the person's own assessment. Out of the eliminated 1,362 observations, 1,340 were non-citizens, and either 'refusal to answer', 'don't know' or 'no answer' was recorded for the rest.

live here?" As illustrated in Figure 3.1 in the introduction, the variable has 4 ordered categories: none, a few, some and many. We call this ordered categorical variable *host*.

3.3.2. Explanatory variables

Our measure of a citizen's perception of immigration's impact on the national labour market is the response to the following question: "Would you say that people who come to live here generally take jobs away from workers in this country, or generally help to create new jobs?" Each respondent was asked to choose one out of 11 categories that were ordered from 0 (= take away) to 10 (= help create). The eleven numbers were placed in order along a straight line with an equal interval between an adjacent pair in the interview. Therefore, we assume that each response is a score given on an interpersonally comparable scale to measure labour-market concern, and we treat the variable as continuous. We call this variable *labor*.

A citizen's perception of immigration's impact on the domestic public finance is similarly measured on a scale of 11 categories by using the following question: "Most people who come to live here work and pay taxes. They also use health and welfare services. On balance, do you think people who come here take out more than they put in or put in more than they take out?" We call this variable *fiscal*.

We include variables that are likely to affect labour-market concern. First, we have an indicator for the status of being unemployed and looking for a job in the last seven days (*unemploy*). By using this, we would like to check whether the status of being unemployed is an important determinant of labour-market concern but does not matter to the formation of demand for immigration, which the majority of the past studies in the literature have found. Approximately 14 percent of the sample belongs to this category.[12]

Second, we create a continuous measure which indicates labour substitutability between each respondent and immigrants. Table 3.1 shows the share of foreigners in each industry's total employment in a country dvided by the share of foreigners in the country's total

[12]We do not include those who were unemployed but were not looking for a job. Hence the dummy variable is not contaminated by the welfare-dependent unemployed, provided that the respondents were honest.

employment.[13] Unfortunately, we do not have corresponding figures for Belgium. The table indicates which industries in each country have a relatively large share of foreigners, ie, those whose figures are greater than unity. Noticeably, in all the countries, the hotel and restaurant industry used many foreign workers (category h). Another industry is of household activities (category p), eg, housemaids. In the other industries, we see variations across countries. We also confirm our expectation that the use of the average skill level of immigrant workers, which tends to be low, is not suitable for representing labour substitutability. While the construction sector (category f) hired many foreign workers in more than half the countries, they also seem to have been highly present in the education sector (category m) in Finland and the health and social service sector (category n) in the United Kingdom. The required skills in immigrant-concentrated sectors thus vary significantly.[14]

Since ESS collected a two-digit NACE Rev.1 code for each respondent, we know to which NACE Rev.1 major industrial group he or she belonged. We assign the relevant Eurostat figure in Table 3.1 to each ESS observation. We call this variable *isub*.

We construct another similar measure of labour substitutability between each citizen and immigrants. This is based on the skill-based occupational classification, ISCO-88(COM), rather than industry. We call this *osub*. Unfortunately, we do not have corresponding figures for Belgium, France and Sweden, while only Belgium is missing for *isub*. Table 3.2 again indicates that skill levels themselves are not good indicators of labour substitutability because of the variations across occupations and countries.

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[13]OECD has produced a similar table in its annual publication, *Trends in International Migration*, but it does not give the figures as we do here. In addition, ours is more disaggregated than OECD's in terms of industry.

[14]As we discussed in Subsection 3.2.1, education has often been used to represent the skill level of labour in the literature. However, education is likely to have its own impact directly on a person's preferences regarding immigration other than an indirect effect through the labour market. For instance, education might nurture a more open mind and give wider viewpoints, which might result in less restrictive attitudes towards immigration. Therefore, we do not regard education as labour skill. In addition, the distinction between low- and high-skills are useful for discussions in theoretical models, but the point of argument boils down to labour substitutability between immigrants and natives that is likely to be affected by other factors than skills and educational attainments, eg, connections, sector-specific labour demand and work-permit policy.

Table 3.1 Extent of non-citizens' presence by industry and country (*isub*)

Country†	NACE Rev. 1 major division‡																
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q
at	.42	..	.82	1.21	.25	1.53	.91	2.23	.89	.39	1.36	.07	.43	.70	1.09	1.62	3.14
be	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
de	.45	..	..	1.35	..	1.07	.90	3.32	1.00	.40	1.10	.23	.47	.67	.97	1.30	..
dk	1.00	.49	.65	1.12	.23	.46	.86	3.27	.97	.34	1.66	.27	.98	.74	.91	1.00	12.86
es	1.88	.64	.78	.66	.45	1.46	.71	2.06	.66	.35	.87	.19	.50	.52	.87	5.61	..
fi	.35	.42	.19	.93	.19	.72	.97	2.90	.82	.36	1.62	.33	1.57	.57	1.08	..	11.58
fr	.80	..	1.14	1.02	.25	2.51	.90	1.90	.64	.40	1.46	.27	.49	.57	1.05	4.32	9.57
gb	.34	.40	.75	.78	.57	.56	.88	1.82	1.06	1.12	1.23	.76	1.00	1.23	.97	2.54	..
gr	1.21	1.12	.59	1.03	.16	2.86	.53	1.35	.41	.14	.64	.11	.24	.30	.56	7.94	..
ie	.43	1.05	.61	.94	.37	.68	.77	2.14	.76	.78	1.35	.28	.68	1.08	.97	2.16	..
it	1.08	1.04	1.07	1.31	.34	1.50	.67	1.66	.73	.23	.54	.16	.43	.58	1.01	..	..
lu	.44	.00	1.23	.88	.13	1.72	.98	1.74	.62	1.10	1.37	.12	.34	.72	.90	1.94	1.99
nl	.85	.25	1.97	1.22	.29	.51	.89	2.20	.83	.57	1.87	.24	.70	.48	.90	..	..
pt	.44	.43	.89	.60	.65	2.65	.68	1.80	.58	.31	1.38	.29	.49	.81	1.46	1.84	..
se	.40	.21	.51	1.18	.29	.57	.82	2.68	.88	.55	1.28	.38	.95	.96	.91	4.02	..

Source: Eurostat Census 2001, http://europa.eu.int/comm/eurostat NB: .. = not available

Each figure is defined as $\left(\frac{\#\text{ non-citizens employed in the industrial group}}{\#\text{ all employed in the industrial group}}\right) / \left(\frac{\#\text{ non-citizens employed in all groups}}{\#\text{ all employed in all groups}}\right)$ in each country.

A figure greater than 1 indicates that the share of non-citizens in the corresponding industrial group's employment is relatively high.

† Refer to the note of Figure 1 for country abbreviations. ‡ a = agriculture, hunting, forestry; b = fishing; c = mining, quarrying; d = manufacturing; e = electricity, gas, water supply; f = construction; g = wholesale/retail trade, repair of motor vehicles, motorcycles and personal/household goods; h = hotels, restaurants; i = transport, storage, communication; j = financial intermediation; k = real estate/renting/business activities; l = public administration, defence, compulsory social security; m = eduaction; n = health/social work; o = other community/social/personal service activities; p = household activities; q = extraterritorial organisations/bodies

Table 3.2 Extent of non-citizens' presence by skill-based occupational category and country (*osub*)

Country†	1-digit ISCO-88(COM) code‡									
	0	1	2	3	4	5	6	7	8	9
at	.08	.62	.59	.52	.46	1.01	.17	1.18	1.56	2.67
be	..	..	..	..	..	..	..	..	..	..
de	..	.98	.50	.51	.56	1.31	.53	1.23	1.87	2.23
dk	.04	.37	.83	.57	.52	.86	.49	.57	1.38	1.64
es	.25	.69	.52	.55	.50	1.15	.77	.95	.67	2.71
fi	..	.66	1.34	.73	.60	1.04	.35	.84	.91	1.66
fr	..	..	..	..	..	..	..	..	..	..
gb	1.26	1.11	1.44	1.10	.86	1.02	.29	.56	.89	.90
gr	..	.26	.26	.23	.22	.77	.52	1.78	.62	4.17
ie	.15	.95	1.07	1.12	.71	1.17	.33	.78	.73	.96
it	.00	.73	.74	.62	.52	.92	.80	1.23	1.16	1.97
lu	.07	1.00	1.02	.73	.68	1.12	.38	1.33	1.02	1.49
nl	..	.58	.84	.58	.76	.86	..	1.01	1.44	2.21
pt	.25	.78	.94	.69	.37	.98	.42	1.41	.54	1.64
se	..	..	..	..	..	..	..	..	..	..

Source: Eurostat Census 2001, europa.eu.int/comm/eurostat NB: .. = not available

Each figure is defined as $\left(\frac{\#\text{ non-citizens employed in the occupational group}}{\#\text{ all employed in the occupational group}}\right) / \left(\frac{\#\text{ non-citizens employed in all groups}}{\#\text{ all employed in all groups}}\right)$ in each country.

A figure greater than unity indicates that the share of non-citizens in the corresponding occupational group's employment is relatively high.

Observations for *fr* are not categorised by ISCO-88(COM) in ESS, and hence the figures are not given.

† Refer to the note of Figure 1 for country abbreviations.

‡ The categorisation is based on skill requirements: the lowest (9), the second lowest (4 to 8), the third (3) and the highest (2).

Groups 0 and 1 are not well defined in terms of skill. See Elias and Birch (1994).

0 = armed forces; 1 = legislators, senior officials, managers; 2 = professionals; 3 = technicians, associate professionals; 4 = clerks;

5 = service workers, shop and market sales workers; 6 = skilled agricultural and fishery workers; 7 = craft and related trades workers;

8 = plant and machine operators, assemblers; 9 = elementary occupations

There is an argument that, while employees are afraid of labour-market competition increased by immigration, employers would potentially benefit from the availability of immigrant workers. They are seen as owners of complementary production factors. If this is the case, we would expect employers to be pro-immigration. To test this, we create a dummy variable that is equal to 1 if a respondent employed at least one person and zero otherwise.[15] We call this variable *employer*.

We try a few alternative measures of the level of income for testing the importance of public-finance concern. ESS contains each respondent's estimate of monthly net household income in 12 ordered categories in terms of Euros. Over 20 percent of the observations were recorded as missing. The categories do not share an equal interval. Furthermore, the responses are comparable across countries only in nominal terms. Since we analyse individual opinions, and since we examine the importance of economic self-interest, we transform the estimated figures into per capita income. We assign the mid-value of each category's income range. The highest category has no upper bound and hence no mid-value. However, it contains only 0.78 percent of the whole sample and, at the country level, at most 2.79 percent of the British sample. Therefore, we drop the observations in the highest category. We then divide the mid-values by the corresponding number of household members.

We then adjust for international price differences by dividing the resulting figures by corresponding purchasing power parities (PPPs) for 2002. Eurostat provides PPPs according to ESA95 (European System of Accounts 1995).[16] Under the system, there are two measures of consumption. One is final consumption expenditure: a sector's expenditure on consumption goods and services, and the other is actual final consumption: a sector's acquisition of consumption goods and services. The difference is based on the treatment of some goods and services not financed by but supplied to households, eg, social transfers in

[15]We need to be cautious, however, in interpreting our results. Question F13 asked each respondent "How many employees do or did you have if any?", which suggests that the respondent could be an employee at the time of being interviewed because the person might have referred to (a) any past hiring or (b) self-employment.

[16]http://forum.europa.eu.int/irc/dsis/nfaccount/info/data/esa95/en/titelen.htm

kind. We use the PPPs based on the household final consumption expenditure (category e011), for the data we have are of net income.[17] We call the variable obtained this way *inc*.

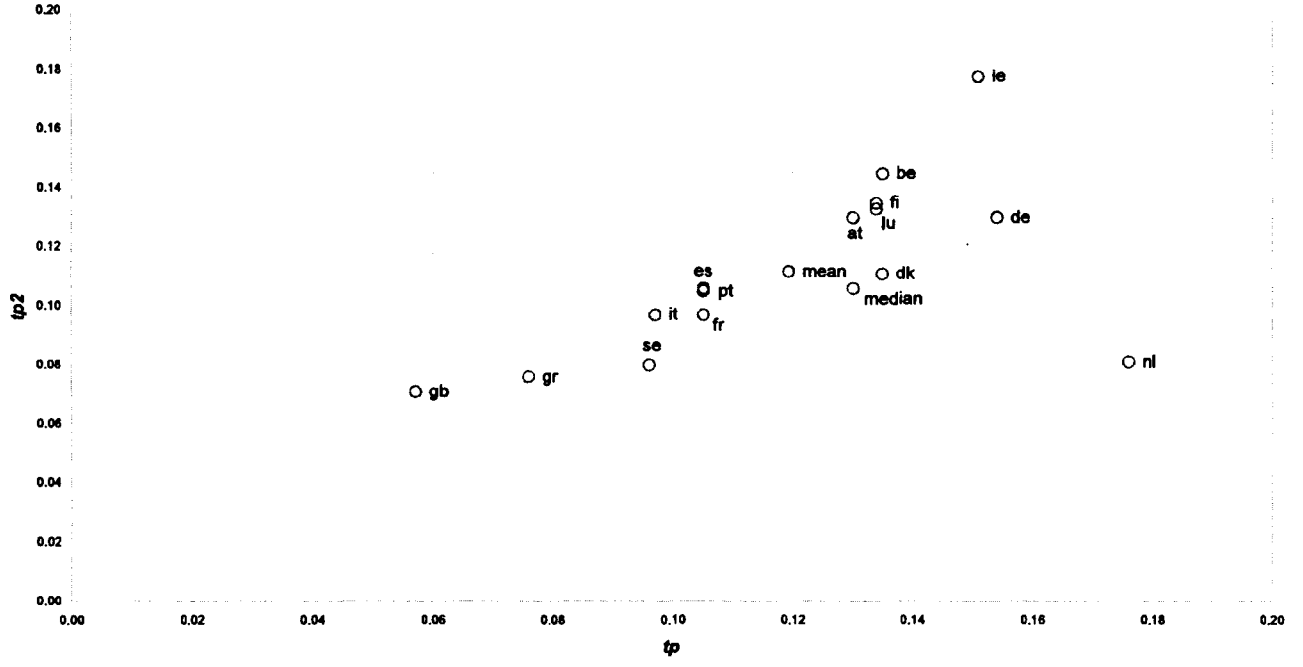
The second measure of income is obtained by dividing the pre-PPP-adjusted figures by the corresponding national mean. The variable measures the relative income position of each respondent in her/his country. For instance, 1.5 means that the respondent's net income is 50 percent higher than the national average. We call it *relinc*.

As a third measure of income, we try a respondent's perception of the sufficiency of household income. ESS contains responses to the question "Which of the descriptions comes closest to how you feel about your household's income nowadays: living comfortably, coping, difficult or very difficult?" with only 1.36 percent of the sample missing. Since individuals have different needs, spending habits as well as shares of household income, this subjective measure of income sufficiency might work better. We create *sufinc* dummies.

If immigrants are perceived to contribute negatively to government coffers overall, and if the adjustment is thought to take place through a change in taxation rather than benefits, then respondents with high income are more likely to oppose immigration than those with low income under a progressive tax system. To test if this is the case, we use a simple measure of tax progressivity used by Facchini and Mayda (2006). It is the difference between the average wage tax rates for single persons without a child who earn 67 percent and 167 percent of the annual wage earnings of an average production worker respectively. We call this variable *tp*. We also have an alternative which adds the corresponding employee's social security contribution to *tp*. We call this *tp2*. Figure 3.2 plots *tp* against *tp2* and shows that these measures provide similar information on tax progressivity. However, we also see that, for the Netherlands, *tp* indicates a more progressive system while *tp2* indicates a less progressive system among the countries. These two measures of tax progressivity are country-level variables, which will be interacted with individual-specific variables in our analysis.

[17]Question F30 asked each respondent the following question: "Using this card, if you add up the income from all sources, which letter describes your household's total net income? If you don't know the exact figure, please give an estimate." The presented card showed 12 ordered income groups.

Fig. 3.2
Tax progressivity, 2002



Source: OECD 2003, Tables 1 and 3
NB: tp(tp2) is the difference between the average wage tax rates (plus employee social security contribution) for singles with no child who earn 67% and 167% of the annual wage earnings of an average production worker.

We also have a measure of welfare generosity: the average net replacement rate over 5 years of unemployment calculated by OECD (2004).[18] If the adjustment is thought to take place through a change in taxation, respondents with high income are more likely to oppose immigration than those with low income under a generous social welfare system. We call this country-level variable *nrr*, which will be interacted with individual-specific variables in our analysis.

If the adjustment to immigration is thought to take place through a change in benefits, and if immigrants are thought to be net beneficiaries of the welfare system, then existing beneficiaries of social welfare programmes are more likely to oppose to immigration than those who do not benefit from the welfare system. To test if this is the case, we create dummies that indicate beneficiaries of welfare programmes. We use dummies that indicate whether the main source of the respondent's household income is *pension* or any other social welfare benefits (*benefit*). We also have a dummy for the status of being a lone parent with at least one child living together (*parent1*), for such lone parents are most likely to benefit from the welfare systems in these countries.[19]

If both net contributors and net beneficiaries oppose immigration, there may be fears of both tax increases and benefit cuts.

Both public-finance and labour-market concerns may be affected by the types of immigrants and respondents' images associated with them. We have responses to the question "Thinking about people coming from other countries within Europe to live here nowadays, would you say most of them are from richer or poorer countries, or about half and half?" Using the responses, we create *origin* dummies. If respondents think that the type of immigrant worker depends on the wealth of their origin countries, for instance, those who think existing immigrants mainly came from poorer countries may oppose immigration from such countries because they may regard it as an increase in the supply of labour that is already plentiful in their labour markets.

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[18]The net replacement ratio is defined as the ratio of the net income during unemployment to the net income during employment. In other words, it is the proportion of in-work net income that is maintained for someone becoming unemployed. The unweighted average is taken over four types of family, and we used the figures with social assistance in addition to unemployment insurance. See OECD (2004: Table 3.3b).

[19]See OECD (2003: 27).

We have two proxies for the presence of immigrants. One is based on the responses to the question "How would you describe the area where you currently live? Almost no ethnic minority, some or many?" We create *ethlive* dummies for each respondent's perception of the presence of ethnic minorities in her/his living environment. Another is a country-level measure: the share of non-citizens in the country's total population. We call it *fshare*.

We include the highest educational attainment of each respondent in all estimations. But we do not interpret it as a proxy for the level of his/her labour skill. We interpret it as education. ESS sorted respondents into 7 groups according to a modified version of ISCED97, and we create *edu* dummies.

We include various control variables. We have purely exogenous variables such as a respondent's gender (*female*) and approximate *age* in 2003. We also include an indicator of whether at least one parent of a respondent was born abroad (*fparent*).[20]

We control respondents' self-assessed political orientation (*polit*) and exposure to the media on current affairs and politics (*media* in hours). The latter indirectly measures a respondent's interest in current affairs and politics, provided that he/she was exposed to the media in his/her own initiative. Exposure to the media might also influence individual opinions to lean towards a certain direction.[21]

We include the self-reported level of each respondent's general wellbeing (*happy*) and his/her perception of the state of the national economy (*econ*). The former would influence the mood of each respondent and might make any opinions tend to either a negative or a positive direction. The latter would also make each respondent's views either optimistic or pessimistic overall.

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[20]This variable is easily constructed by using Questions C25 and C27. We prefer this to other similar dummies that indicate whether a respondent was born abroad (C20) and is an ethinc minority (C24) because *fparent* contains a higher proportion of positive responses, although still only about 10 percent of the whole sample. In any case, these are highly associated with each other. The weighted-sample cross-product ratios are 51.10 between *fparent* and an indicator that a respondent was born abroad and 13.70 between *fparent* and an indicator he/she is an ethnic minority.

[21]See Appendix C for the creation of *media*. Inclusion of *polit* is motivated by the fact that several researchers, those who work in political science in particular, often included similar measures of political orientation. However, as Nordhaus (in Blinder and Krueger, 2004: 392) questioned "Am I conservative because I don't like taxes, or do I dislike taxes because I'm conservative?", self-assessed political orientation here is also potentially endogenous. We naively assume *polit* is exogenous in this study.

Table 3.3 Summary statistics

	Definition	mean†	s.d†	median	min.	max.	obs.	ESS no.
host	Permissible number of immigrants from poorer European countries	1.59	0.81	2.00	0.00	3.00	26,641	D7
	0 = none; 1 = a few; 2 = some; 3 = many							
labor	Perceived labour-market impact of immigration on job opportunities	4.52	2.19	5.00	0.00	10.00	26,601	D25
	0 = take jobs away; 5 = neutral; 10 = help create jobs							
fiscal	Perceived net contribution of immigrants to government coffers	4.25	2.21	4.00	0.00	10.00	26,181	D26
	0 = take more out; 5 = neutral; 10 = put more in							
unemploy	1 = unemployed and looking for a job in the last seven days	0.03	0.18	0.00	0.00	1.00	27,673	F8a,b
isub	Immigrants' penetration into industries based on NACE Rev.1	1.01	0.79	0.90	0.00	12.86	22,433	F24
osub	Immigrants' penetration into occupations based on ISCO-88(COM)	1.00	0.53	0.84	0.04	4.17	19,541	F21-23
employer	1 = employer in any industry	0.05	0.22	0.00	0.00	1.00	27,746	F13
parentl	1 = lone parent with at least one child living together	0.05	0.22	0.00	0.00	1.00	27,746	F58-61,64
benefit	1 = social welfare benefits other than pension are the main household income source	0.04	0.20	0.00	0.00	1.00	27,746	F29
pension	1 = pension is the main household income source	0.23	0.42	0.00	0.00	1.00	27,746	F29
inc	Real net income per capita in thousands	0.97	1.04	0.60	0.00	13.05	21,490	F30,1
relinc	Intra-country relative net income per capita	1.00	0.81	0.81	0.01	20.00	21,490	F30,1
sufinc	Perceived sufficiency of household income	2.06	0.79	2.00	0.00	3.00	27,380	F31
	0 = very difficult; 1 = difficult; 2 = manageable; 3 = comfortable							
friend	0 = no immigrant friend; 1 = a few; 2 = several	0.61	0.71	0.00	0.00	2.00	27,597	D47
origin	0 = most European immigrants come from poorer countries; 1 = half half; 2 = richer	0.21	0.46	0.00	0.00	2.00	26,645	D2
ethlive	0 = almost no ethnic minority in the residential area; 1 = some; 2 = many	0.70	0.68	1.00	0.00	2.00	27,230	D39
crime	0 = immigrants make crime situations worse; 5 = neutral; 10 = better	3.26	2.09	3.00	0.00	10.00	26,882	D30
culture	0 = immigrants undermine cultural life; 5 = neutral; 10 = enrich	5.57	2.43	6.00	0.00	10.00	26,379	D28
polit	0 = right; 5 = centre; 10 = left	5.12	2.10	5.00	0.00	10.00	24,365	B28
media	Hours spent on the media on current affairs and politics per weekday	1.50	1.15	1.25	0.00	9.75	27,619	A2,4,6
econ	0 = dissatisfied with the state of the national economy; 5 = neutral; 10 = satisfied	4.15	2.27	5.00	0.00	10.00	26,939	B30
happy	0 = unhappy; 5 = neutral; 10 = happy	7.31	1.90	8.00	0.00	10.00	27,635	C1
edu	0 = less than primary; 1 = primary or basic (1st); 2 = lower secondary or basic (2nd);	2.82	1.47	3.00	0.00	6.00	27,634	F6
	3 = upper second; 4 = postsecondary (non-tertiary); 5 = tertiary (1st); 6 = tertiary (2nd)							
fparent	1 = at least one parent born abroad	0.09	0.29	0.00	0.00	1.00	27,716	C25,27
age	Approximate age in 2003 based on the year of birth	46.85	18.10	47.00	15.00	110.00	27,593	F3
female	1 = female	0.52	0.49	1.00	0.00	1.00	27,717	F2

Source: ESS 2002-2003; Eurostat NB: † weighted

Table 3.3 (Continued, country-level variables)

	Definition	mean	s.d	median	min.	max.
tp	Facchini and Mayda's (2006) measurement of tax progressivity, 2002	.11	.03	.13	.05	.17
tp2	*tp* (wage tax only) plus employee's social security contribution	.11	.03	.10	.07	.17
nrr	Average net replacement rate over 5 years of unemployment, 2002	.64	.21	.72	.05	.81
fshare	Share of non-citizens in the total population, 2002	.07	.08	.04	.02	.38

Source: OECD (2003: Tables 1 and 3; 2004: Table 3.3b; 2005: Table A.1.5)

We also include controls specific to immigration issues: each respondent's security concern with respect to immigrant residents (*crime*), concern over cultural invasion due to immigration (*culture*) and closeness to immigrants (*friend* dummies).

In all estimation, we include 14 country dummies (*gb* as the reference) to capture unobservable country-specific factors. We will not report the coefficients on these country dummies.[22] We also weigh each observation in all estimation: see the appendix concerning the weight.

3.3.3. Illustration

Let us briefly illustrate the relationships between the variables of our main interest before regression analysis.

3.3.3.1. Labour market concern. The monotone association between *host* and *labor* is statistically significant and positive:[23] we obtain Goodman and Kruskal's γ approximately equal to .345 with the asymptotic standard error equal to .006.

We expect that repondents who belong to an industry or an occupation where the presence of immigrants is relatively high are likely to be substituted by them more easily than those in the other sectors. In this case, respondents with high *isub* or *osub* might fear a negative labour-market impact of immigration more than the other respondents do. Figure 3.3a shows overlapping histograms of *labor* for those who belong to an industry with high presence of immigrants ($isub \geq 1$) and the others ($isub < 1$) respectively. It shows

[22]The estimates are available upon request.

[23]See Goodman and Kruskal (1954; 1963) and Agresti (2002).

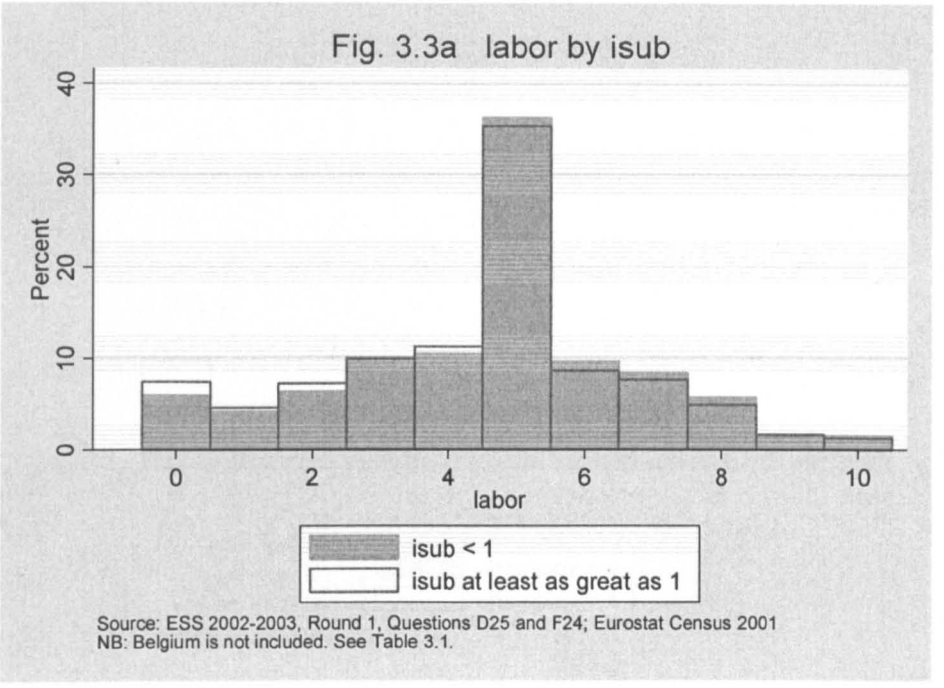
that the distribution of the subset of the sample with $isub \geq 1$ is slightly thicker to the left of the scale for labour-marlet concern compared with the distribution of the rest. That is, the proportion of respondents who perceived the labour-market impact of immigration on job opportunities as negative is slightly higher among those with $isub \geq 1$ than among the rest of the sample.

In Figure 3.3b, we use occupation instead of industry. It shows that the difference between respondents with $osub \geq 1$ and those with $osub < 1$ is clearer than the industry-based one. It indicates that there are more of those whose occupations are relatively common among immigrant workers, who perceived labour-market impact of immigration on job opportunities as negative. The use of *unemploy* gives a similar picture in Figure 3.4, although the monotone trend is disturbed at the ninth point on the *labor* scale.

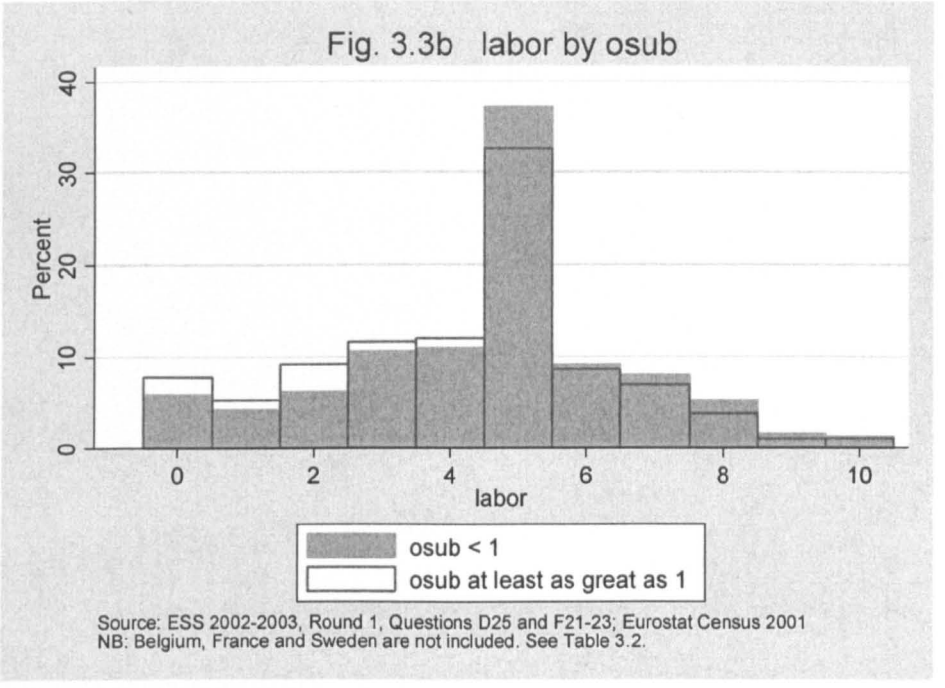
3.3.3.2. Public finance concern. The monotone association between *host* and *fiscal* is statistically significant and positive: we obtain Goodman and Kruskal's γ approximately equal to .358 with the asymptotic standard error equal to .006.

Citizens may be more concerned with public-finance impacts of immigration in countries with more generous welfare provision and a higher presence of immigrants, provided they think immigrants are net users of welfare systems. Figure 3.5a plots our measure of welfare generosity against the share of non-citizens in the country's total population, while figure 3.5b does the same without the outlier, Luxembourg. Based on the location of the mean in these pictures, I create $hssfe = 1$ for Germany, Austria, Belgium and Luxembourg and 0 otherwise. This variable is similar to Hanson, Scheve and Slaughter's (2005) measure of fiscal exposure to immigration.[24] Figure 3.6 then shows overlapping histograms of *fiscal* by *hssfe*. It indicates that a higher proportion of citizens perceived immigrants as net beneficiaries of welfare systems on average in countries with more generous welfare provision and a higher presence of immigrants.

[24]Ideally, we would like to have a more direct indicator of how welfare-dependent immigrants are in each country, eg, the proportion of total welfare expenditure taken by immigrants. Unfortunately, we do not have a measure of welfare use by immigrants.



Source: ESS 2002-2003, Round 1, Questions D25 and F24; Eurostat Census 2001
NB: Belgium is not included. See Table 3.1.



Source: ESS 2002-2003, Round 1, Questions D25 and F21-23; Eurostat Census 2001
NB: Belgium, France and Sweden are not included. See Table 3.2.

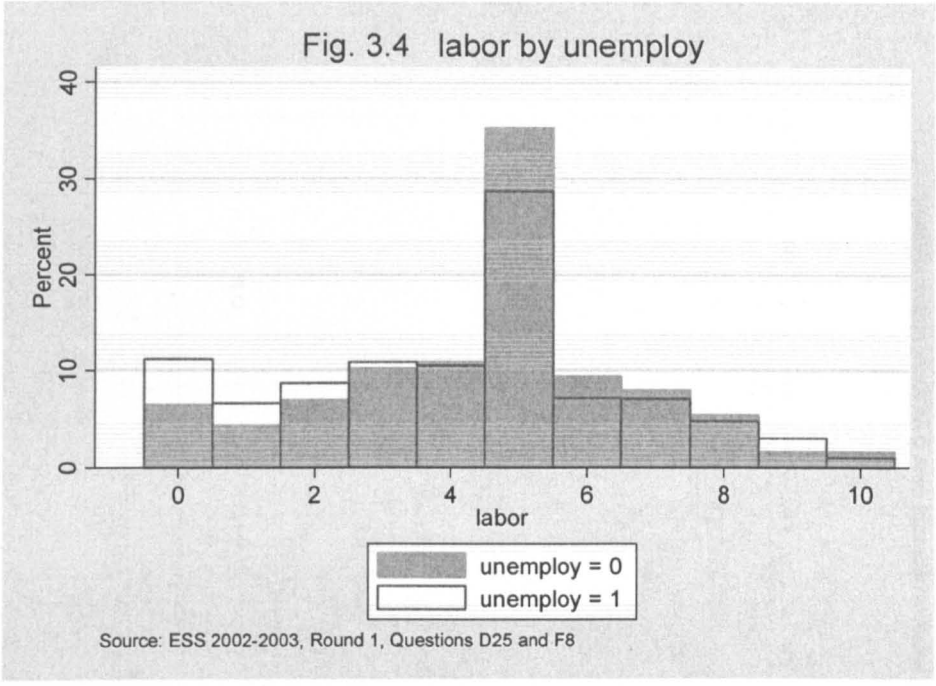
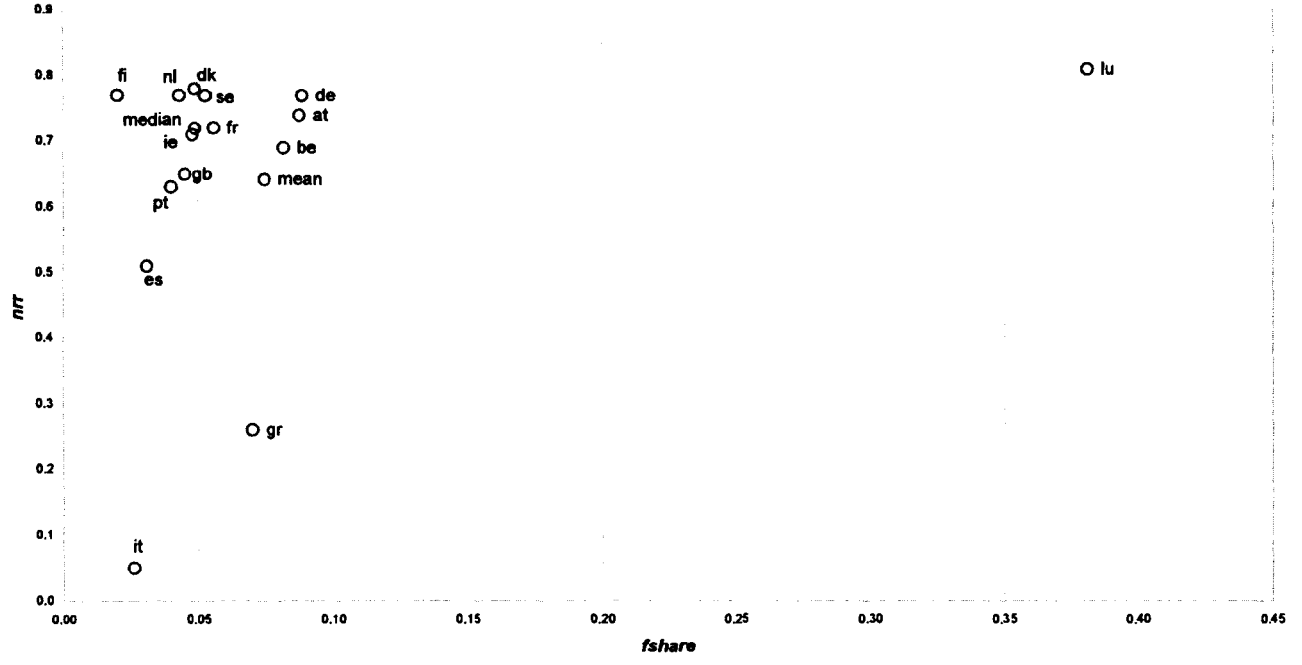


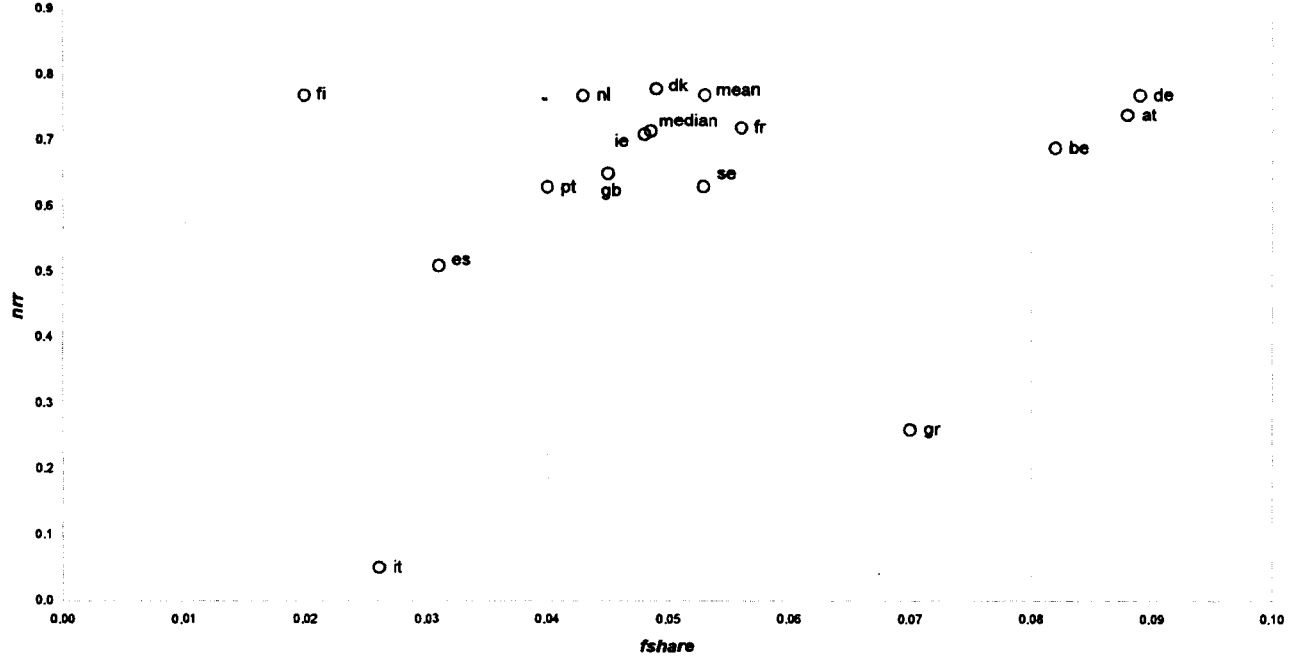
Fig. 3.4 labor by unemploy
Percent
0
10
20
30
40
0
2
4
6
8
10
labor
unemploy = 0
unemploy = 1
Source: ESS 2002-2003, Round 1, Questions D25 and F8

Fig. 3.5a
Welfare generosity and the presence of foreigners, 2002



Source: OECD (2004: Table 3.3b; 2005: Table A.1.5)
NB: fshare is the share of non-citizens in the country's total population. nrr is the average net replacement rate over 5 years of unemployment.

Fig. 3.5b
Welfare generosity and the presence of foreigners, excluding Luxembourg, 2002



Source: OECD (2004: Table 3.3b; 2005: Table A.1.5)
NB: fshare is the share of non-citizens in the country's total population. nrr is the average net replacement rate over 5 years of unemployment.

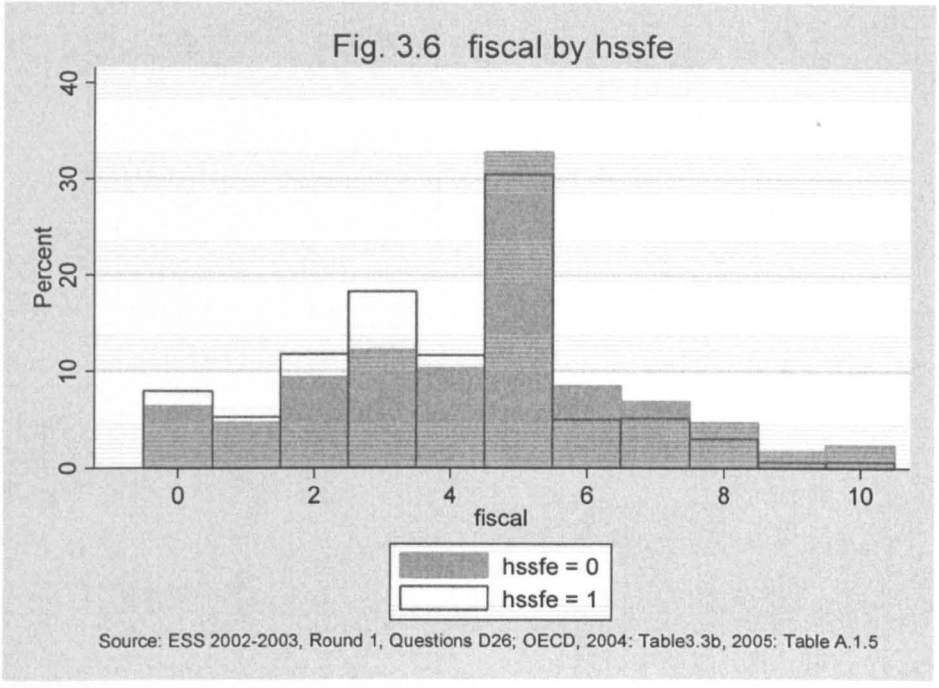


Fig. 3.6 fiscal by hssfe
Percent
0
10
20
30
40
0
2
4
6
8
10
fiscal
hssfe = 0
hssfe = 1
Source: ESS 2002-2003, Round 1, Questions D26; OECD, 2004: Table3.3b, 2005: Table A.1.5

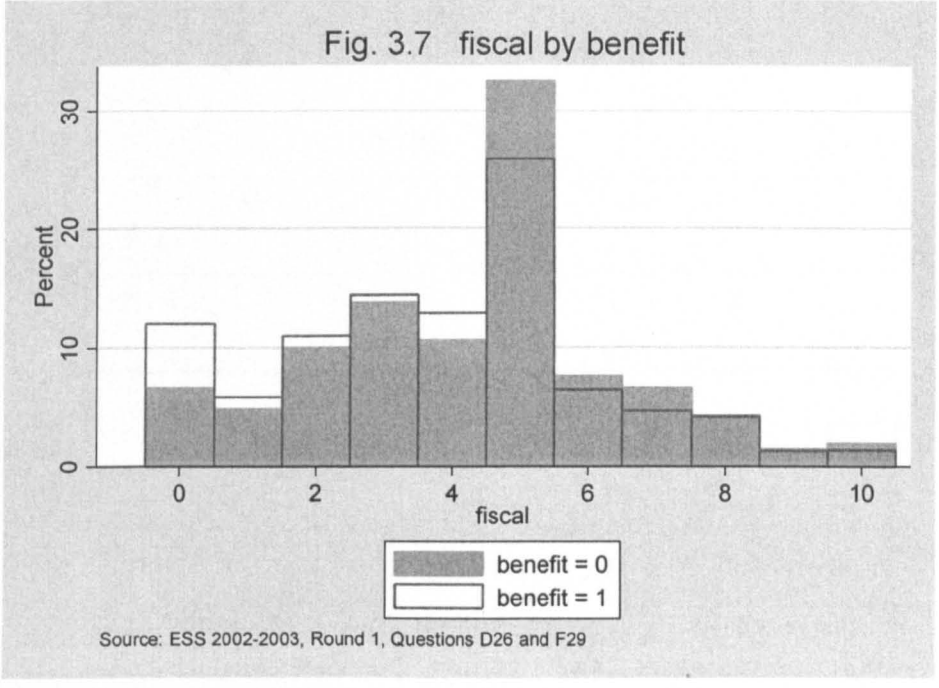


Fig. 3.7 fiscal by benefit
Percent
0
10
20
30
0
2
4
6
8
10
fiscal
benefit = 0
benefit = 1
Source: ESS 2002-2003, Round 1, Questions D26 and F29

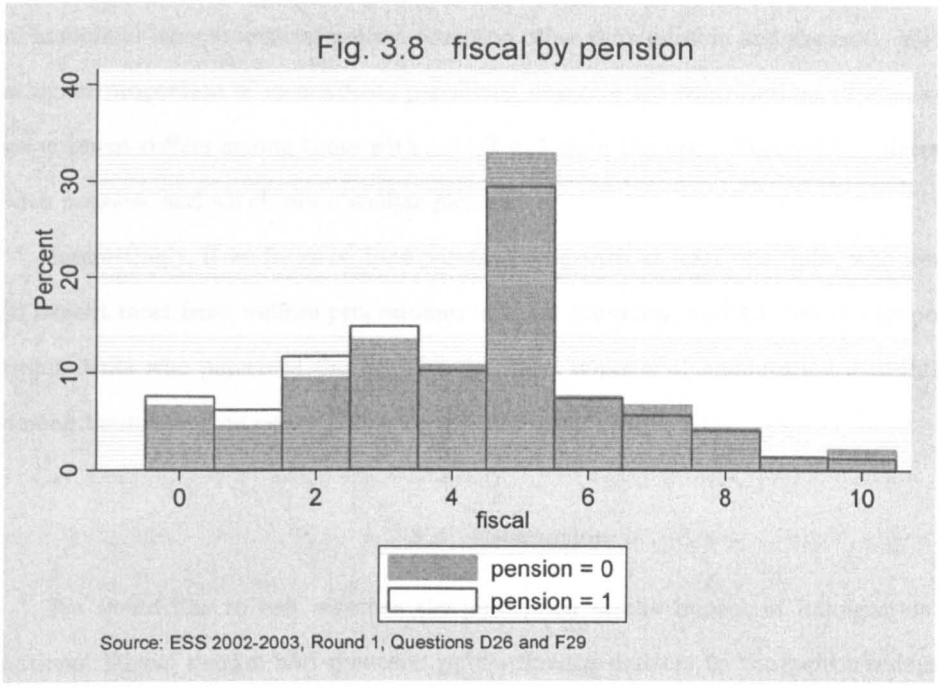


Fig. 3.8 fiscal by pension
Percent
0
10
20
30
40
0
2
4
6
8
10
fiscal
pension = 0
pension = 1
Source: ESS 2002-2003, Round 1, Questions D26 and F29

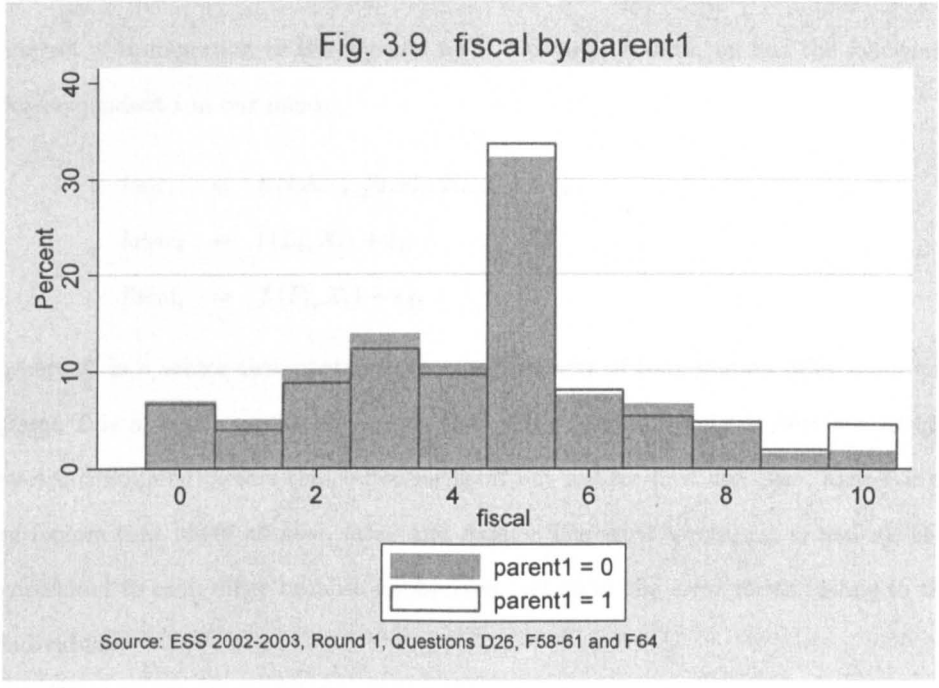


Fig. 3.9 fiscal by parent1
Percent
0
10
20
30
40
0
2
4
6
8
10
fiscal
parent1 = 0
parent1 = 1
Source: ESS 2002-2003, Round 1, Questions D26, F58-61 and F64

Figure 3.7 shows overlapping histograms of *fiscal* for the respondents whose main source of household income is social welfare provision other than pension and the rest. We observe a higher proportion of respondents perceiving negative net contributions of immigrants to government coffers among those with *benefit* = 1 than the rest. Figure 3.8 replaces *benefit* with *pension*, and we obtain a similar picture.

Interestingly, if we focus on lone parents living with at least one child, who were likely to benefit most from welfare programmes in these countries, we find that the proportion of respondents who perceived the negative net fiscal impacts of immigration is slightly lower among them than the rest. This is shown in Figure 3.9.

3.4. Estimation

We would like to test whether the perception of the impact of immigration on the national labour market and domestic public finance matters to the person's demand for immigration from poorer European countries. The causality is thus from the perceived impact of immigration to the demand for it. Given the data, we had the following model for respondent i in our mind:

$$\begin{aligned} host_i &= h\left(labor_i, fiscal_i, H_i, X_i\right) + \varepsilon_{hi} \\ labor_i &= l\left(L_i, X_i\right) + \varepsilon_{li} \\ fiscal_i &= f\left(F_i, X_i\right) + \varepsilon_{fi} \end{aligned}$$

where H is a vector that contains perceived impacts of immigration other than *labor* and *fiscal*, L is a vector containing factors that affect *labor* but neither *host* nor *fiscal*, F is a vector containing factors that influence *fiscal* but neither *host* nor *labor*, and X is a vector of factors that affect all *host*, *labor* and *fiscal*. The error terms, ε_h, ε_l and ε_f, should be correlated to each other because unobserved factors in the error terms belong to the same individual.

However, we are unable to estimate this model in this chapter. First, ideally, we would like to treat not only *host* but also *labor* and *fiscal* as ordered categorial variables. If we do so, *labor* and *fiscal* add 20 endogenous dummy variables to the equation for *host* because

there are 11 ordered categories in *labor* and *fiscal* respectively. Second, even if we treat *labor* and *fiscal* to be continuous because of the way the responses were collected, say, the ordered probit estimation of the equation system requires trivariate normality due to the correlated error terms. Third, we made an attempt to estimate the equation system by collapsing the 4 ordered categories of *host* into two and using Stata's ivprobit. This attempt turned out to be unfruitful: insufficient variations in our instrumental variables meant that Stata could not maximise the loglikelihood function.

Accordingly, we estimate the three equations separately in this chapter. This clearly limits the validity of our results in this chapter. The assumption that *labor* and *fiscal* are econometrically exogenous in the equation for *host* is likely to be faulty because they are likely to be correlated with ε_h, as we have already explained. In addition, in each equation, we have variables such as the satisfaction with the state of the national economy (*econ*) and the perceived origin of European immigration (*origin*), which are also subjective responses. They are also likely to be correlated to the error terms. The validity of our results thus depends on the exogeneity of explanatory variables in each equation. Our approach thus resembles that of Blinder and Krueger (2004).

We first estimated the equations for *labor* and *fiscal* respectively by both ordered probit and OLS. The results are similar, and hence we report only OLS results. The vector, L_i, contains our measure of labour substitutability between a respondent and immigrants ($isub_i$ or $osub_i$), the status of being unemployed ($unemploy_i$) and the status of being an employer ($employer_i$). The vector, F_i, contains the three indicators for net social welfare beneficiries ($pension_i$, $benefit_i$ and $parent1_i$). A measure of per capita income (inc_i, $relinc_i$ or $sufinc_i$) appears in both vectors. In addition, we include interaction terms in F_i that might capture how a citizen's public-finance concern depends on the welfare state. For instance, we have $benefit_i * nrr_i$ whose coefficient would be significantly positive if there is a positive relationship between the perceived fiscal impact of immigration ($fiscal_i$) and the generosity of social welfare provision in the country (nrr_i) among those whose household income mainly came from non-old-age social welfare benefits.

We then estimated the equation for *host* by ordered probit. We do not estimate it by OLS, for the intervals between the 4 ordered categories are not obvious. Let $host_i^*$ denote citizen i's demand for immigration from poorer countries of Europe. This is a latent variable, for we observe only one of the four ordered categories that is closest to demand but not the demand itself. In this chapter, we are interested in how *ceteris paribus* a change in an explanatory variable would affect this latent variable rather than the probability that a particular category of *host* is chosen. Hence we report the estimated coefficient on each explanatory variable.

Since we do not know the metric of $host^*$ which is latent, we report its estimated standard deviation. If $host^* = x'\beta + \varepsilon$ where x is the vector of all explanatory variables, β the vector of corresponding parameters and $\varepsilon \sim NID(0,1)$, the estimated standard deviation is

$$\hat{\sigma} \equiv \sqrt{\hat{var}(host^*)} = \sqrt{\hat{\beta}' \hat{var}(x) \hat{\beta} + var(\varepsilon)}$$

where $\hat{\beta}$ is the vector of estimated coefficients, $\hat{var}(x)$ the variance-covariance matrix for observed x and $var(\varepsilon) = 1$ by assumption. We can then standardise the estimated j^{th} parameter, $\hat{\beta}_j$, by dividing it by the estimated standard deviation of the latent dependent variable. For example, suppose x_j is a dummy variable and $\hat{\beta}_j < 0$. Then, $host^*$ was $\hat{\beta}_j/\hat{\sigma}$ standard deviations lower for a person with $x_j = 1$ than someone with $x_j = 0$, other things being equal.[25]

The vector, H_i, in the equation for *host* contains our measures of non-economic concerns related to immigration ($crime_i$ and $culture_i$). We will first examine the importance of labour-market concern and public-finance concern for individual demand for immigration separately. We then include both concerns on the right-hand side. If the inclusion of both concerns significantly affects the estimates, it implies that focusing only on either one of the economic concerns is misleading.

[25]For the computation of the latent variable's standard deviation, we used Long and Freese's (2003: 170) `listcoef, std` command in Stata.

3.5. Explaining economic concerns

Before examining the determinants of the desirable level of immigration, we estimate models for explaining individual perceptions of immigrants' impacts on the number of job opportunities (*labor*) and government coffers (*fiscal*) respectively. We use these perceptions to explain *host** in Section 3.6. However, by examining determinants of *labor* and *fiscal*, we may anticipate whose *host** would be more affected by these economic concerns than the others.

Since our sample is not small, we work at the significance level of 5 percent or less throughout the rest of the chapter, although the significance level of 10 percent is also indicated in the result tables. We find evidence of heteroscedasticity in every estimation. Hence reported standard errors are all heteroscedasticity-robust.

3.5.1. Explaining *labor*

We present OLS estimates of 11 models for explaining *labor* in Table 3.4. The results from orderd probit are similar, and hence we do not report them. Each model includes a constant and 14 country dummies whose coefficients are not reported in the table.[26] Model i does not include explanatory variables which are directly related to the labour-market.

We begin with model ii where we have two explanatory dummy variables of interest, *unemploy* and *employer*, together with the set of all the explanatory variables appearing in model i. We find the estimated coefficient on *unemploy* statistically insignificant, although its sign is negative as expected. That is, the status of being unemployed and looking for a job does not make a difference in perceiving immigrants' impact on the number of job opportunities. This result conflicts with that of Bauer, Lofstrom and Zimmermann (2000).[27] On the other hand, we find the estimated coefficient on *employer* significantly positive, although its size is not large: it suggests that, other things being equal, the perceived impact of immigration on the number of job opportunities is only .073 point higher among employers than the rest on the *labor* scale of 10 points.

[26] Available upon request

[27] See Subsection 3.2.1 above.

Most of the estimated coefficients on the other explanatory variables are as expected. Those who thought that most European immigrants originated from richer countries (*originr*) perceived a more positive impact of immigration on the number of job opportunities, as compared to the others who thought that they came from both richer and poorer countries equally (the reference group) or mainly from poorer countries (*originp*). Other things being equal, their *labor* score is found .193 higher than the rest.

The estimated coefficients on *ethlive* dummies indicate that those who lived in an area with either almost no ethnic minorities (*ethlive0*) or many of them (*ethlive2*) perceived a more negative impact of immigrants on the number of job opportunities than those who lived in an area with some ethnic minorities (the reference group). Furthermore, the presence of many ethnic minorities in living environments seems to lead to a more negative perception than little presence of them.

The estimated coefficients on educational attainment dummies (the reference group, *edu3*) together show a monotone tendency that respondents who attained higher formal education were likely to perceive a more positive impact of immigration on the national labour market than those with lower formal education. The estimates on *edu0* and *edu6* suggest that the difference between the lowest and the highest educated is approximately 1 point on the *labor* scale.

The more immigrant friends a respondent had, the more positive impact of immigration on the number of job opportunities the person perceived (the reference group, *friend0*). Respondents who had at least one foreign-born parent perceived immigrants' labour-market impact more positively than the others. The estimated coefficient on *fparent* is over 6 times larger than the one on *employer*.

Respondents' satisfaction with the current state of the national economy (*econ*), self-assessed political orientation (*polit*), exposure to the media on current affairs (*media*) and general wellbeing (*happy*) are all found significant factors, while respondent's gender and age are found insignificant. For instance, about 7 additional hours of exposure to the media on current affairs per weekday seem to increase the *labor* score by half a point.

Table 3.4 OLS models for explaining *labor*

	i		ii		iii		iv		v	
isub	..		..		..		−.026		..	
							.016			
osub	..		..		..		..		−.242	***
									.047	
sufinc0	..		..		−.457	***	−.585	***	−.658	***
					.118		.103		.159	
sufinc1	..		..		−.126		−.147		−.234	**
					.105		.106		.081	
sufinc3	..		..		.101		.118	*	.113	**
					.065		.062		.053	
unemploy	..		−.287		−.217		−.232		−.100	
			.243		.219		.208		.225	
employer	..		.073	**	.048		.027		−.021	
			.031		.033		.026		.019	
originp	−.078		−.080		−.084		−.057		−.108	
	.053		.054		.057		.074		.083	
originr	.195	***	.193	***	.187	***	.245	***	.245	***
	.047		.048		.046		.054		.051	
friend1	.461	***	.456	***	.456	***	.466	***	.449	***
	.060		.058		.059		.070		.070	
friend2	.755	***	.752	***	.743	***	.768	***	.714	***
	.067		.068		.064		.061		.080	
ethlive0	−.171	***	−.173	***	−.181	***	−.174	***	−.182	***
	.031		.032		.033		.043		.056	
ethlive2	−.289	***	−.288	***	−.275	***	−.312	***	−.316	***
	.034		.033		.033		.040		.057	
econ	.121	***	.120	***	.113	***	.120	***	.123	***
	.011		.011		.012		.014		.019	
polit	.084	***	.085	***	.085	***	.080	***	.067	***
	.019		.019		.017		.015		.015	
media	.068	**	.068	**	.065	**	.074	**	.049	
	.024		.024		.024		.030		.033	
happy	.079	***	.076	***	.065	***	.059	***	.068	***
	.013		.012		.011		.012		.009	
edu0	−.464	***	−.470	***	−.404	**	−.379	**	−.260	
	.131		.128		.138		.155		.217	
edu1	−.291	**	−.293	**	−.260	*	−.291	*	−.288	*
	.131		.134		.138		.143		.145	
edu2	−.163	**	−.162	**	−.147	**	−.202	**	−.119	**
	.074		.074		.067		.070		.040	
edu4	.167		.163		.162		.180		.161	
	.108		.105		.096		.104		.122	
edu5	.424	***	.421	***	.405	***	.389	***	.433	***
	.102		.100		.090		.101		.087	
edu6	.695	***	.688	***	.646	***	.723	***	.622	***
	.093		.090		.081		.096		.105	
fparent	.441	***	.446	***	.435	***	.359	**	.309	**
	.135		.134		.135		.122		.127	
female	.019		.019		.018		.026		.029	
	.023		.022		.018		.023		.022	
age	.002		.001		.001		.004		.003	
	.002		.002		.002		.002		.003	
obs.	22,087		22,054		21,881		18,338		15,821	
$\bar{R}^2$	.139		.139		.142		.151		.139	

NB: Heteroscedasticity-robust standard errors appear in a small font, adjusting for intra-country correlation. To avoid perfect multicollinearity, the *be* dummy is dropped in models including *isub*, while dummies for *be*, *fr* and *se* are dropped in models including *osub*.
The levels of significance are indicated by * (10%), ** (5%) and *** (1%).
Dummies for *edu*, *ethlive*, *friend*, *origin* and *sufinc* are respectively jointly significant at the 1% level in each model except viii and xi where *origin* dummies are jointly significant at the 2% level. Refer to Table 3.3 for the descriptions of the variables.

In models iii to v, we add our measure of subjectively assessed household income sufficiency, *sufinc* dummies (the reference group, *sufinc2*), to model ii. In models vi to viii, we use our measure of real net income per capita (*inc*) instead. In models ix to xi, we use our measure of intracountry relative net income per capita (*relinc*) instead. In each of

these 3 sets of 3 models, the second model includes our measure of labour substitutability between citizens and non-citizens by industry and country (*isub*), while the third model uses a similar measure based on occupational categories (*osub*) instead.

In model iii, we find that *sufinc* dummies are jointly significant. The sign and size of each estimated coefficient suggests a monotone trend, ie, a respondent who regarded his/her household income as insufficient for living was likely to perceive a more negative labour-market impact of immigration. It is however the group of those who felt their life was very difficult with their household income (*sufinc0* = 1) that significantly differ from the rest. The estimated coefficient on *sufinc0* suggests that their *labor* score is lower than the others by almost half a point.

The estimated coefficient on *unemploy* remains insignificant. That on *employer* is also insignificant as a result of including *sufinc* dummies. The signs of the other estimated coefficients remain the same as in model ii, and their magnitudes are also roughly the same.

In model iv, we add our measure of labour substitutability between citizens and immigrants by industry and country. We find *isub* statistically insignificant, although it has the negative sign as expected. We thus do not confirm our expectation that respondents who belonged to industries that were more penetrated by immigrant workers in each country perceived a more negative impact of immigration on the number of job opportunities than the others. Note that the inclusion of *isub* slightly increases the adjusted R^2 even though the sample size drops due to the lack of the Belgian data on *isub*. Both *unemploy* and *employer* continue to be insignificant. The size of the estimated coefficients on *sufinc0*, *edu6* and *originr* increases respectively by the inclusion of *isub*, while that on *fparent* decreases. The other estimated coefficients remain roughly the same as in model iii.

In model v, we use *osub* instead of *isub*. Its estimated coefficient is significantly negative as expected. It suggests that, for instance, those who belonged to the lowest-skill occupational group (category 9 in Table 3.2) are likely to have marked $.33 \simeq .242\,(1.87 - .50)$ point lower on the *labor* scale than those who were in the highest-skill occupational group (category 2) in Germany. The use of this alternative measure of labour substitutability between citizens and immigrants further strengthens the effect of *sufinc* dummies both statistically

and in terms of magnitude. Both *unemploy* and *employer* remain statistically insignificant. Moreover, the sign of the estimated coefficient on *employer* is now negative. The partial effect of the extent of exposure to the media on current affairs is now insignificant. The size of the coefficient on *fparent* is further reduced. Note that, while a significant monotone trend among *edu* dummies is roughly preserved, we see the size of the estimated coefficients on the lowest and the highest, *edu0* and *edu6*, becomes smaller. In addition, we find *edu0* no longer significant.

Table 3.4 (Continued)

	vi		vii		viii		ix		x		xi	
isub	..		−.004		..		..		−.002		..	
			.027						.027			
osub	..		..		−.284	***	..		..		−.276	***
					.053						.051	
inc	.053		.053		.055		..		..		..	
	.057		.059		.051							
relinc	..		..		..		.083	*	.084		.088	*
							.047		.050		.047	
unemploy	−.332		−.384	*	−.268		−.323		−.375	*	−.261	
	.220		.190		.227		.219		.188		.226	
employer	.149	***	.133	***	.112	***	.140	***	.124	***	.105	**
	.034		.032		.035		.035		.034		.036	
originp	−.109	**	−.114	**	−.127		−.110	**	−.114	**	−.126	
	.045		.047		.074		.045		.046		.074	
originr	.198	***	.225	***	.216	**	.199	***	.226	***	.217	**
	.058		.071		.082		.058		.071		.083	
friend1	.478	***	.464	***	.443	***	.475	***	.462	***	.441	***
	.059		.074		.076		.059		.075		.076	
friend2	.765	***	.790	***	.722	***	.764	***	.789	***	.722	***
	.056		.061		.062		.055		.060		.059	
ethlive0	−.181	***	−.177	***	−.167	**	−.181	***	−.177	***	−.168	**
	.044		.054		.074		.044		.054		.074	
ethlive2	−.276	***	−.338	***	−.301	***	−.276	***	−.337	***	−.303	***
	.029		.031		.031		.028		.030		.032	
econ	.126	***	.127	***	.139	***	.126	***	.127	***	.139	***
	.014		.015		.016		.014		.015		.016	
polit	.086	***	.086	***	.075	***	.086	***	.087	***	.075	***
	.013		.014		.017		.013		.014		.017	
media	.067	*	.079	*	.045		.067	*	.079	*	.045	
	.033		.038		.042		.033		.038		.042	
happy	.069	***	.069	***	.081	***	.069	***	.069	***	.081	***
	.019		.020		.018		.020		.020		.019	
edu0	−.592	***	−.575	**	−.571	**	−.569	***	−.552	**	−.550	**
	.162		.200		.200		.167		.203		.203	
edu1	−.344	**	−.418	**	−.388	*	−.329	*	−.403	**	−.374	*
	.152		.172		.184		.156		.177		.190	
edu2	−.205	**	−.294	**	−.184	**	−.201	**	−.290	**	−.183	**
	.093		.104		.065		.093		.105		.066	
edu4	.240	**	.261	**	.217	*	.235	**	.256	**	.212	*
	.096		.103		.116		.094		.102		.115	
edu5	.420	***	.415	***	.465	***	.415	***	.409	***	.459	***
	.106		.111		.087		.104		.108		.083	
edu6	.631	***	.686	***	.493	**	.607	***	.660	***	.461	**
	.103		.121		.161		.102		.122		.166	
fparent	.379	***	.321	**	.252	*	.380	***	.320	**	.252	*
	.125		.135		.131		.125		.135		.132	
female	−.033		−.011		−.018		−.032		−.010		−.017	
	.036		.031		.032		.035		.030		.032	
age	.002		.005	*	.003		.002		.005	*	.003	
	.003		.002		.003		.003		.002		.003	
obs.	17,918		15,340		12,959		17,918		15,340		12,959	
$\bar{R}^2$	.155		.164		.153		.156		.164		.153	

In models vi to viii, we use *inc* instead of *sufinc* dummies. We find our measure of real net income per capita insignificant in all 3 models. The estimated coeffcient on *unemploy* remains statistically insignificant in these models. Interestingly, the inclusion of *inc* does not make the positive coefficient on *employer* that was found significant in model ii insignificant, while that of *sufinc* dummies did so in models iii to v. In fact, the size of the estimated coefficient on *employer* is larger than in model ii. However, we cannot make a comparison between *sufinc* and *inc* models because *inc* suffers from over 20 percent of missing values.

In model vi, the estimated coefficient on *originp* is significantly negative, and the *origin* dummies together maintain a monotone trend. We find *media* insignificant. The size of the estimated coefficients on *edu0* and *edu1* are large and larger than in the previous models, which may in turn indicate that *sufinc0* and low educational attainment are correlated, ie, those with the lowest educational attainment tend to regard their household income very insufficient for living. The rest of the coefficients are similar to those in model iii.

In model vii, we find *isub* insignificant. In model viii, we find *osub* significantly negative, and the size is similar to the one in model v. The use of *osub* rather than *isub* makes the coefficients on *originp* and *fparent* insignificant. The positive coefficient on *edu6* is reduced as a result of including *osub*.

In models ix to xi, we use *relinc*, our measure of intracountry relative net income per capita. We find it insignificant in all the 3 models. The estimated coefficient on *osub* remains significantly negative, and the size is similar to model viii. As in models vi to viii, we find *unemploy* insignificant. The coefficient on *employer* is significantly positive in all the 3 models, and the size is similar to the corresponding ones in models vi to viii. The use of *osub* also makes the coefficients on *originp* and *fparent* insignificant and reduces the positive coefficient on *edu6* as in model viii such that the positive effects of *edu6* and *edu5* are almost the same.

To summarise, being an employer seems to suggest that the person is likely to perceive a more positive impact of immigration on the number of job opportunities: .1 to .15 point higher on the *labor* scale (models vi to xi). However, this is not confirmed when we use

our measure of subjective income sufficiency rather than estimated income (models iii to v). Being unemployed and looking for a job does not suggest that the person is likely to perceive a more negative impact of immigration on the number of job opportunities (models iii to xi). Belonging to an occupation that is more represented by non-citizens in the country indicates that the person is likely to perceive a more negative impact of immigration on the number of job opportunities (models v, viii and xi), but belonging to an industry that is more represented by non-citizens in the country does not make any difference (models iv, vii and x). The higher the attained formal education is, the more positive the person's perception of immigration's impact on the number of job opportunities (all models). While the subjective assessment of sufficiency of household income is implied as being positively related to *labor* (models iii to v), neither real net income per capita (models vi to viii) nor intracountry relative net income per capita (models ix to xi) is. Immigrants from richer countries seem to be perceived to have a more positive labour-market impact than those from poorer countries (all models). A perception of either little or many ethnic minorities in residential areas appears related to a perception of a more negative labour-market impact of immigration than a perception of some ethnic minorities in residential areas (all models). Once the presence of immigrants by occupation and country is controlled, having a foreign-born parent does not seem to result in a more positive perception of immigrants' labour-market effect than the others (models viii and xi).

3.5.2. Explaining *fiscal*

We present OLS estimates of 17 models to explain *fiscal* in Table 3.5. The results from ordered probit are similar, and hence we do not report them. Each model includes a constant and 14 country dummies whose coefficients are not reported.[28] Model i has the same set of explanatory variables as does model i in the previous section (Table 3.4).

We begin with model ii which adds three explanatory dummy variables of interest to model i, ie, *benefit*, *pension* and *parent1*. We find none of these statistically significant.

[28] Available upon request

The estimated coefficients on the other explanatory variables are very similar to the corresponding ones in model i. Respondents who thought that most immigrants originated from poorer European countries (*originp*) were likely to perceive a more negative net fiscal impact of immigration than those who thought that most European immigrants came from richer countries (*originr*) or both poorer and richer countries equally (the reference group).

The more immigrant friends a respondent had (*friend* dummies), the more positive the person's perception of immigration's public-finance impact would be. Respondents who perceived many ethnic minorities in their residential areas (*ethlive2*) were likely to perceive a more negative public-finance impact of immigrants than those who perceived either some or little ethnic minorities in their residential areas (the reference group and *ethlive0* respectively). Those who had at least one parent who was born abroad (*fparent*) were more likely to regard immigrants as net contributors to government coffers than the others.

A respondent's satisfaction with the state of the national economy (*econ*), self-assessed political orientation (*polit*), exposure to the media on current affairs (*media*) and general wellbeing (*happy*) are all statistically significant. For instance, other things being equal, one point increase in *fiscal* seems to require more than 15 extra hours of exposure to the media on current affairs per weekday.

Note that only those who attained high formal education appear noticeably different from the rest, regarding the perception of immigrants' net fiscal contribution. The positive effect of the attainment of first-stage tertiary education (*edu5*) is as strong as that of having a foreign-born parent (*fparent*) or a few immigrant friends (*friend1*). The estimated figures suggest that this magnitude would be roughly doubled if second-stage tertiary education were attained (*edu6*). The rest (from *edu0* to *edu4*) are not distinguishable from each other. The effect of education on *fiscal* thus seems discrete rather than continuous. The threshold level of education is first-stage tertiary.

Table 3.5 OLS models for explaining *fiscal*

	i		ii		iii		iv		v	
inc	..		..		..		.026		..	
							.034			
relinc	..		..		..		..		.020	
									.040	
sufinc0	..		..		−.255	**	..		..	
					.108					
sufinc1	..		..		−.033		..		..	
					.045					
sufinc3	..		..		.201	***	..		..	
					.041					
benefit	..		−.166		−.075		−.092		−.098	
			.119		.110		.125		.128	
pension	..		.003		.016		.054		.052	
			.060		.063		.032		.034	
parent1	..		.335	*	.373	**	.266	**	.264	**
			.166		.167		.110		.108	
originp	−.221	***	−.222	***	−.219	***	−.306	***	−.306	***
	.059		.059		.062		.046		.047	
originr	.039		.032		.029		.038		.040	
	.103		.106		.102		.126		.126	
friend1	.423	***	.420	***	.416	***	.390	***	.391	***
	.064		.065		.063		.072		.072	
friend2	.627	***	.619	***	.614	***	.611	***	.612	***
	.106		.110		.112		.125		.124	
ethlive0	−.126		−.124		−.129		−.151	**	−.151	**
	.077		.077		.078		.069		.069	
ethlive2	−.154	**	−.160	**	−.142	**	−.156	***	−.156	***
	.062		.061		.061		.050		.050	
econ	.118	***	.117	***	.112	***	.123	***	.123	***
	.010		.011		.010		.013		.013	
polit	.121	***	.121	***	.121	***	.121	***	.121	***
	.037		.036		.036		.035		.035	
media	.062	**	.064	**	.063	**	.072	***	.072	***
	.023		.024		.022		.017		.017	
happy	.054	***	.055	***	.045	***	.060	***	.060	***
	.015		.014		.014		.009		.009	
edu0	.020		.008		.061		.027		.030	
	.133		.135		.125		.127		.132	
edu1	−.027		−.023		.017		−.009		−.008	
	.083		.083		.086		.107		.111	
edu2	−.113	*	−.114	*	−.102		−.106		−.108	
	.055		.055		.059		.093		.093	
edu4	.058		.054		.045		.090		.090	
	.135		.135		.129		.158		.158	
edu5	.388	***	.386	***	.364	***	.360	***	.364	***
	.081		.082		.085		.116		.114	
edu6	.795	***	.796	***	.763	***	.677	***	.676	***
	.073		.073		.064		.074		.069	
fparent	.391	**	.388	***	.382	**	.308	**	.308	**
	.133		.128		.130		.109		.109	
female	.042		.026		.027		−.032		−.033	
	.057		.054		.055		.062		.062	
age	−.001	**	−.001		−.002		−.002	*	−.002	*
	.000		.001		.001		.001		.001	
obs.	21,867		21,867		21,700		17,788		17,788	
$\bar{R}^2$	.120		.121		.123		.120		.120	

NB: Heteroscedasticity-robust standard errors appear in a small font, adjusting for intra-country correlation. To avoid perfect multicollinearity, we do not interact *sufinc* dummies with country-level variables. The significance levels are indicated by * (10%), ** (5%) and *** (1%). Dummies for *edu*, *ethlive*, *friend*, *origin* and *sufinc* are respectively jointly significant at the 1% level in each model except i where *ethlive* dummies at the 6% level, ii where *ethlive* dummies at the 5% level and iii where *ethlive* dummies at the 8% level and *origin* dummies at the 2% level. Refer to Table 3.3 for the descriptions of the variables.

In models iii to v, we add our measures of income to model ii. Model iii contains *sufinc* dummies. It suggests that each respondent's expressed sufficiency of household income for living is positively related to *fiscal*. The more sufficient a respondent felt about the

household income, the more positive perception of immigrants' net contribution to public finance the person had. Note that the estimated coefficient on *parent1* is now significantly positive, suggesting that lone parents with at least one child living together tend to perceive a more positive net fiscal impact of immigration than the others. The rest of the coefficients in model iii are very similar to those of model ii with the same signs.

In model iv, we use *inc* instead of *sufinc* dummies. This measure of real net income per capita is found insignificant. The addition of *inc* to model ii results in a slight decrease in the size of the coefficients on *edu6*, *parent1* and *fparent*. However, this comparison between models ii and iv is not valid, for the sample size is smaller in model iv than in model ii.

We also find *ethlive0* now significantly negative. That is, those who perceived little ethnic minorities in their residential areas were likely to have a more negative perception of immigration's public-finance effect than those who perceived some ethnic minorities in their residential areas (the reference group). The magnitude of *originp* also slightly increases.

In model v with our measure of intracountry relative net income per capita, the coefficient on *relinc* is found insignificant. The other coefficients are almost the same as in model iv.

In models vi to xiii, we attempt to see whether the coefficients on income and the other indicators of net fiscal contributions of respondents turn out as economic theory predicts. We found *inc* and *relinc* insignificant in models iv and v respectively. We found our subjective measure of income significant in model iii, but *sufinc* dummies would measure not only the sufficiency of household income but also spending habit as well as lifestyle aspiration implicitly. We therefore use *inc* in models vi to xiii to see whether the relationship between personal income and the perception of immigrants' net fiscal contribution depends on the system of public finance. These are extensions of model iv in the table. The results from the use of *relinc* instead of *inc* in models vi to xiii are very similar and are hence reported in Table A3.4 in the appendix.[29] We do not discuss the estimated coefficients on the set

[29]In any case, we cannot use *sufinc* dummies in the same way as we do in models vi to xiii because our measures of public finance are country-specific, ie, the inclusion of the set of *sufinc* dummies interacted with country-level variables causes perfect multicollinearity because we also have country dummies in each model.

of the explanatory variables appearing in model i , for they remain roughly the same as in model iv.

In model vi, we interact *inc*, *benefit*, *pension* and *parent1* with *tp* in order to see whether the importance of these variables for *fiscal* depends on country-level tax progressivity. We find that real net income per capita continues unimportant. Nor do beneficiaries of non-pension social welfare benefits differ from the rest. The coefficient on *pension* is now significantly positive although the interaction with *tp* is insignificant. That is, other things being equal, a respondent having pension as the main source of household income was likely to perceive a more positive net fiscal impact of immigrants than the rest. We find *parent1* and *parent1*tp* insignificant.

In model vii, we further add interaction terms with *fshare* in order to see whether the importance of *inc*, *benefit*, *pension* and *parent1* for *fiscal* depends on not only tax progressivity but also the extent of immigrants' presence at the country level. Ideally we would like to use a measure of social welfare use by immigrants, which we do not have. We tentatively use the share of non-citizens in the total population as a proxy at the price of being unable to draw firm conclusions because, in interpreting the results, we need to assume that citizens and non-citizens are equally likely to benefit from welfare programmes.[30] We find all the terms involving *inc*, *benefit*, *pension* and *parent1* insignificant even though they are respectively jointly significant.

In model viii, we repeat model vi but use *tp2* instead of *tp*. By using this alternative measure of tax progressivity that takes into account employees' social security contribution, we find the positive coefficient on *pension* no longer significant: it was in the *tp* version. Model ix is the *tp2* version of model vii. We find none of the explanatory variables of interest significant, as we did in the *tp* version.

[30]Hanson, Scheve and Slaughter (2005) could use immigrants' share of cash-benefit recipients in the United States, as we noted in Subsection 3.2.2 above.

Table 3.5 (Continued)

	vi	vii	viii	ix	x	xi	xii	xiii
inc	−.018 .037	.583 .378	−.077 .067	−.115 .469	−.084 .055	−.099 .103	.944 *** .186	−.152 .829
*inc*tp*	.547 .640	−5.330 * 2.573	..	..	..	..	−13.533 *** 2.217	..
*inc*tp*fshare*	..	102.185 * 55.300	..	..	..	..	286.204 *** 48.420	..
*inc*tp2*	..	..	1.189 .949	.065 4.259	..	..	..	.752 10.190
*inc*tp2*fshare*	..	..	..	−6.510 79.103	..	..	..	−20.777 223.474
*inc*nrr*	..	..	..	..	.171 .106	.025 .139	1.110 *** .237	−.049 .636
*inc*nrr*fshare*	..	..	..	..	..	−.048 3.609	−29.570 *** 6.438	1.906 17.691
*inc*fshare*	..	−11.686 8.249	..	3.192 9.427	..	2.084 2.645	−16.524 *** 3.818	3.418 15.745
	(.318)	(.000)	(.391)	(.028)	(.300)	(.059)	(.000)	(.002)
benefit	.204 .274	−.911 2.420	.373 .308	−.054 2.962	−.459 .554	−2.719 *** .483	−.902 .850	.038 1.786
*benefit*tp*	−2.601 1.891	6.211 16.757	..	..	..	..	−24.951 * 12.208	..
*benefit*tp*fshare*	..	−172.882 356.773	..	..	..	..	523.938 * 272.088	..
*benefit*tp2*	..	..	−4.560 * 2.378	−.455 23.262	..	..	..	−27.325 17.756
*benefit*tp2*fshare*	..	..	..	−74.421 493.745	..	..	..	541.248 385.210
*benefit*nrr*	..	..	..	..	.543 .768	4.026 *** .857	6.392 *** 1.304	4.897 *** 1.119
*benefit*nrr*fshare*	..	..	..	..	..	−96.902 *** 23.817	−154.439 *** 36.101	−109.472 *** 33.960
*benefit*fshare*	..	23.050 53.132	..	8.234 64.291	..	66.853 *** 16.660	33.618 * 16.408	7.519 42.664
	(.123)	(.000)	(.020)	(.000)	(.659)	(.000)	(.000)	(.000)

(continued ...)

NB: p-value for joint significance in brackets, eg, $p = .318$ for the joint significance of *inc* and *inc*tp* in model vi

Table 3.5 (Continued)

	(vi)		(vii)	(viii)	(ix)	(x)		(xi)		(xii)		(xiii)	
pension	.167	**	.734	.128	.787	.045		.410	***	.717	***	.791	
	.065		.445	.130	.615	.071		.060		.225		.542	
*pension*tp*	−.982		−4.418	..	..	..		..		−3.047		..	
	.609		3.297							2.986			
*pension*tp*fshare*	..		80.406	..	..	..		..		37.392		..	
			64.061							58.614			
*pension*tp2*	..		..	−.671	−5.021	..		..		..		−4.377	
				1.285	5.302							6.475	
*pension*tp2*fshare*	..		..	..	105.175	..		..		..		84.296	
					93.940							121.057	
*pension*nrr*	..		..	..	..	.012		−.210	*	−.149		−.003	
						.111		.100		.241		.344	
*pension*nrr*fshare*	..		..	..	..	..		12.703	***	12.805	**	7.765	
								2.223		5.893		8.467	
*pension*fshare*	..		−12.830	..	−15.149	..		−12.448	***	−17.083	***	−19.328	*
			9.346		11.844			1.649		4.540		9.571	
	(.054)		(.042)	(.209)	(.078)	(.308)		(.000)		(.000)		(.000)	
parent1	.277		1.945	.154	1.835	.697	**	1.481	***	.474		−.721	
	.297		1.640	.278	2.085	.281		.233		.701		1.099	
*parent1*tp*	−.125		−13.549	..	..	..		..		15.836		..	
	2.046		11.047							9.916			
*parent1*tp*fshare*	..		253.796	..	..	..		..		−384.254		..	
			217.120							229.710			
*parent1*tp2*	..		..	1.079	−13.234	..		..		..		27.245	*
				1.992	15.864							14.443	
*parent1*tp2*fshare*	..		..	..	268.937	..		..		..		−617.313	*
					317.255							330.738	
*parent1*nrr*	..		..	..	..	−.695	*	−2.310	***	−4.273	***	−4.221	***
						.375		.397		1.283		1.227	
*parent1*nrr*fshare*	..		..	..	..	..		40.781	***	92.163	**	87.599	**
								5.828		31.532		31.541	
*parent1*fshare*	..		−33.404	..	−32.836	..		−23.698	***	−4.419		21.947	
			32.862		42.192			4.061		13.198		22.183	
	(.054)		(.000)	(.022)	(.000)	(.031)		(.000)		(.000)		(.000)	

(continued ...)

Table 3.5 (Continued)

	(vi)		(vii)		(viii)		(ix)		(x)		(xi)		(xii)		(xiii)	
originp	−.303	***	−.302	***	−.304	***	−.304	***	−.306	***	−.304	***	−.303	***	−.305	***
	.048		.047		.048		.047		.046		.047		.047		.047	
originr	.044		.042		.044		.042		.040		.044		.042		.042	
	.128		.127		.129		.128		.126		.128		.128		.129	
friend1	.388	***	.387	***	.388	***	.388	***	.389	***	.386	***	.385	***	.386	***
	.072		.072		.072		.072		.073		.073		.073		.073	
friend2	.611	***	.607	***	.610	***	.607	***	.609	***	.608	***	.606	***	.607	***
	.125		.124		.124		.124		.124		.124		.124		.125	
ethlive0	−.152	**	−.152	**	−.151	**	−.153	**	−.154	**	−.155	**	−.157	**	−.155	**
	.069		.068		.069		.068		.068		.068		.069		.068	
ethlive2	−.156	***	−.156	***	−.156	***	−.156	***	−.155	**	−.155	***	−.159	***	−.157	***
	.049		.050		.049		.050		.050		.050		.050		.050	
econ	.123	***	.124	***	.123	***	.124	***	.123	***	.123	***	.123	***	.123	***
	.013		.013		.013		.013		.013		.013		.013		.013	
polit	.121	***	.121	***	.121	***	.121	***	.122	***	.121	***	.121	***	.121	***
	.035		.035		.035		.035		.035		.035		.035		.035	
media	.071	***	.071	***	.071	***	.071	***	.071	***	.070	***	.070	***	.070	***
	.017		.017		.017		.017		.017		.017		.017		.017	
happy	.059	***	.058	***	.059	***	.059	***	.060	***	.058	***	.057	***	.057	***
	.010		.010		.009		.009		.009		.009		.010		.009	
edu0	.025		−.003		.029		.006		.021		.018		.013		.024	
	.124		.120		.125		.120		.123		.116		.118		.118	
edu1	−.009		−.024		−.008		−.022		−.012		−.014		−.021		−.014	
	.105		.103		.105		.105		.107		.104		.100		.102	
edu2	−.112		−.118		−.113		−.117		−.107		−.114		−.119		−.115	
	.091		.090		.090		.091		.091		.089		.091		.091	
edu4	.083		.081		.083		.078		.089		.084		.085		.082	
	.155		.157		.155		.157		.156		.156		.157		.157	
edu5	.355	***	.355	***	.356	***	.353	***	.357	***	.358	***	.358	***	.358	***
	.115		.115		.115		.115		.115		.114		.114		.113	
edu6	.671	***	.675	***	.668	***	.664	***	.678	***	.676	***	.697	***	.672	***
	.073		.079		.073		.078		.075		.077		.079		.077	
fparent	.310	**	.313	**	.310	**	.314	**	.312	**	.317	**	.317	**	.315	**
	.109		.110		.109		.109		.108		.108		.110		.109	
female	−.032		−.035		−.033		−.035		−.034		−.036		−.033		−.034	
	.061		.061		.061		.061		.063		.062		.061		.061	
age	−.002	*	−.002	*	−.002	*	−.002	*	−.002	*	−.002	*	−.002	*	−.002	*
	.001		.001		.001		.001		.001		.001		.001		.001	
obs.	17,788		17,788		17,788		17,788		17,788		17,788		17,788		17,788	
$\bar{R}^2$	.120		.120		.120		.120		.120		.121		.121		.121	

In model x, we add to model iv interactions of *inc*, *benefit*, *pension* and *parent1* with *nrr* respectively in order to see whether the importance of these variables for *fiscal* depends on country-level welfare generosity. We find only *parent1* significant, and the positive coefficient is much larger than the one in model iv.

In model xi, we further add interaction terms with *fshare* in order to see whether the importance of *inc*, *benefit*, *pension* and *parent1* for *fiscal* depends on not only welfare generosity but also the extent of immigrants' presence at the country level. We find all the terms involving *inc* insignificant. We find all the terms involving *benefit* and *parent1* statistically significant. The estimated partial effect of *benefit* on *fiscal* is the following: $-2.719 + 4.026nrr - 96.902nrr*fshare + 66.853fshare$. The resulting sign of this expression is ambiguous. The second and third terms imply that *fshare* has to be sufficiently small if more generous welfare provision should make those who rely on non-pension social welfare benefits perceive a more positive net fiscal effect of immigration than the rest, ie, *fshare* $< 4.026/96.902 \simeq .041$. The third and fourth terms imply that *nrr* has to be sufficiently small if more presence of immigrants should make them perceive a more positive net fiscal effect of immigration than the rest, ie, $nrr < 66.853/96.902 \simeq .689$. For the mean values of *nrr* and *fshare* (given in Table 3.3), the estimated partial effect is approximately .196.

The estimated partial effect of *pension* on *fiscal* is the following: $.410 + (12.703nrr - 12.448)fshare$. It suggests that more generous social welfare provision would make pensioners perceive a more positive net fiscal impact of immigration. A higher presence of immigrants would make them perceive a more negative net fiscal impact of it: the sum inside the brackets would be negative even when the sample's maximum *nrr* (given in Table 3.3) is substituted. For the mean values of *nrr* and *fshare*, the estimated partial effect is approximately .107.

We obtain the estimated partial effect of *parent1* on *fiscal* as follows: $1.481 - 2.310nrr + 40.781nrr*fshare - 23.698fshare$. The second and third terms imply that *fshare* has to be sufficiently large if more generous welfare provision should make lone parents living with at least one child perceive a more positive net fiscal effect of immigration than the rest, ie, *fshare* $> 2.310/40.781 \simeq .056$. The third and fourth terms imply that *nrr* has to be

sufficiently large if more presence of immigrants should make them perceive a more positive net fiscal effect of immigration than the rest, ie, $nrr > 23.698/40.781 \simeq .581$. Compared to $\partial fiscal/\partial benefit$, each term in this partial effect has an opposing sign. For the mean values of *nrr* and *fshare*, the estimated partial effect is approximately .170.

In model xii, we combine models vii and xi. That is, we examine the influence of tax progressivity, welfare generosity and the presence of non-citizens together on the importance of *inc*, *benefit*, *pension* and *parent1* for *fiscal*. We then find all the terms involving *inc* statistically significant. The estimated partial effect of *inc* on *fiscal* is complex:

$$\frac{\partial fiscal}{\partial inc} \simeq .944 - 16.524 fshare + (286.204 fshare - 13.533)\, tp + (1.110 - 29.570 fshare)\, nrr$$

The third term suggests that more progressive tax would contribute positively to the effect if the share of non-citizens in the country's total population is sufficiently high, ie, *fshare* $> 13.533/286.204 \simeq .047$. The fourth term suggests that, if *fshare* $> 1.110/29.570 \simeq .037$, more generous welfare provision would contribute negatively to the effect. The contribution of the presence of non-citizens to the effect also depends on tax progressivity positively and welfare generosity negatively. For the mean values of *nrr*, *tp* and *fshare* (given in Table 3.3), the estimated partial effect is approximately $-.111$. In this case, other things being equal, having higher income implies the perception of a more negative net fiscal contribution of immigration to government coffers.

The estimated partial effect of *benefit* on *fiscal* is $(6.392 - 154.439 fshare) nrr$. This suggests that, if *fshare* $> 6.392/154.439 \simeq .041$, those who rely on non-pension social welfare benefits are likely to perceive a more negative net fiscal contribution of immigration under more generous social welfare provision. For the mean values of *nrr* and *fshare*, the estimated partial effect is approximately -2.827.

The estimated partial effect of *pension* on *fiscal* is $.717 + (12.805 nrr - 17.083) fshare$. This suggests that those whose household income depended mainly on pension are likely to perceive a more positive net fiscal impact of immigration under a more generous social welfare system. They are also likely to perceive a more negative net fiscal impact of immigration

with a higher share of non-citizens in the total population because the net replacement ratio is unlikely to exceed one. For the mean values of *nrr* and *fshare*, the estimated partial effect is approximately .094.

The estimated partial effect of *parent1* on *fiscal* is $(92.163fshare - 4.273)nrr$. This suggests that, lone parents with at least one child living together are likely to perceive a more positive net fiscal impact of immigration with a higher share of non-citizens in the total population. If the share is sufficiently high, ie, $fshare > 4.273/92.163 \simeq .046$, they are likely to perceive a more positive net fiscal impact of immigration under a more generous welfare system. For the mean values of *nrr* and *fshare*, the estimated partial effect is approximately 1.394.

In model xiii, we repeat model xii but use *tp2* instead of *tp*. Tax progressivity then takes into consideration employee's social security contributions. We then find all the terms involving *inc* and *pension* insignificant, although they are jointly significant. The estimated partial effect of *benefit* on *fiscal* is $(4.897 - 109.472fshare)nrr$. This suggests that those who rely on non-pension social welfare benefits are likely to perceive a more negative net fiscal contribution of immigrants with a higher share of non-citizens in the total population. If this share is sufficiently high, ie, $fshare > 4.897/109.472 \simeq .044$, they are also likely to perceive a more negative net fiscal impact of immigration under a more generous welfare system. This is what we also found in the *tp* version (model xii), and the threshold *fshare* is also similar. For the mean values of *nrr* and *fshare*, the estimated partial effect is approximately -1.770.

The estimated partial effect of *parent1* on *fiscal* is $(87.599fshare - 4.221)nrr$. This suggests that lone parents living with at least one child are likely to perceive a more positive net fiscal contribution of immigrants with a higher share of non-citizens in the total population. If the share is sufficiently high, ie, $fshare > 4.221/87.599 \simeq .048$, they are also likely to perceive a more positive net fiscal contribution of immigration under a more generous welfare system. This is what we also found in the *tp* version (model xii), and the threshold *fshare* is also similar. For the mean values of *nrr* and *fshare*, the estimated partial effect is approximately 1.222.

Although suggestive, some results from models xii and xiii are very difficult to interpret. Hence we also estimated simpler models with measures of both tax progressivity and welfare generosity. In models xiv to xvii, we do not interact these measures with the share of foreigners in the total population. Models xiv and xv use *tp*, while models xvi and xvii use *tp2* instead. In models xiv and xvi, *fshare* is not included. It is interacted with *inc*, *benefit*, *pension* and *parent1* in models xv and xvii.

Model xiv shows a significantly positive coefficient on *inc*nrr*, which suggests that the positive relationship between *inc* and *fiscal* depends positively on *nrr*. The more generous welfare provision is, the stronger the positive relationship between *inc* and *fiscal* is. However, this is not confirmed in models xv to xvii.

Model xiv shows the following partial effect of *benefit* on *fiscal*: $1.194nrr - 4.405tp$. This indicates that non-pension welfare beneficiaries would perceive a more positive fiscal impact of immigration than the rest if welfare provision were generous. They would also perceive a more negative fiscal impact of immigration than the rest if tax were progressive. Model xvi shows that the generosity of welfare provision becomes unimportant if the measure of tax progressivity takes into consideration the social security contribution by employees. Furthermore, in models xv and xvii where we include *fshare*, the partial effect of *benefit* on *fiscal* is not dependent on tax progressivity. It is related positively to *nrr* and negatively to *fshare*. The results are thus mixed.

The partial effect of *pension* on *fiscal* is also unclear. Model xiv suggests that it is negatively related to tax progressivity, while model xvii suggests that it is negatively related to the share of foreigners in the total population.

Finally, we find that the partial effect of *parent1* on *fiscal* is significantly negatively related to the generosity of welfare provision. This finding is consistent across models xiv to xvii, whether we use *tp* or *tp2*, and whether *fshare* is included or not. The more generous welfare provision is, the more negative fiscal impact of immigration lone parents with at least one child living together perceive.

Table 3.5 (Continued)

	xiv		xv		xvi		xvii	
inc	−.093 .058		−.090 .038	**	−.146 .075	*	−.091 .054	
*inc*tp*	.401 .564		−.241 .431		..		..	
*inc*tp2*	..		..		1.027 .813		−.140 .977	
*inc*nrr*	.136 .059	**	.022 .053		.129 .066	*	.018 .066	
*inc*fshare*	..		2.357 1.116	*	..		2.215 1.334	
	(.011)		(.000)		(.163)		(.039)	
benefit	−.408 .247		−.416 .209	*	−.122 .364		−.254 .360	
*benefit*tp*	−4.405 1.800	**	−3.045 1.509	*	..		..	
*benefit*tp2*	..		..		−6.070 2.578	**	−3.544 2.685	
*benefit*nrr*	1.194 .414	**	1.514 .438	***	.949 .468	*	1.253 .485	**
*benefit*fshare*	..		−6.211 1.926	***	..		−5.677 2.058	**
	(.011)		(.000)		(.026)		(.000)	
pension	.134 .086		.134 .069	*	.113 .137		.046 .117	
*pension*tp*	−1.206 .528	**	−.342 .828		..		..	
*pension*tp2*	..		..		−.758 1.310		.951 1.499	
*pension*nrr*	.090 .135		.213 .149		.036 .118		.210 .136	
*pension*fshare*	..		−2.989 1.655	*	..		−3.793 1.570	**
	(.038)		(.000)		(.366)		(.004)	
parent1	.554 .277	*	.568 .260	**	.439 .295		.575 .321	*
*parent1*tp*	1.783 1.687		.004 1.846		..		..	
*parent1*tp2*	..		..		2.922 2.082		−.057 3.285	
*parent1*nrr*	−.790 .353	**	−1.078 .449	**	−.767 .351	**	−1.084 .468	**
*parent1*fshare*	..		6.400 4.875		..		6.502 5.569	
	(.043)		(.002)		(.035)		(.000)	

(continued ...)

Table 3.5 (Continued)

	(xiv)		(xv)		(xvi)		(xvii)	
originp	−.304	***	−.304	***	−.304	***	−.304	***
	.047		.047		.047		.047	
originr	.045		.044		.045		.043	
	.128		.128		.129		.128	
friend1	.386	***	.385	***	.386	***	.386	***
	.073		.073		.073		.072	
friend2	.610	***	.608	***	.609	***	.607	***
	.125		.124		.124		.124	
ethlive0	−.155	**	−.155	**	−.154	**	−.155	**
	.068		.068		.068		.068	
ethlive2	−.155	***	−.154	***	−.154	***	−.154	***
	.050		.050		.050		.050	
econ	.123	***	.123	***	.123	***	.123	***
	.013		.013		.013		.013	
polit	.121	***	.121	***	.121	***	.121	***
	.035		.035		.035		.035	
media	.071	***	.071	***	.071	***	.070	***
	.017		.017		.017		.017	
happy	.059	***	.058	***	.059	***	.058	***
	.010		.010		.009		.009	
edu0	.023		−.007		.024		.005	
	.121		.121		.122		.123	
edu1	−.006		−.018		−.007		−.020	
	.104		.105		.106		.107	
edu2	−.110		−.114		−.112		−.114	
	.091		.090		.090		.090	
edu4	.086		.084		.084		.083	
	.155		.156		.155		.156	
edu5	.355	***	.358	***	.355	***	.357	***
	.115		.115		.115		.114	
edu6	.675	***	.673	***	.671	***	.671	***
	.075		.076		.074		.076	
fparent	.314	**	.315	**	.313	**	.315	**
	.109		.109		.108		.109	
female	−.034		−.034		−.035		−.035	
	.062		.062		.062		.062	
age	−.002	*	−.002	*	−.002	*	−.002	*
	.001		.001		.001		.001	
obs.	17,788		17,788		17,788		17,788	
$\bar{R}^2$	.120		.121		.120		.121	

To summarise, in specifications where either tax progressivity or welfare generosity is included on its own, neither of them seems to matter to *fiscal* (models vi, viii and x). When we have them together in a specification, we find that lone parents living with at least one child perceive a more negative fiscal impact of immigration under a more generous welfare system (models xiv to xvii). We also found that those citizens who relied on non-pension social welfare benefits perceived a more negative fiscal impact of immigration under a more progressive tax system (models xiv and xvi). But the influence of tax progressivity became insignificant when *benefit*fshare* was included, and we found that those welfare beneficiaries perceived a more negative fiscal impact of immigration when the presence of immigrants in the country is high (models xv and xvii).

When we interact *fshare* not only with *inc*, *benefit*, *pension* and *parent1* but also *nrr* and *tp* (*tp2*), the use of *tp* makes all terms involving *inc* significant, while the use of *tp2* makes all of them insignificant (models xii and xiii). Hence the result depends on the definition of tax progressivity. Similarly, the result regarding the terms involving *pension* changes depending on whether we use *tp* or *tp2* in specification (models xii and xiii). As for those citizens who replied on non-pension social welfare benefits, their perception of the fiscal impact of immigration was more positive under more generous welfare provision, provided that the share of foreigners in the total population is not very high (models xii and xiii). On the other hand, we found that lone parents living with at least one child would perceive a more negative fiscal impact of immigration if welfare provision were generous, given a low share of foreigners in the total population (models xii and xiii).

Regarding the other explanatory variables, we find that attaining tertiary education distinguishes the respondent from the others by perceiving more positive net fiscal contributions of immigration (all models). Those who thought most European migrants came from poorer countries were likely to perceive a more negative net fiscal impact of immigration than the others (all models). Perceiving either many or little ethnic minorities in residential areas implies the perception of a more negative fiscal effect of immigration than perceiving some ethnic minorities (models iv to xiii).

3.6. Explaining the desirable level of immigration

We now turn to our main dependent variable, the desirable level of immigration. We first try to explain *host** by labour-market concern. We then try to explain it by public-finance concern. We finally introduce both concerns. If the result changes significantly by having both concerns rather than just one of them, it is misleading to concentrate on one of these concerns in explaining the desirable level of immigration from poorer European countries.[31] As we explained in Section 3.4, we will assume that all the explanatory variables, including *labor* and *fiscal*, are econometrically exogenous.[32]

[31] In this section, we no longer use *sufinc* dummies as explanatory variables because they cause perfect multicollinearity. See Subsection 3.5.2.

[32] This is the reason why we control such factors as general wellbeing (*happy*) and self-assessed political orientation (*polit*) that might bias respondents' opinions and perceptions towards a certain direction overall.

3.6.1. Importance of *labor*

We first present the results from 6 models for explaining *host** by *labor*. We use our measure of real net income per capita (*inc*) in Table 3.6.[33] The use of our measure of intracountry relative net income per capita (*relinc*) instead of *inc* yields very similar results which are therefore presented in Table A3.5 in the appendix.

Model i contains explanatory variables that are included in all the subsequent models explaining *host**. Note that we now include each respondent's perception of immigrants' security impact (*crime*) and cultural impact (*culture*): these did not appear when we examined the determinants of *labor* and *fiscal* in the previous section. We thus account for these non-economic motives behind individual opinions on the desirable level of immigration. The positive coefficient on *culture* suggests that the more positive cultural influence of immigrants a respondent perceived, the more immigration the person was likely to permit. Similarly, the less positive security effect of immigrants a respondent perceived (*crime*), the less immigration the person was likely to permit.

The number of immigrant friends is important for *host**: the more immigrant friends a respondent had, the more immigration the person was likely to desire. The significantly negative coefficient on *originp* implies that those who perceived most European immigrants to have come from poorer countries were likely to prefer less immigration of the same type than the rest. The estimated coefficients on *edu* dummies indicate that the attainment of formal education is positively related to *host**. We find neither *econ* nor *fparent* statistically significant, while the estimated coefficient on *inc* is significantly positive.

Model ii adds *labor* to model i. Its estimated coefficient is significantly positive: those who perceived a more negative impact of immigrants on the number of job opportunities were likely to desire less immigration. One point move to the positive direction on the *labor* scale would increase the preferred level of immigration by $.073/1.229 \simeq .06$ standard deviations. We find that *ethlive* dummies become insignificant as a consequence of including *labor*.

[33] With weighted observations, Stata maximises the log pseudolikelihood. The pseudo-R^2 is defined as $1 - L_1/L_0$ where L_1 is the log pseudolikelihood of the model and L_0 is that of the constant-only model. See [R] **maximise**.

Table 3.6 Ordered probit models for explaining *host by *labor***

	i		ii		iii		iv		v		vi	
*isub*labor*	..		..		..		.006 .004		..		..	
isub	..		..		−.006 .020		−.034 .039		..		..	
							(.149)					
*osub*labor*	..		..		..		..		..		−.002 .005	
osub	..		..		..		..		−.084 .054		−.071 .052	
											(.312)	
*unemploy*labor*	..		..		..		−.004 .033		..		−.006 .037	
unemploy	..		..		−.041 .093		−.020 .125		−.058 .109		−.035 .121	
							(.921)				(.849)	
*employer*labor*	..		..		..		−.095 .019	***	..		−.097 .020	***
employer	..		..		−.122 .104		.331 .180	*	−.040 .089		.415 .162	**
							(.000)				(.000)	
labor	..		.073 .010	***	.073 .007	***	.073 .004	***	.075 .009	***	.085 .008	***
crime	.093 .015	***	.079 .013	***	.085 .011	***	.084 .011	***	.090 .014	***	.089 .014	***
culture	.163 .008	***	.145 .009	***	.141 .007	***	.141 .007	***	.143 .010	***	.143 .010	***

(continued ...)

NB: To avoid perfect multicollinearity, the *be* dummy is dropped in models inculding *isub*, while dummies for *be*, *fr* and *se* are dropped in models including *osub*. Dummies for *edu* and *friend* are respectively jointly significant at the 1% level in all models. Dummies for *origin* are jointly significant at the 1% level in models i to iv, the 10% level in v but insignificant in vi. Dummies for *ethlive* are jointly insignificant at the 10% level in all the models except model i.

Table 3.6 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)	
originp	−.103	***	−.101	***	−.088	***	−.087	***	−.078	*	−.076	*
	.033		.031		.028		.028		.041		.041	
originr	−.007		−.035		−.013		−.016		.004		−.002	
	.081		.079		.089		.091		.113		.116	
friend1	.204	***	.190	***	.202	***	.204	***	.208	***	.210	***
	.041		.044		.041		.042		.051		.052	
friend2	.306	***	.279	***	.295	***	.293	***	.292	***	.289	***
	.029		.034		.039		.038		.056		.052	
ethlive0	−.056	**	−.045	*	−.051		−.051		−.071	*	−.071	*
	.028		.026		.039		.039		.042		.042	
ethlive2	−.015		−.002		−.027		−.026		−.021		−.020	
	.057		.059		.046		.046		.065		.066	
econ	.025	*	.020		.021		.020		.012		.012	
	.013		.013		.013		.013		.015		.016	
polit	.045	***	.044	***	.044	***	.044	***	.061	***	.060	***
	.014		.013		.015		.015		.013		.013	
media	.036	***	.032	***	.025		.025		.022		.021	
	.012		.011		.016		.016		.019		.019	
happy	.028	**	.024	**	.027	***	.027	***	.032	***	.032	***
	.012		.011		.010		.010		.010		.009	
inc	.040	**	.039	***	.041	***	.041	***	.037	***	.037	***
	.017		.014		.012		.013		.010		.011	
edu0	−.164	***	−.150	**	−.197	***	−.197	***	−.116	*	−.112	*
	.058		.070		.063		.067		.065		.065	
edu1	−.100	***	−.088	***	−.110	***	−.111	***	−.036		−.042	
	.029		.024		.031		.030		.038		.036	
edu2	−.086	**	−.082	**	−.107	**	−.106	**	−.130	***	−.127	***
	.036		.036		.043		.042		.036		.037	
edu4	.014		.003		−.010		−.016		−.008		−.015	
	.063		.059		.058		.056		.063		.061	
edu5	.228	***	.209	***	.196	***	.194	***	.176	***	.173	***
	.044		.039		.047		.049		.050		.053	
edu6	.011		−.003		−.046		−.049		.002		.000	
	.073		.071		.064		.067		.086		.089	
fparent	.083		.067		.076		.072		−.004		−.005	
	.077		.076		.075		.074		.037		.038	
female	−.011		−.006		−.000		−.001		−.018		−.017	
	.035		.038		.043		.043		.042		.043	
age	−.003	***	−.004	***	−.003	***	−.003	***	−.003	***	−.003	***
	.001		.001		.001		.001		.000		.000	
s.d. of *host**	1.218		1.229		1.233		1.234		1.226		1.228	
obs.	17,420		17,167		14,692		14,692		12,412		12,412	
log pseudo-likelihood	−17,523		−17,148		−14,610		−14,597		−12,528		−12,516	
pseudo-R^2	.141		.147		.150		.151		.145		.146	

Model iii further adds *isub*, *unemploy* and *employer* to model ii. We find these added variables insignificant. Note that the inclusion of *isub* means that the sample for this specification is of 14 countries without Belgium.[34] We now find *media* statistically insignificant.

In model iv, we further add these 3 variables interacted with *labor* in order to check whether the importance of labour-market concern for determining *host** depends on a respondent's position in the labour market. We find the estimated coefficient on *labor*employer* significantly negative. Its size suggests that their perceptions of immigrants' impact on the number of job opportunities do not really matter to their opinions on the permissible number of immigrants from poorer countries of Europe, ie, $\partial host^*/\partial labor = .073 - .095 = -.022$ for employers.

Model v repeats model iii by replacing *isub* with *osub*. As a result of the use of this occupation-based measure of labour substitutability between citizens and non-citizens, *origin* dummies now become jointly insignificant. We find *osub*, *unemploy* and *employer* insignificant as in model iii. Note that the inclusion of *osub* means that the sample for this model is of 12 countries without Belgium, France and Sweden.[35] We find the estimated coefficients on *edu0* and *edu1* insignificant.

Model vi is the *osub* version of model iv. The estimated coefficient on *employer* is now significantly positive, ie, employers are likely to prefer more immigration than the rest, other things being equal. As in model iv where *isub* is used, employers' perceptions of immigrants' impact on the number of job opportunities do not really matter to their opinions on the permissible number of immigrants from poorer countries of Europe, ie, $\partial host^*/\partial labor = .085 - .097 = -.012$ for them.[36]

3.6.2. Importance of *fiscal*

We now examine the importance of public-finance concern for the determination of *host**. We present the results from 7 models estimated by ordered probit in Table 3.7 where we

[34] See Table 3.1.

[35] See Table 3.2.

[36] As the results in models v and vi suggest, *osub* appears unimportant to *host** while its estimated coefficient was found significantly negative in explaining *labor* (subsection 3.5.1). Hence we tried to use *osub* as an instrument for *labor*, but failed to obtain a result. See section 3.4.

use our measure of real net income per capita (*inc*). The use of intracountry relative net income per capita (*relinc*) instead of *inc* yields similar results which are therefore presented in Table A3.6 in the appendix.

In model i, we add *fiscal* to Table 3.6's model i. We find its estimated coefficient significantly positive, which suggests that those who perceived a more positive net fiscal contribution of immigrants were likely to permit more immigration from poorer European countries. The other estimated coefficients are similar to those of Table 3.6's model i.

In model ii, we add *benefit*, *pension* and *parent1* to model i. We find none of these dummies that indicate beneficiaries of social welfare provision statistically significant. The other coefficients remain roughly the same as in model i.

In model iii, we add to model ii the interaction terms of *fiscal* with these 3 variables and *inc* respectively in order to check whether the importance of *fiscal* for determining *host** depends on a respondent's level of income or/and net fiscal contribution. We find none of them significant. We also find *inc* on its own becomes insignificant.

In model iv, we add to model iii the interaction terms with our measure of tax progressivity (*tp*) and social welfare generosity (*nrr*). We like to check whether these two country characteristics affect the influence of public-finance concern on the desirable number of immigrants. We find all the terms involving *benefit* statistically significant except *benefit* on its own. The estimated partial effect of *fiscal* on *host** among those who rely on non-pension social welfare benefits differs from that among the rest by $-.202 - .896tp + .473nrr$. This indicates that more generous welfare provision increases the partial effect of *fiscal* on *host** among them. That is, public-finance concern becomes more important for the formation of *host**. On the other hand, more progressive taxation negatively contributes to the partial effect among them. The more progressive the tax system is, the less affected they are likely to be because they are net beneficiaries. Hence public-finance concern becomes less important for their opinion formation. For the mean values of *tp* and *nrr* (given in Table 3.3), the estimated partial effect of *fiscal* on *host** is approximately .059 among non-pension welfare beneficiaries.

The estimated partial effect of *fiscal* on *host** among pensioners differs from that among the rest by $-.050nrr$. This indicates that higher welfare generosity negatively contributes to the partial effect of *fiscal* on *host** among them. In other words, public-finance concern becomes less important in a more generous welfare state. Furthermore, pensioners seem to have some other reasons that make them prefer more immigration than the others: the coefficient on *pension* on its own is significantly positive.

We find none of the terms involving *parentl* statistically significant, although they are jointly significant at the confidence level of 1 percent. We find that the partial effect of *fiscal* on *host** depends on real net income per capita: $\partial^2 host^*/\partial fiscal \partial inc \simeq .039 - .053nrr$. If nrr were sufficiently high, its sign would be negative, ie, higher income then implies lower $\partial host^*/\partial fiscal$, other things being equal. In other words, under a generous welfare system, public-finance concern matters to the desirable level of immigration more among low-income earners than among high-income earners.

In model v, we still add to model iv interaction terms involving *fshare*. By including these interactions, we hope to check whether the importance of *fiscal* for *host** that may depend on tax progressivity and/or welfare generosity also depends on the presence of non-citizens in the country. First, we can summarise the difference in the estimated partial effect of *fiscal* on *host** between non-pension social welfare beneficiaries and the rest as follows: $-.417\ -2.897tp\ +(1.197\ -22.341fshare)nrr$. On the one hand, this suggests that more generous welfare provision would contribute positively to the partial effect among them if the share of non-citizens in the total population is sufficiently low, ie, $fshare < 1.197/22.341 \simeq .053$. It implies that the net fiscal impact of immigration becomes a more important issue for them if welfare provision is generous and there are not many immigrants in the country, other things being equal. Note that, in models xii and xiii in Table 3.5, we found that non-pension welfare beneficiaries perceived a more positive fiscal impact of immigration under generous welfare provision and a low presence of foreigners in the country. This then implies that *fiscal* is important because they think that immigrants contribute to the welfare system positively. On the other hand, more progressive taxation would negatively contribute to the partial effect of *fiscal* on *host** among them: potential tax increase is unlikely to affect

these beneficiaries when the tax system is progressive, so immigrants' fiscal impact becomes unimportant in thinking of the desirable level of immigration.

The positive coefficient on *pension* on its own remains significant, indicating that pensioners were likely to prefer more immigration *ceteris paribus* by reasons unexplained in the model. The estimated partial effect of the perception of immigration's net fiscal contribution on the permissible number of immigrants differs between those who rely on pension benefits and the rest by $(21.367tp - 2.026nrr)fshare$. This suggests that the partial effect unambiguously increases under a more progressive tax system or/and a less generous social welfare system among pensioners. An increase in the share of non-citizens in the total population may increase or decrease the partial effect depending on the sign of the sum in the brackets. For the mean values of *tp*, *nrr* and *fshare* (given in Table 3.3), the estimated partial effect is approximately .133 among them.

We find all the terms involving *parent1* statistically significant except *parent1* on its own. The estimated partial effect of *fiscal* on *host** differs between lone parents with at least one child living together and the rest by $-.318 + 4.281fshare + (4.129 - 85.107fshare)tp + (10.867fshare - .345)nrr$. The interpretation of this is rather difficult. It suggests that more generous welfare provision would contribute positively to the partial effect of *fiscal* among them if the share of non-citizens in the total population is sufficiently high, ie, $fshare > .345/10.867 \simeq .031$. However, if $fshare > 4.129/85.107 \simeq .048$, more progressive taxation would negatively contribute to it. For the mean values of *tp*, *nrr* and *fshare*, the estimated partial effect is approximately .106 among them.

The estimated partial effect of *fiscal* on *host** depends on real net income per capita:

$$\frac{\partial^2 host^*}{\partial fiscal \partial inc} \simeq .170 - 3.067fshare + (18.039fshare - .854)\, tp - .067nrr$$

which suggests that welfare generosity contributes unambiguously negatively to the second partial derivative. Tax progressivity contributes positively to it if $fshare > .854/18.039 \simeq .047$. However, a higher *fshare* reduces the second partial derivative via the second term. If its sign is positive, higher income results in a larger contribution of *fiscal* to determining

Table 3.7 Ordered probit models for explaining *host by *fiscal***

	i	ii	iii	iv	v	vi	vii
benefit*fiscal*nrr*fshare	..	..	..	..	−22.341 ***	..	−24.776 ***
					7.471		4.832
benefit*fiscal*nrr	..	..	..	.473 ***	1.197 ***	.379 ***	1.244 ***
				.083	.218	.125	.136
benefit*fiscal*tp*fshare	..	..	..	..	53.364 *	..	..
					27.855		
benefit*fiscal*tp	..	..	..	−.896 ***	−2.897 **	..	..
				.215	1.266		
benefit*fiscal*tp2*fshare	..	..	..	..	..	..	93.341 ***
							31.911
benefit*fiscal*tp2	..	..	..	..	..	−.858	−4.536 ***
						.595	1.697
benefit*fiscal*fshare	..	..	..	..	8.417 *	..	5.905
					4.959		6.092
benefit*fiscal	..	..	.026	−.202 ***	−.417 ***	−.151	−.276
			.018	.060	.158	.094	.232
benefit	..	−.098	−.203	−.206	−.196	−.206	−.198
		.083	.138	.136	.133	.137	.134
			(.325)	(.000)	(.000)	(.019)	(.000)
pension*fiscal*nrr*fshare	..	..	..	..	−2.026 **	..	−.281
					.822		1.874
pension*fiscal*nrr	..	..	..	−.050 ***	.026	−.038 ***	−.026
				.013	.037	.013	.071
pension*fiscal*tp*fshare	..	..	..	..	21.367 **	..	..
					9.234		
pension*fiscal*tp	..	..	..	.282 *	−.789	..	..
				.150	.605		
pension*fiscal*tp2*fshare	..	..	..	..	..	..	27.618
							22.798
pension*fiscal*tp2	..	..	..	..	..	.121	−1.478
						.213	1.113
pension*fiscal*fshare	..	..	..	..	−1.433 *	..	−2.909
					.794		1.871
pension*fiscal	..	..	−.015	−.018	.066	−.006	.156
			.010	.017	.056	.025	.097
pension	..	.039	.103 *	.102 **	.105 **	.108 **	.105 **
		.029	.054	.052	.052	.052	.052
			(.157)	(.002)	(.000)	(.001)	(.000)

(continued ...)

NB: Heteroscedasticity-robust standard errors appear in a small font, adjusting for intracountry correlation. p-values for joint significance are in brackets. The levels of significance are indicated by * (10%), ** (5%) and *** (1%). Dummies for *edu*, *friend* and *origin* are respectively jointly significant at the 1% level in all the estimated equations. Dummies for *ethlive* are jointly insignificant at the 10% level in all the models. Refer to Table 3 for the descriptions of the variables.

*host**. For the mean values of *tp*, *nrr* and *fshare*, the estimated value of this second derivative is approximately −.042. In this case, other things being equal, higher income means lower $\partial host^*/\partial fiscal$. Note, with the use of *relinc* instead of *inc*, we find a similar result, but the last term that involves *nrr* is not significant (Table A3.6, v).

Table 3.7 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)	
*parent1*fiscal*nrr*fshare*	..		..		..		..		10.867 2.291	***	..		9.490 3.544	***
*parent1*fiscal*nrr*	..		..		..		.076 .048		−.345 .096	***	.079 .042	*	−.316 .131	**
*parent1*fiscal*tp*fshare*	..		..		..		..		−85.107 19.019	***	..		..	
*parent1*fiscal*tp*	..		..		..		.121 .418		4.129 1.072	***	..		..	
*parent1*fiscal*tp2*fshare*	..		..		..		..		..		..		−128.894 37.063	***
*parent1*fiscal*tp2*	..		..		..		..		..		.021 .540		6.286 1.806	***
*parent1*fiscal*fshare*	..		..		..		..		4.281 1.626	***	..		9.566 2.684	***
*parent1*fiscal*	..		..		.012 .054		−.040 .062		−.318 .101	***	−.031 .073		−.556 .159	***
parent1	..		−.002 .047		−.055 .216		−.095 .224		−.057 .218		−.091 .222		−.047 .218	
					(.954)		(.005)		(.000)		(.006)		(.000)	
*inc*fiscal*nrr*fshare*	..		..		..		..		.800 .458	*	..		1.641 .839	*
*inc*fiscal*nrr*	..		..		..		−.053 .012	***	−.067 .015	***	−.051 .012	***	−.097 .029	***
*inc*fiscal*tp*fshare*	..		..		..		..		18.039 4.701	***	..		..	
*inc*fiscal*tp*	..		..		..		.083 .042	*	−.854 .227	***	..		..	
*inc*fiscal*tp2*fshare*	..		..		..		..		..		..		15.063 11.920	
*inc*fiscal*tp2*	..		..		..		..		..		.170 .061	***	−.694 .573	
*inc*fiscal*fshare*	..		..		..		..		−3.067 .417	***	..		−3.046 .980	***
*inc*fiscal*	..		..		.012 .006	*	.039 .011	***	.170 .019	***	.031 .010	***	.162 .050	***
inc	.044 .017	**	.041 .016	**	−.006 .019		−.010 .020		−.007 .021		−.010 .020		−.006 .021	
					(.026)		(.000)		(.000)		(.000)		(.000)	
fiscal	.071 .009	***	.071 .009	***	.061 .016	***	.058 .017	***	.060 .017	***	.058 .017	***	.060 .017	***

(continued ...)

Table 3.7 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)	
crime	.073	***	.073	***	.073	***	.074	***	.074	***	.074	***	.074	***
	.012		.012		.012		.012		.012		.012		.012	
culture	.146	***	.146	***	.146	***	.147	***	.146	***	.147	***	.147	***
	.008		.008		.008		.008		.008		.008		.008	
originp	−.090	***	−.091	***	−.091	***	−.088	***	−.088	***	−.089	***	−.089	***
	.031		.031		.031		.032		.032		.032		.032	
originr	−.022		−.025		−.030		−.030		−.030		−.032		−.030	
	.072		.074		.073		.075		.075		.075		.075	
friend1	.198	***	.198	***	.197	***	.195	***	.194	***	.194	***	.194	***
	.044		.044		.044		.041		.042		.041		.042	
friend2	.297	***	.297	***	.295	***	.296	***	.295	***	.294	***	.297	***
	.036		.037		.038		.038		.038		.037		.038	
ethlive0	−.052	*	−.053	*	−.054	*	−.050	*	−.049	*	−.051	*	−.050	*
	.029		.029		.028		.027		.027		.027		.027	
ethlive2	−.014		−.012		−.011		−.014		−.017		−.014		−.016	
	.060		.060		.059		.059		.060		.059		.060	
econ	.020		.020		.020		.021		.021		.021		.021	
	.014		.014		.014		.013		.013		.013		.013	
polit	.041	***	.041	***	.041	***	.041	***	.042	***	.041	***	.042	***
	.015		.015		.015		.015		.015		.015		.015	
media	.032	***	.032	***	.032	***	.033	***	.034	***	.034	***	.034	***
	.011		.011		.011		.011		.011		.011		.011	
happy	.027	**	.026	**	.026	**	.024	**	.024	**	.025	**	.024	**
	.013		.012		.013		.012		.012		.012		.012	
edu0	−.174	***	−.178	***	−.171	***	−.171	***	−.177	***	−.173	***	−.169	**
	.064		.063		.064		.064		.066		.064		.069	
edu1	−.118	***	−.118	***	−.116	***	−.110	***	−.116	***	−.112	***	−.111	***
	.025		.026		.027		.030		.029		.028		.029	
edu2	−.088	**	−.088	***	−.087	***	−.084	***	−.089	***	−.086	***	−.089	***
	.034		.033		.033		.032		.030		.031		.030	
edu4	.010		.010		.012		.010		.009		.009		.011	
	.060		.060		.060		.060		.061		.060		.061	
edu5	.220	***	.219	***	.215	***	.216	***	.216	***	.217	***	.218	***
	.043		.044		.044		.042		.041		.042		.041	
edu6	.004		.004		.002		−.000		.003		−.003		.001	
	.068		.068		.069		.070		.070		.069		.070	
fparent	.075		.077		.076		.073		.074		.074		.074	
	.080		.080		.079		.078		.079		.078		.078	
female	−.008		−.009		−.009		−.009		−.007		−.008		−.006	
	.036		.035		.035		.034		.034		.034		.034	
age	−.004	***	−.004	***	−.004	***	−.004	***	−.004	***	−.004	***	−.004	***
	.001		.001		.001		.001		.001		.001		.001	
s.d. of *host**	1.229		1.230		1.230		1.234		1.236		1.233		1.235	
obs.	17,066		17,066		17,066		17,066		17,066		17,066		17,066	
log pseudo-likelihood	−17,044		−17,039		−17,032		−16,995		−16,977		−17,001		−16,979	
pseudo-R^2	.147		.148		.148		.150		.151		.150		.151	

In model vi, we repeat model iv by replacing *tp* with *tp2*. That is, we regard employees' social security contributions as part of tax in approximating tax progressivity. The estimated partial effect of *fiscal* on *host** among those who rely on non-pension social welfare benefits depends positively on welfare generosity. Compared to model iv, tax progressivity does not now matter. We find all the terms involving *parent1* insignificant, although they are jointly significant. This was also the case in model iv. For pensioners, we find a significantly negative coefficient on *pension*fiscal*nrr*. Its size relative to the coefficient on *fiscal* suggests that public-finance concern is not very important for their opinions on the permissible level of immigration under a generous social welfare system. Note that those who rely on pension benefits were likely to prefer more immigration for reasons unexplained by the model. This was also the case in model iv.

The influence of *inc* on $\partial host^*/\partial fiscal$ is positively related to the alternative measure of tax progressivity and negatively to welfare generosity. Note that we obtain a positive number by substituting the sample's minimum of *tp2* and the maximum of *nrr* in $\partial^2 host^*/\partial fiscal \partial inc \simeq .031 + .170 tp2 - .051 nrr$. That is, *inc* is unambiguously positively related to $\partial host^*/\partial fiscal$, and higher income results in a larger contribution of *fiscal* to determining *host** under a more progressive tax system or/and a less generous welfare system. Note that, in model iv, the coefficient on *tp* was found insignificant.

In model vii, we repeat model v by replacing *tp* with *tp2*. The difference in the estimated partial effect of *fiscal* on *host** between those who rely on non-pension social welfare benefits and the others is $(93.341 fshare - 4.536) tp2 + (1.244 - 24.776 fshare) nrr$ which suggests that, if the share of non-citizens in the total population is sufficiently low, ie, *fshare* $< 4.536/93.341 \simeq .048$, the first term is negative. Tax progressivity then contributes negatively to the partial effect among them. However, if *fshare* $< 1.244/24.776 \simeq .050$, the second term is positive. In this case, welfare generosity contributes positively to it. Compared with model v, the use of *tp2* rather than *tp* makes the interaction of tax progressivity with *fshare* significant. As a result, the influence of tax progressivity on $\partial host^*/\partial fiscal$ among those beneficiaries becomes dependent on the presence of foreigners in the country.

We continue to find the coefficient on *pension* on its own significantly positive, as in models iv to vi. But none of the interaction terms involving *pension* is significant.

The difference in the estimated partial effect of *fiscal* on *host** between lone parents living with at least one child and the others is $-.556 + 9.566 fshare + (6.286 - 128.894 fshare) tp2 + (9.490 fshare - .316) nrr$. This suggests that tax progressivity would negatively contribute to the partial effect among such lone parents if the share of non-citizens in the total population is sufficiently high, ie, $fshare > 6.286/128.894 \simeq .048$. However, if $fshare > .316/9.490 \simeq .033$, welfare generosity would positively contribute to it among them. For the mean values of *tp2*, *nrr* and *fshare*, the estimated partial effect is approximately .095 among them.

The estimated partial effect of *fiscal* on *host** depends on the level of real net income per capita as follows: $\partial^2 host^*/\partial fiscal \partial inc \simeq .162 - 3.046 fshare - .097 nrr$. This suggests that welfare generosity as well as the presence of non-citizens in the country unambiguously negatively contribute to the second partial derivative. If the resulting sign is still positive, higher income implies a larger effect of *fiscal* on *host**. Compared to model v, we do not find tax progressivity important here. However, the *relinc* version of model vii in Table A3.6 yields a slightly different result: $\partial^2 host^*/\partial fiscal \partial relinc \simeq .162 - .059 nrr - 1.091 tp2 - 2.955 fshare$. Thus, tax progressivity negatively contributes to the influence of income on the partial effect of *fiscal* on *host** when using intracountry relative net income per capita.

3.6.3. Importance of *labor* and *fiscal*

We have so far examined the importance of labour-market and public-finance concerns separately for individual opinions on the permissible number of immigrants from poorer European countries. In this subsection, we now examine the importance of these two concerns for *host** together. We use *inc* in Table 3.8, and the results from the corresponding *relinc* version are reported in Table A3.7 in the appendix. Only where the results are remarkably different between the *inc* and *relinc* versions, do we refer to Table A3.7.

In model i of Table 3.8 below, we add to Table 3.6's model i only *labor* and *fiscal* on their own. The estimated coefficients on both of these are found significantly positive, and

the magnitude is similar to each other. The coefficients on the other explanatory variables are similar to Table 3.6's model i. We then add all the variables we have used in Tables 3.6 and 3.7. We use *isub* in models ii and iv and *osub* instead in models iii and v. We use *tp* in models ii and iii and *tp2* instead in models iv and v.

In all the 4 models, we confirm what we found in Table 3.6's models iv and vi. First, when using *osub*, we find that, other things being equal, employers are likely to permit more immigration than the others. Second, the perception of immigrants' impact on the number of job opportunities seems to have a slightly negative effect on *host** among employers, eg, $-.043 = .059 - .102$ in model ii and $-.037 = .068 - .105$ in model v. However, the magnitude is small: in model ii, for example, even one point decrease in the *labor* score increases only .034 standard deviations in *host** among employers.

Unexpectedly, we conclude that, other things being equal, those whose labour can be more easily substituted by non-citizens do not differ from the others regarding the influence of labour-market concern for the desirable level of immigration. Neither *labor*isub* nor *labor*osub* are found significant in models ii to v. We also confirm that labour-market concern matters no more to the unemployed than to the employed.

Before describing the results related to public-finance concern, we note a few things about the other explanatory variables. First, *origin* dummies lose significance when we use *osub* rather than *isub*. Second, *ethlive* dummies are consistently insignificant in not only Table 3.8 but also Tables 3.6 and 3.7: the perceived presence of ethnic minorities in residential areas does not matter to opinions on the permissible level of immigration. Third, with *isub*, those with low educational attainment distinguish themselves from the others by preferring less immigration. But by replacing *isub* by *osub*, this difference disappears.

Let us now turn to the importance of *fiscal* for *host**. First, we focus on those who rely on non-pension social welfare beneficiaries. In models ii and iv where *isub* is used, the sign, size and significance of each pair of the corresponding coefficients are similar to each other. The difference is that the negative coefficient on *fiscal*benefit* is significant in model ii but not in model iii. In model ii, for example, the difference in the estimated partial effect of *fiscal* on *host** between non-pension welfare beneficiaries and the rest is

$-.194 + (85.228 fshare - 4.289) tp + (1.170 - 20.851 fshare) nrr$. The relationship among *tp*, *nrr* and *fshare* in the equation is what we found in model vii in Table 3.7. It suggests that tax progressivity contributes negatively to the partial effect if the share of non-citizens in the total population is sufficiently low, ie, $fshare < 4.289/85.228 \simeq .050$. On the other hand, welfare generosity contributes positively if $fshare < 1.170/20.851 \simeq .056$. In the case of model iv, the threshold *fshare* is slightly lower than in model ii, but we observe the same relationship among *tp2*, *nrr* and *fshare*.

This relationship among tax progressivity, welfare generosity and the presence of non-citizens loses statistical significance when we replace *isub* by *osub* in models iii and v. Only the positive coefficient on *fiscal*benefit*nrr* is significant, which suggests that welfare generosity positively contributes to the partial effect of *fiscal* on *host** among those who rely on non-pension social welfare benefits. The magnitude is similar in each case. It then appears that, for non-pension social welfare beneficiaries, it does not really matter whether *tp* or *tp2* is used in estimation, but the significance of the result is sensitive to the measure of labour substitutability between citizens and non-citizens. If we use the industry-based measure of non-citizens' penetration into the national labour market, we find most of the interaction effects significant. If we use the occupation-based measure, we have a simple interpretation: these welfare beneficiaries are more concerned with immigrants' net fiscal contribution if benefits are not trivial.

Second, the coefficients on the terms involving *pension* are consistent in their signs across the models except iii, but the significance of each coefficient is not. The use of *osub* results in none of the terms being significant in models iii and v. The use of *isub* gives the difference in the estimated partial effect of *fiscal* on *host** between those whose household income depended mainly on pension and the others as follows in model ii where we use *tp*: $(26.437 tp - 3.087 nrr) fshare$. This implies that tax progressivity contributes positively, and welfare generosity contributes negatively, to the partial effect. Compared to Table 3.7's model v, the relationship between *tp*, *nrr* and *fshare* is preserved. By using *tp2* instead of *tp*, we get $.279 - 5.589 fshare + (67.652 fshare - 3.021) tp2$. We now see that welfare generosity no longer matters. In addition, the contribution of tax progressivity can

be either positive or negative depending on the sum inside the brackets of the third term. It is hard to conclude about this group of respondents from these results. Note that, in Table 3.7's model vii where *labor*-related terms were absent, all the terms interacted with *pension* were insignificant.

Third, we find the signs of the coefficients on the terms involving *parent1* are consistent across models ii to v. We observe that the positive coefficient on *parent1* is not significant in models ii and iv where we use *isub*, but it is in models iii and v where *osub* is used instead. On the other hand, the positive coefficient on *parent1*fiscal*fshare* is significant when *isub* is used but not when *osub* is used. Regarding the significant signs which are of our interest, the 4 models consistently indicate that the share of non-citizens in the country's total population should be sufficiently high if tax progressivity should contribute negatively to the partial effect of *fiscal* on *host** among lone parents with at least one child living together. A sufficiently high share of non-citizens in the total population also implies that welfare generosity would positively contribute to the partial effect of *fiscal* on *host** among them. The finding is consistent with what we saw in Table 3.7's models v and vii. Note that the sign on each coefficient on the terms related to tax progressivity or welfare generosity is opposing between the lone parents and those who rely on non-pension welfare benefits.

Finally, let us look at the terms involving *inc*. The signs of the coefficients on these terms are consistent across the models except v: in model v where we use *osub* and *tp2*, none of these terms are significant. In models ii and iii where *tp* is used instead of *tp2*, both tax progressivity and welfare generosity seem to matter, while they do not when *tp2* is used. In models ii to iv, *inc*fiscal*fshare* and *inc*fiscal* are significant. The influence of *inc* on the estimated partial effect of *fiscal* on *host** in model iii for example is

$$\frac{\partial^2 host^*}{\partial fiscal \partial inc} \simeq .143 - 2.673 fshare + (7.713 fshare - .400)\, tp + (2.061 fshare - .106)\, nrr$$

This suggests that both tax progressivity and welfare generosity would contribute positively to the second partial derivative if the share of non-citizens in the country's total population is sufficiently high. The relationship among *tp*, *nrr* and *fshare* is the same as in model ii,

although *inc*fiscal*nrr*fshare* is not significant at the 5 % level in model ii. In model iv where we use *tp2* and *isub*, we find neither tax progressivity nor welfare generosity matters. Note that the *relinc* version in Table A3.7 implies that welfare generosity does not matter when *isub* is used, but the use of *osub* indicates tax progressivity does not matter. Nevertheless, we again find that either tax progressivity or welfare generosity would contribute positively to the second partial derivative if the share of non-citizens in the country's total population is sufficiently high.

Table 3.8 Ordered probit models for explaining *host* by both *labor* and *fiscal*

	i	ii		iii		iv		v		vi		vii		viii		ix	
*benefit*fiscal*nrr*fshare*	..	−20.851	***	−12.759	*	−27.624	***	−19.441	*	..		..		..		..	
		4.138		7.152		6.327		10.520									
*benefit*fiscal*nrr*	..	1.170	***	.851	***	1.333	***	1.004	***	.444	***	.447	***	.378	***	.375	***
		.151		.247		.191		.361		.075		.058		.099		.089	
*benefit*fiscal*tp*fshare*	..	85.228	***	32.382		..		..		..		..		..		..	
		22.040		53.821													
*benefit*fiscal*tp*	..	−4.289	***	−1.911		..		..		−.683	***	−.715	***	..		..	
		1.024		2.368						.235		.059					
*benefit*fiscal*tp2*fshare*	..	..		..		147.913	***	57.795		..		..		..		..	
						28.491		127.731									
*benefit*fiscal*tp2*	..	..		..		−6.785	***	−2.685		..		..		−.787		−.765	**
						1.444		5.693						.536		.372	
*benefit*fiscal*fshare*	..	2.780		4.575		1.450		6.888		..		..		..		..	
		2.302		3.191		4.841		10.787									
*benefit*fiscal*	..	−.194	**	−.308	*	−.066		−.347		−.203	***	−.195	***	−.156	**	−.150	**
		.096		.176		.184		.506		.050		.046		.073		.060	
benefit	..	−.199	*	−.174		−.196		−.170		−.206	*	−.181		−.203	*	−.179	
		.119		.112		.121		.113		.121		.113		.123		.114	
		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
*pension*fiscal*nrr*fshare*	..	−3.087	***	−1.644		−3.511	*	−3.457		..		..		..		..	
		1.113		2.358		1.911		3.196									
*pension*fiscal*nrr*	..	.035		−.012		.076		.072		−.079	***	−.060	***	−.060	***	−.040	**
		.050		.079		.082		.105		.017		.013		.017		.016	
*pension*fiscal*tp*fshare*	..	26.437	**	13.296		..		..		..		..		..		..	
		12.380		24.989													
*pension*fiscal*tp*	..	−.760		−.221		..		..		.517	***	.437	***	..		..	
		.738		1.298						.169		.105					
*pension*fiscal*tp2*fshare*	..	..		..		67.652	**	64.489	*	..		..		..		..	
						26.983		38.408									
*pension*fiscal*tp2*	..	..		..		−3.021	**	−2.902	*	..		..		.386		.280	
						1.433		1.759						.284		.275	
*pension*fiscal*fshare*	..	−1.414		−.489		−5.589	**	−5.122	*	..		..		..		..	
		1.052		1.703		2.503		2.735									
*pension*fiscal*	..	.060		.013		.279	**	.259	*	−.028		−.029	*	−.022		−.020	
		.068		.106		.129		.143		.019		.015		.029		.030	
pension	..	.098	*	.101		.099	*	.105		.098	*	.101		.104	*	.108	
		.056		.079		.056		.079		.057		.080		.056		.079	
		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.095)	

(continued ...)

NB: Heteroscedasticity-robust standard errors appear in a small font, adjusting for intracountry correlation. *p*-values for joint significance are in brackets. To avoid perfect multicollinearity, the *be* dummy is dropped in models inculding *isub*, while dummies for *be*, *fr* and *se* are dropped in models including *osub*. Dummies for *edu* and *friend* are respectively jointly significant at the 1% level in all the estimated equations. Dummies for *origin* are jointly significant at the 1% level except models iii, v, vii and ix where they are jointly insignificant at the 10% level. Dummies for *ethlive* are jointly insignificant at the 10% level in all the models.

Table 3.8 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)		(viii)		(ix)	
*parent1*fiscal*nrr*fshare*	..		12.909	***	2.949	***	16.753	***	7.849	***	..		..		..		..	
			2.254		.636		2.560		2.711									
*parent1*fiscal*nrr*	..		−.454	***	−.151	***	−.594	***	−.312	***	.055		−.056	***	.061		−.044	***
			.099		.026		.113		.097		.055		.013		.050		.016	
*parent1*fiscal*tp*fshare*	..		−107.804	***	−14.684	**	..		..		..		..		..		..	
			18.740		5.976													
*parent1*fiscal*tp*	..		5.307	***	1.131	***	..		..		.199		.545	***	..		..	
			.964		.264						.459		.070					
*parent1*fiscal*tp2*fshare*	..		..		..		−199.216	***	−77.508	**	..		..		..		..	
							31.361		33.497									
*parent1*fiscal*tp2*	..		..		..		9.291	***	3.901	***	..		..		.070		.638	***
							1.556		1.431						.662		.166	
*parent1*fiscal*fshare*	..		5.976	***	.006		12.987	***	4.131	*	..		..		..		..	
			1.446		.487		2.260		2.395									
*parent1*fiscal*	..		−.430	***	−.145	***	−.766	***	−.360	***	−.059		−.127	***	−.048		−.138	***
			.091		.024		.149		.106		.060		.016		.078		.024	
parent1	..		.064		.340	***	.073		.335	***	.008		.339	***	.012		.339	***
			.207		.054		.207		.054		.216		.055		.214		.055	
			(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.001)		(.000)	
*inc*fiscal*nrr*fshare*	..		1.113	*	2.061	***	.332		5.165		..		..		..		..	
			.645		.432		1.739		3.331									
*inc*fiscal*nrr*	..		−.080	***	−.106	***	−.054		−.219	*	−.060	***	−.055	***	−.058	***	−.055	***
			.021		.013		.063		.118		.015		.013		.014		.012	
*inc*fiscal*tp*fshare*	..		18.608	***	7.713	***	..		..		..		..		..		..	
			6.268		2.248													
*inc*fiscal*tp*	..		−.900	***	−.400	***	..		..		.068	*	.033		..		..	
			.303		.108						.041		.031					
*inc*fiscal*tp2*fshare*	..		..		..		33.657		−31.402		..		..		..		..	
							22.408		39.262									
*inc*fiscal*tp2*	..		..		..		−1.543		1.382		..		..		.145	**	.084	
							1.007		1.701						.061		.057	
*inc*fiscal*fshare*	..		−3.413	***	−2.673	***	−4.446	***	.060		..		..		..		..	
			.530		.273		1.588		2.568									
*inc*fiscal*	..		.187	***	.143	***	.237	***	.000		.046	***	.045	***	.038	***	.040	***
			.026		.008		.079		.128		.011		.011		.010		.009	
inc	.043	***	−.009		−.007		−.004		−.004		−.012		−.008		−.010		−.007	
	.015		.015		.024		.016		.024		.015		.024		.015		.024	
			(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
fiscal	.057	***	.047	***	.051	***	.048	***	.051	***	.045	***	.050	***	.045	***	.050	***
	.007		.014		.019		.014		.019		.014		.019		.014		.019	

(continued ...)

Table 3.8 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)		(viii)		(ix)	
*isub*labor*	..		.005 .004		..		.006 .004		..		.006 .005		..		.006 .004		..	
isub	..		−.030 .037		..		−.031 .037		..		−.031 .037		..		−.031 .037		..	
			(.423)				(.411)				(.393)				(.361)			
*osub*labor*	..		..		−.001 .005		..		−.001 .005		..		−.001 .005		..		−.001 .005	
osub	..		..		−.077 .061		..		−.078 .060		..		−.076 .061		..		−.076 .061	
					(.343)				(.328)				(.354)				(.353)	
*unemploy*labor*	..		−.010 .031		−.007 .033		−.009 .031		−.006 .033		−.008 .032		−.007 .033		−.007 .032		−.005 .033	
unemploy	..		.042 .097		.014 .092		.037 .096		.009 .091		.034 .099		.006 .091		.031 .100		.003 .091	
			(.909)		(.976)		(.927)		(.984)		(.943)		(.976)		(.950)		(.983)	
*employer*labor*	..		−.102 .026	***	−.107 .025	***	−.101 .026	***	−.105 .026	***	−.102 .026	***	−.106 .026	***	−.101 .026	***	−.105 .026	***
employer	..		.372 .214	*	.472 .196	**	.365 .216	*	.465 .198	**	.370 .214	*	.468 .198	**	.365 .215	*	.464 .199	**
			(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
labor	.059 .008	***	.059 .005	***	.069 .008	***	.059 .005	***	.068 .008	***	.059 .006	***	.069 .008	***	.058 .005	***	.068 .008	***
crime	.066 .011	***	.072 .010	***	.075 .013	***	.072 .010	***	.075 .013	***	.072 .010	***	.075 .013	***	.072 .010	***	.075 .013	***
culture	.135 .009	***	.131 .007	***	.133 .010	***	.130 .007	***	.133 .010	***	.131 .007	***	.133 .010	***	.130 .007	***	.133 .010	***
originp	−.091 .030	***	−.075 .029	**	−.059 .042		−.076 .029	***	−.060 .042		−.074 .028	**	−.060 .042		−.075 .028	***	−.062 .042	
originr	−.042 .077		−.038 .091		−.026 .119		−.040 .091		−.026 .119		−.037 .090		−.028 .119		−.040 .090		−.031 .120	

(continued ...)

Table 3.8 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)		(viii)		(ix)	
friend1	.189	***	.199	***	.208	***	.199	***	.208	***	.200	***	.209	***	.199	***	.208	***
	.046		.042		.052		.042		.052		.042		.052		.042		.051	
friend2	.280	***	.294	***	.290	***	.293	***	.290	***	.295	***	.289	***	.294	***	.287	***
	.040		.047		.067		.047		.067		.047		.067		.047		.066	
ethlive0	−.043		−.045		−.067	*	−.046		−.068	*	−.046		−.068	*	−.047		−.069	*
	.027		.037		.038		.037		.038		.037		.039		.037		.039	
ethlive2	−.001		−.025		−.004		−.026		−.005		−.022		−.005		−.023		−.006	
	.060		.047		.067		.047		.067		.045		.066		.045		.066	
econ	.017		.019		.010		.019		.010		.019		.010		.019		.010	
	.014		.013		.015		.013		.015		.013		.015		.013		.015	
polit	.041	***	.042	***	.060	***	.042	***	.061	***	.041	**	.059	***	.041	**	.060	***
	.014		.016		.013		.016		.013		.016		.013		.016		.013	
media	.029	***	.024		.022		.024		.022		.023		.022		.023		.022	
	.010		.015		.018		.015		.018		.015		.018		.015		.018	
happy	.024	*	.026	**	.033	***	.025	**	.033	***	.026	**	.033	***	.026	**	.033	***
	.012		.010		.008		.010		.008		.010		.008		.010		.008	
edu0	−.161	**	−.207	***	−.107		−.199	***	−.103		−.198	***	−.098		−.203	***	−.102	*
	.076		.067		.065		.070		.070		.068		.059		.068		.062	
edu1	−.107	***	−.126	***	−.042		−.119	***	−.035		−.118	***	−.037		−.121	***	−.038	
	.023		.036		.041		.039		.039		.036		.045		.036		.045	
edu2	−.085	**	−.106	***	−.116	***	−.107	***	−.118	***	−.100	***	−.115	***	−.103	***	−.119	***
	.034		.035		.035		.035		.035		.037		.036		.037		.034	
edu4	.001		−.019		−.013		−.018		−.013		−.016		−.016		−.017		−.016	
	.058		.057		.062		.057		.061		.056		.062		.056		.062	
edu5	.206	***	.190	***	.174	***	.191	***	.174	***	.190	***	.172	***	.191	***	.173	***
	.040		.046		.050		.045		.050		.048		.050		.047		.050	
edu6	−.006		−.054		−.029		−.052		−.031		−.053		−.026		−.055		−.032	
	.068		.064		.107		.065		.107		.065		.106		.065		.106	
fparent	.065		.069		−.009		.071		−.007		.068		−.009		.068		−.008	
	.078		.076		.033		.075		.033		.074		.033		.075		.033	
female	−.005		.002		.020		.003		.021		−.000		.021		.000		.021	
	.038		.041		.044		.041		.044		.042		.044		.042		.044	
age	−.004	***	−.003	***	−.004	***	−.004	***	−.004	***	−.004	***	−.004	***	−.004	***	−.004	***
	.001		.000		.000		.000		.000		.000		.000		.000		.000	
s.d. of *host**	1.236		1.249		1.244		1.248		1.243		1.247		1.243		1.246		1.242	
obs.	16,854		14,438		12,184		14,438		12,184		14,438		12,184		14,438		12,184	
log pseudo-likelihood	−16,760		−14,219		−12,170		−14,221		−12,174		−14,236		−12,177		−14,242		−12,183	
pseudo-R^2	.151		.158		.154		.158		.154		.157		.154		.157		.153	

To make interpretation easier regarding the public-finance concern about immigration, we also estimated models without interactions with *fshare*. The results are presented in models vi to ix. We use *tp* in models vi and vii, and *tp2* in viii and ix instead. We include *isub* in models vi and viii, and *osub* in vii and ix instead.

We find the estimated coefficient on *benefit*fiscal* significantly negative, which implies that, other things being equal, the perceived fiscal impact of immigration mattered less to the desirable level of immigration from poorer European countries among those EU15 citizens who relied on non-pension welfare benefits. However, the estimated coefficient on *benefit*fiscal*nrr* is significantly positive, which implies that *fiscal* matters more to *host** among them under a more generous welfare system. We also find *benefit*fiscal*tp* (or *benefit*fiscal*tp2*) significantly negative except in model viii, which might suggest that *fiscal* matters less to *host** among them under a more progressive tax system.

As for pensioners, we find that the estimated coefficient on *pension*fiscal*nrr* is significantly negative, which implies that the perceived fiscal impact of immigration is less important for the desirable level of immigration among them under a more generous welfare system.

The estimated coefficients on the terms involving *parent1* in models vi to ix do not give consistent results. The use of *osub* indicates that they are all statistically significant, while the use of *isub* makes them insignificant.

Finally, we find *inc*fiscal* significantly positive. That is, other things being equal, the higher the net per capita income is, the stronger the positive relationship between the perceived fiscal impact of immigration and the desirable level of immigration is.[37] We also find that the estimated coefficient on *inc*fiscal*nrr* is significantly negative. This suggests that the influence of *inc* on the partial effect of *fiscal* on *host** is reduced under a more generous welfare system.

[37]Note however that, in the *relinc* version in Table A3.7, *relinc*fiscal* is insignificant when *isub* is used rather than *osub*.

3.7. Discussion

One of the main findings of this chapter is that, other things being equal, the perceived impact of immigration on the number of job opportunities matters equally to the desirable level of immigration from poorer European countries, whether the person can or cannot be easily substituted by immigrants. Belonging to an occupation or an industry where immigrants are more present does not seem to make the influence of labour-market concern on the person's opinion any stronger. However, we found some evidence that more substitutable citizens (as defined in terms of occupation) are likely to perceive a more negative impact of immigration on the national job market. Therefore, if they tend to prefer less immigration, it is not because the marginal effect of job-market concern on the opinion is larger among them, but because they are likely to be located towards the lower end of the *labor* scale. A policy implication for gaining more support for the Free-Movement-of-Workers principle is that it is necessary to eliminate a situation where existing citizen workers are replaced by immigrants, or if such a situation does not exist we need to ensure everyone understood it in order to avoid misperception.

This study confirms what others have found in the literature: being unemployed does not relate to a desire for less immigration. In addition, we found that the status of being unemployed does not affect the influence of labour-market concern on the opinion about the desirable level of immigration, although we might *ex ante* expect it to strengthen it. We even did not find evidence that the unemployed are likely to perceive a more negative labour-market impact of immigration.

In this chapter, we also examined whether employers are different from the others. It has often been argued that employers tend to benefit from immigration via the availability of workers who are not too selective about the kind of job and are willing to accept a lower wage offer than what native workers would take. Employers would also benefit if they own production factors that are complementary to immigrants. However, in the literature, employers' opinions have not been analysed as far as I am aware of. We found some evidence that, other things being equal, being an employer itself implies that the person is

likely to permit more immigration from poorer European countries than the others. We also found that the perception of immigrants' impact on the number of job opportunities does not seem to matter to the opinion on the desirable level of immigration among employers. Note that, even though labour-market concern does not matter to their opinions, we found that they are likely to perceive a more positive impact of immigration on the number of job opportunities in the national labour market. Since employers seem to gain from immigration from poorer European countries, a potential policy for indirectly increasing support for the Free-Movement-of-Workers principle might be programmes that encourage entrepreneurship among citizens. By helping many to change their labour-market positions from employees to employers, demand for immigrants might increase overall.

Another economic motive that we studied is public-finance concern related to immigration. The interpretation of the results on this is not straightforward, as we found many interaction effects statistically significant. Modelling effort for examining this concern is made as a follow-up of Facchini and Mayda (2006) and Hanson, Scheve and Slaughter (2005). We paid attention to the relationship between per capita income and the desirable level of immigration because the level of income would approximate the person's net fiscal contribution in the economy. We also used three dummy variables to distinguish approximately between net beneficiaries and net contributors in those European welfare states.

We used a dummy explanatory variable that indicated whether the respondent was dependent on social welfare benefits which were unrelated to pension. We found the estimated coefficient on *benefit*fiscal* significantly negative, which suggests that the perceived fiscal impact of immigration is less important for *host** among those welfare beneficiaries than the rest *ceteris paribus*. This might be because they do not expect benefit cuts: net beneficiaries of the welfare system are unlikely to be affected by tax changes that might take place to adjust to immigration. However, we also found that, for those welfare beneficiaries, the generosity of welfare provision contributes positively to the relationship between the perceived fiscal impact of immigration and the desirable level of immigration from poorer European countries. Clearly, when the welfare system is more generous, public-finance concern becomes a more important issue because, for example, benefit cuts in very generous welfare

programmes can easily be argued when adjustment is necessary. These results appear fairly robust, for they remain statistically significant whether we use *tp* or *tp2*; *isub* or *osub*; and terms interacted with *fshare* or not.

As for pensioners, we consistently found *pension*fiscal*nrr* significantly negative if we do not include terms interacted with *fshare*. This might indicate that, among pensioners, the generosity of welfare provision contributes negatively to the relationship between the perceived fiscal impact of immigration and the desirable level of immigration from poorer European countries. The reason might be that pensioners are not worried about cuts in pension benefits. Pension benefit cuts are likely to be introduced to younger generations who are not yet recipients of the benefits.

The estimated coefficients on the terms involving lone parents who lived with at least one child are not consistent in terms of significance when we do not include terms interacted with *fshare*. When we include them (models ii to v in Table 3.8), we find it difficult to interpret the consistently significant coefficients. First, the estimated coefficient on *parent1*fiscal* is significantly negative, but this negative relationship between *fiscal* and *host** is not all. We find both measures of tax progressivity and welfare generosity statistically significant. In particular, tax progressivity would contribute positively to the partial effect of *fiscal* on *host** if the share of foreigners in the total population were small. In other words, if the presence of immigrants is still low, the perceived fiscal impact of immigration is an important factor in considering the desirable level of immigration in a country with progressive tax. This might be a sign of concern about the unknown fiscal impact of immigration. On the other hand, if the presence of immigrants is already high, the perceived fiscal impact of immigration is less important in considering the desirable level of immigration in a country with progressive tax. The coexistence of high *fshare* and high *tp* (or *tp2*) may suggest that the fiscal adjustment to immigration had not affected those welfare beneficiaries in the past, which might make the fiscal impact of immigration unimportant among them.

Moreover, we found that welfare generosity would contribute negatively to the partial effect of *fiscal* on *host** if the share of foreigners in the total population were small. This suggests that, if the presence of immigrants is already high, the perceived fiscal impact

of immigration is more important in considering the desirable level of immigration in a country with generous welfare provision, ie, the generosity of welfare provision might be seen as changeable according to immigration. But, if the presence of immigrants is still low, generous welfare provision makes the perceived fiscal impact of immigration less important. Thus, it is very difficult to give interpretations to the statistically significant relationships between tax progressivity, welfare generosity and the presence of foreigners among those single parents.

As for the net income per capita, we consistently found *inc*fiscal* significantly positive and *inc*fiscal*nrr* significantly negative when we do not include the terms interacted with *fshare*. This suggests that, as far as social welfare provision is not very generous, the relationship between the perceived fiscal effect of immigration and the desirable level of immigration from poorer European countries is positive. This positive relationship is then strengthened, as income increases. On the other hand, when the welfare system is generous, $\partial^2 host^*/\partial fiscal \partial inc$ may be negative, which reduces the positive coefficient on *fiscal* on its own as income rises. That is, *fiscal* become more important for $host^*$ among low-income citizens.

Future research should improve on the variable that approximates tax progressivity, use an alternative measure of welfare generosity for robustness check and find a measure that reliably approximates immigrants' use of welfare programmes. These may result in unambiguous findings with respect to what we could not conclude in this study. Furthermore, as we explained in section 3.4, the estimation of the structural model is necessary to take into account the potential endogeneity of perceptions (*labor* and *fiscal*) in the main equation for explaining the desirable level of immigration.

3.8. Appendix

A. Weights

The ESS data set is provided with two types of weights. One is the sampling weight (named *dweight* in the original data set) in each country, and the other is the weight (named *pweight*) that is used to rescale *dweight* to reflect the relative size of each country's population in cross-country data analysis.[38] Since our analysis is cross-country, we need to apply both *dweight* and *pweight* together, ie, $pweight_i$*$dweight_i$. The sum of the products across observations in a country gives its total population aged 15 years and over divided by 10,000.

In order to focus on the attitudes of citizens in each country, we dropped cases who answered other than yes to Question C18: Are you a citizen of [the name of the country where the person is questioned]? We then need to rescale $pweight_i$*$dweight_i$ because the sum of the products across observations in a country should give its citizen population, not the total population, aged 15 years and over divided by 10,000. We simply discount each weight by multiplying $1 - f_k$ where f_k is the share of non-citizens in the total population of country k. We use figures from OECD (2005) for this discounting. See Table A3.3 below.

B. Creating *inc* and *relinc*

Question F30 asked each respondent the question "If you add up the income from all sources, which category describes your household's total net income? If you don't know the exact figure, please give an estimate." A respondent was then given a table where each category shows a range of income in Euros or relevant national currencies or both.[39] The responses to this question suffer from a large percentage of missing values: over 20 percent of the responses were recorded missing. Among these, almost 16 percent were those who refused to answer.

I assign the mid-value of each category's interval in terms of monthly income in Euros to the responses except the highest category which has no upper bound: 75 (= category J),

[38] See Häder and Gabler (2004) for the detail.

[39] However, respondents in Ireland were given a table with categories that are not consistent with those of the other countries. Compare Card 56 and Ireland's Card F6 available at ESS's website (http://ess.nsd.uib.no).

225 (= R), 400 (= C), 750 (= M), 1,250 (= F), 1,750 (= S), 2,250 (= K), 2,750 (= P), 4,000 (= D), 6,250 (= H) and 8,750 (= U). We remove the responses in category N (= 10,000 and over) rather than assign an arbitrarily chosen value to them, for they represent only 0.78 percent of the whole sample. I then divide these figures by the number of household members collected by Question F1. There are 6 missing responses to F1 having non-missing responses to F30. Since we cannot obtain per capita figures for these cases, I assign missing values to them. Finally, we convert these nominal figures into the real counterparts by dividing them by the corresponding country-level PPPs provided by Eurostat.[40] We use PPPs for 2002, for most of the survey was conducted from the last quarter of 2002 to the first quarter of 2003. In any case, the PPPs for 2002 and 2003 are not very different from each other. We use the PPPs based on the household final consumption expenditure (category e011), for the data we have are of net income. This variable is called *inc*.

Purchasing power parity for 2002

at	*be*	*de*	*dk*	*es*	*fi*	*fr*	*gb*	*gr*	*ie*	*it*	*lu*	*nl*	*pt*	*se*
1.014	.985	1.036	9.710	.818	1.198	1.022	.670	.792	1.179	.943	.987	1.015	.734	10.687

Source: Eurostat NB: The average for the 15 countries = 1

We also construct a measure of intra-country relative income. This may be useful if the relative income within the economy matters to our explained variables rather than the level of income, for the mean of *inc* varies across the countries. We divide the pre-PPP-adjusted *inc* by the corresponding country's mean of it to obtain *relinc*. For example, a respondent with *relinc* = 1.5 has monthly net income per capita 50 percent higher than his/her country's average.

Mean of *inc* by country

at	*be*	*de*	*dk*	*es*	*fi*	*fr*	*gb*	*gr*	*ie*	*it*
852.66	921.09	1,168.53	1,389.21	490.96	1,026.96	553.94	1,314.94	479.24	579.30	718.15
lu	*nl*	*pt*	*se*							
1,514.32	1,108.28	437.37	1,107.52							

Source: ESS, Round 1, Questions F30 and F1; Eurostat; Author's computation

C. Creating *media*

We create this variable by using the responses to the 3 separate questions "On an average weekday, how much of your time is spent watching television / listening to the radio /

[40] http://epp.eurostat.cec.eu.int/ Go to Data → Economy and finance → Prices → Purchasing power parities

reading newspapers about politics and current affairs? (A2 / A4 / A6 respectively)" Since people use different types of the media, the exposure to the media is best indicated by the total amount of time spent on the media regardless of types. Unfortunately, the question on the use of the internet (A7) did not focus specifically on politics and current affairs.

The responses to these questions were given on the same scale that has an equal interval in hours between categories: 0 (= No time at all), 1 (= Less than 0.5 hour), 2 (= 0.5 to 1 hour), 3 (= More than 1 and up to 1.5 hours), 4 (= More than 1.5 and up to 2 hours), 5 (= More than 2 and up to 2.5 hours), 6 (= More than 2.5 and up to 3 hours) and 7 (More than 3 hours). This enables us to combine the responses at the individual level. We assign an amount of hours for each category as follows: 0 (= 0), .25 (= 1), .75 (= 2), 1.25 (= 3), 1.75 (= 4), 2.25 (= 5), 2.75 (= 6) and 3.25 (= 7). We then aggregate the hours spent on TV, radio and newspapers giving information on current affairs and politics at the individual level.

Table A3.1 Per capita GDP and GNP in current international dollars, 2001

Rank	Country	GDP per capita	Country†	GNI per capita
1	Luxembourg	53,780		48,560
2	Ireland	32,410	Denmark	28,490
3	Denmark	29,000	Netherlands	27,390
4	Netherlands	27,190	Ireland	27,170
5	Austria	26,730		26,380
6	Belgium	25,520		26,150
7	Germany	25,350		25,240
8	Italy	24,670		24,530
9	Finland	24,430	UK	24,340
10	Sweden	24,180	France	24,080
11	UK	24,160	Finland	24,030
12	France	23,990	Sweden	23,800
13	Cyprus*	21,190		21,110
14	Spain	20,150		19,860
15	Portugal	18,150		17,710
16	Greece	17,440		17,520
17	Slovenia*	17,130		17,060
18	Czech Republic*	14,720		14,320
19	Malta*	13,160		13,140
20	Hungary*	12,340		11,990
21	Slovak Republic*	11,960		11,780
22	Estonia*	10,170		9,650
23	Poland*	9,450		9,370
24	Lithuania*	8,470		8,350
25	Latvia*	7,730		7,760

Source: World Bank's World Development Indicators 2003

NB: Figures of 2001, based on PPP GNI ≈ GNP

* New EU10 † Shown only if different from the second column

Table A3.3 Share of non-citizens in each country's total population, 2002

	at	*be*	*de*	*dk*	*es*	*fi*	*fr*	*gb*	*gr*	*ie*	*it*	*lu*	*nl*	*pt*	*se*
f_k	.088	.082	.089	.049	.031	.020	.056†	.045	.070‡	.048	.026	.381	.043	.040	.053

Source: OECD, 2005, Table A.1.5: 334

† The figure for France is of 1999 ‡ The figure for Greece is of 2001

Table A3.2
Empirical studies of determinants of individual opinions on the level of immigration

(a) United States

Study	Main data source (sample)	Method	Regressors of interest [result, relevant table in the study]
Espenshade & Hempstead (1996)	CBS News/New York Times poll 1993 (1,363; aged 18 and over; regardless of citizenship)	Ordered probit	• Immigrants mostly take jobs Americans don't want [significant, A8] • Most new immigrants do not end up on welfare [insignificant, A8] • Educational attainment [significant only among the uneducated, A8] • Household income [significant only among the low-income group, A8]
Citrin, Green, Muste & Wong (1997)	ANES 1992 (1,066)	Ordered probit	• Hispanics and Asians take jobs away from people already here [significant, 1] • They cause higher taxes due to more demands for public services [significant, 1] • Years of education [insignificant, 1] • Labour-supply status [insignificant, 1] • Income (made dichotomous; personal or household?) [insignificant, 1]
Scheve & Slaughter (2001)†	ANES 1992 (2,485) 1994 (1,795) 1996 (1,714)	Ordered probit	• Average wages by occupation as a proxy for labour skill [significant only among labour-force participants, 2 and 4] • Years of education (and also educational attainment) as a proxy for labour skill [significant only among labour-force participants, 2 and 4] • High share of immigrants in the residential-area population as a proxy for labour market competition [insignificant, 5]
Hanson, Scheve & Slaughter (2005)	ANES 1992 (2,978) 2000 (3,117)	Probit	• Educational attainment as a proxy for income level [significant among the educated, 5] • Income quartiles as an alternative [significant only interactions between high income and fiscal exposure, 8] • (Generous welfare state with high share of immigrants in the state population)*(Educational attainment) [significant only among the educated; particularly in states under progressive tax system, 5] • (State with high share of immigrant households receiving cash benefits)*(Educational attainment) [significant particularly among the educated, 5] • (High share of immigrants in the state population)*(Educational attainment) [significant only among the uneducated, 5]

NB: ANES = American National Election Studies † Kessler's (2001) study is almost identical except the use of additional samples from 1998 (1,281) and 2000 (1,807)

Table A3.2 (Continued, 2 of 5)

(b) Other single-country studies‡

Study [country]	Main data source (sample) [explained variable]	Method	Regressors of interest [result, relevant table in the study]
Fertig & Schmidt (2002) [Germany]	ALLBUS 1996 (3,499; regardless of citizenship) [Degree of agreement with the statement "Foreigners are a burden for the social security system in Germany"]	Ordered probit	▪ Currently unemployed status [insignificant, 11] ▪ Worry about being unemployed [insignificant, 11] ▪ Educational attainment [significant (less educated, more likely to agree), 11] ▪ Low share of foreigners in the regional population [significant (more likely to agree), 11]
de Melo, Miguet & Müller (2004) [Switzerland]	VOX 2000 (1,024; aged over 18; citizens only) [Voting on a popular initiative proposing a change in the constitution to reduce the share of foreigners from 19.3 to 18 percent]	Censored bivariate probit	▪ Years of schooling [significant (less educated, more likely to accept), 6.5 and 6.6] ▪ Mincer's potential earnings using schooling years and experience [significant (lower, more likely), 6.6] ▪ Canton-level unemployment rate [significant (lower, more likely), 6.5 and 6.6] ▪ Share of foreigners in the regional population [significant small magnitude (lower, more likely), 6.6]
Dustmann & Preston (2004) [UK]	BSAS (various sample size summarised in Table A1; white English only) 1983 1984 1985 1986 1987 1989 1990 [Desirable level of immigration by country of origin, categorised based on ethnicity]	Probit	▪ Average percentile point of household income as relative income [significant regarding ethnic minorities (higher ranking, less tolerant), 4] ▪ Educational attainment [significantly moderate among the educated (more educated, more tolerant), 4] ▪ County-level unemployment rate [insignificant, 4] ▪ Experience of unemployment [insignificant, 4] ▪ Share of ethnic minorities in the county population [insignificant, 4] ▪ Manual worker status [insignificant, 4]
		Factor model	▪ Labour-market concern score [significant moderate magnitude regarding ethnic minorities only among non-manual workers, 7 and 8] ▪ Fiscal concern score [significant moderate magnitude regarding ethnic minorities only among non-manual workers and the medium-to-high educated, 7 and 8]

NB: ALLBUS = Allgemeine Bevölkerungsumfrage der Sozialwissenschaften BSAS = British Social Attitude Survey ‡ See also Fetzer (2000: Part II) for studies of France, Germany and the US

Table A3.2 (Continued, 3 of 5)

(c) Cross-country studies

Study [countries]	Main data source (sample) [explained variable]	Method	Regressors of interest [result, relevant table in the study]
Dustmann & Preston (2006) [EU15, Czech Republic, Hungary, Norway, Poland, Slovenia, Switzerland]	ESS 2002-2003 (31,822; aged 15 or over) [Is immigration good or bad for the country's economy?]	Ordered probit Factor model	• Educational attainment [significant (less educated, more negative), 3] • Unemployed status [significant negative, 3] • Labour-market concern score [insignificant, 5] • Fiscal concern score [significant, 5]
Hainmueller & Hiscox (2006) [EU15, Czech Republic, Hungary, Israel, Norway, Poland, Slovenia, Switzerland]	ESS 2002-2003 (various estimation-specific sample size between 25,000 and 29,000; aged 15 or over; regardless of citizenship) [Desirable level of immigration by wealth and location (in/outside Europe) of origin country]	Probit	• Education [significant modest (more educated, more tolerant), 7] • Skill-based occupational categories [significant relatively large except low-skill category, 7] • Reported nominal household income [significant small magnitude, 7]
Brenner & Fertig (2006) [EU15, Hungary, Norway, Poland, Slovenia, Switzerland]	ESS 2002-2003 (24,874; aged 15 or over; citizens only) [Latent general attitude to immigration]	Ordered probit factor model / weighted least square	• Educational attainment [significant only among high education across countries (country-by-country estimation: this doesn't hold in Spain), 5.2 and 5.4] • Status of being unemployed [significant across countries (country-by-country estimation: significant only for Germany and Italy), 5.2 and 5.4] • Parents' educational attainment [significant only among high education across countries (country-by-country estimation: this doesn't hold in Hungary and Italy), 5.2 and 5.4]

NB: ESS = European Social Survey

Table A3.2 (Continued, 4 of 5)

(c) Cross-country studies (Continued)

Study	Main data source (sample) {countries} [explained variable]	Method	Regressors of interest [result, relevant table in the study]
Gang, Rivera-Batiz & Yun (2002)	Eurobarometer 1988 1997 (21,643; aged 16 to 70; EU citizens only) {Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, UK} [Are there too many non-EC/EU nationals living in the country?]	Probit	• Years in education [significant (less educated, more likely to agree), 5 and 6] • Number of children aged 15 or less [significant (more children, less likely to agree), 5 and 6] • Status of being unemployed [not significantly different from status of being employed, 5] • Being in education [significant (less likely to agree), 5] • Currently or in the past being in the labour force [significant (more likely to agree), 6] • Perception that many foreigners are present [significant (more likely to agree), 5 and 6]
Kessler & Freeman (2005)	Eurobarometer 1988 (6,311) 1993 (6,108) 1997 (7,742) 2000 (7,255) {EU12 (1988, 1993) and EU15 (1997, 2000)} [Are there too many non-EC/EU nationals living in the country?]	Ordered probit	• Status of being unemployed [significant except 1993 (opposing signs), 5] • Skill-based occupational categories [low-skill category significant negative only in 2000 (more likely to agree), high-skill category significant in 1988 and 1997 (less likely to agree), 5] • Perceived performance of national economy [significant in 1997 and 2000 (opposing signs), 5] • Educational level [significant (more educated, less likely to agree), 5] • Income quartile dummies [insignificant, 5]
Bauer, Lofstrom & Zimmermann (2000)	ISSP 1995 (over 11,700) {US, Canada, New Zealand; UK, Germany, Austria, Netherlands, Norway, Sweden; Ireland, Italy Spain} [The number of immigrants should be reduced]	Probit	• Educational attainment [significant (more educated, more tolerant), 2, 3 and 4] • Status of being unemployed [insignificant (significant if the explained variable is "immigrants take jobs away"), 2, 3 and 4] • Immigrants take jobs away [country-by-country estimation: significant in all countries, 6]

NB: ISSP = International Social Survey Programme

Table A3.2 (Continued, 5 of 5)

(c) Cross-country studies (Continued)

Study	Main data source (sample) {countries} [explained variable]	Method	Regressors of interest [result, relevant table in the study]
O'Rourke & Sinnott (2006)	ISSP 1995 (about 21,000) {UK, US, Hungary, Germany, Spain, Netherlands, Austria, Ireland, Bulgaria, Canada, Latvia, Czech Republic, Slovakia, Slovenia, Poland, Norway, Philippines, Australia, New Zealand, Russia} [The number of immigrants should be increased or reduced?]	Ordered probit / bivariate SUR probit	• High-skill occupation group [significant particularly among the labour-force participants (more tolerant), 3, 4 and 5] • (High-skill occupation group)*(country-level per capita GDP) [significant particularly among the labour-force participants (more tolerant), 3, 4 and 5] • (High-skill occupation group)*(country-level Gini coefficient) [significant particularly among the labour-force participants (less tolerant), 3, 4 and 5] • Status of being unemployed [insignificant, 3, 4 and 5]
Mayda (2006)	ISSP 1995 (about 23,000) WVS 1995-97 (about 36,000) {66 countries} [The number of immigrants should be increased or reduced? / Allow or limit people from other countries coming here to work?]	Probit	• Education [significant negative among the labour-force participants (more educated, less tolerant), 2] • Education*GDP [significant positive among the labour-force participants, 2] • Relative income [significant (wealthier, more tolerant), 1] • High-skill occupational category [significant negative, 2] • (High-skill occupational category)*GDP [significant positive, 2] • (Country-level native-immigrant skill ratio)*education [significant (more educated, more tolerant if immigrants are less skilled relative to natives), 3] • Occupation-level immigrant-native ratio [significant (higher, less tolerant), 3]
Facchini & Mayda (2006)	ISSP 1995 (over 13,605; citizens only) {Germany, UK, US, Austria, Ireland, Netherlands, Norway, Sweden, New Zealand, Japan, Canada, Spain, Slovenia, Czech Republic, Hungary, Slovak Republic} [The number of immigrants should be increased or reduced?]	Probit	• Years of education [significant negative (more educated, less tolerant), 4] • (Years of education)*(Skill level of natives relative to immigrants) [significant positive (less skilled migrants, more educated, more tolerant), 4] • Education*(average labour tax rate) [significant positive (higher tax, more educated, more tolerant), 4] • Education*(immigrant skill level)*(average labour tax rate) [significant negative (less skilled migrants, higher tax, more educated, less tolerant), 4] • Education*(immigrant skill level)*(tax progressivity) [significant negative (less skilled migrants, more progressive tax system, more educated, less tolerant), 4] • Education*(average public transfer) [significant positive (more generous benefit, more educated, more tolerant), 4] • Education*(immigrant skill level)*(average public transfer) [insignificant, 4] • ln(real personal income) [insignificant, 4]

NB: ISSP = International Social Survey Programme WVS = World Value Survey

Table A3.4 ***relinc*** **version of models vi to xvii in Table 3.5**

	vi	vii	viii	ix	x	xi	xii	xiii
relinc	−.047 .082	.497 * .269	−.086 .103	.195 .322	−.041 .034	−.047 .079	.936 *** .093	.308 .615
*relinc*tp*	.634 .952	−4.858 ** 1.879	..	..	..	..	−13.061 *** 1.011	..
*relinc*tp*fshare*	..	89.517 ** 39.857	..	..	..	..	272.909 *** 22.151	..
*relinc*tp2*	..	..	1.050 1.247	−2.577 2.892	..	..	..	−4.266 7.729
*relinc*tp2*fshare*	..	..	..	48.242 56.554	..	..	..	86.457 169.394
*relinc*nrr*	..	..	..	..	.103 .090	−.080 .140	1.053 *** .123	.145 .515
*relinc*nrr*fshare*	..	..	..	..	..	1.806 2.996	−27.240 *** 3.032	−4.091 13.771
*relinc*fshare*	..	−9.489 5.776	..	−3.551 6.570	..	.957 1.613	−16.366 *** 1.833	−5.481 11.616
	(.783)	(.001)	(.707)	(.257)	(.468)	(.277)	(.000)	(.364)
benefit	.176 .288	−.953 2.402	.353 .317	−.022 2.937	−.464 .551	−2.712 *** .475	−.865 .829	.128 1.776
*benefit*tp*	−2.442 1.967	6.466 16.667	..	..	..	..	−25.904 ** 11.980	..
*benefit*tp*fshare*	..	−178.181 354.293	..	..	..	..	546.366 * 266.913	..
*benefit*tp2*	..	..	−4.466 * 2.422	−.800 23.057	..	..	..	−28.445 17.683
*benefit*tp2*fshare*	..	..	..	−66.925 489.272	..	..	..	565.595 383.460
*benefit*nrr*	..	..	..	..	.542 .761	4.001 *** .857	6.538 *** 1.287	4.948 *** 1.111
*benefit*nrr*fshare*	..	..	..	..	..	−96.261 *** 23.639	−158.888 *** 35.439	−111.198 *** 33.563
*benefit*fshare*	..	23.882 52.720	..	7.364 63.722	..	66.446 *** 16.437	33.550 * 15.915	5.805 42.382
	(.120)	(.000)	(.016)	(.000)	(.649)	(.000)	(.000)	(.000)

(continued ...)

NB: p-values for joint significance in brackets, eg, $p = .783$ for joint significance of *relinc* and *relinc*tp* in model vi

Table A3.4 (Continued)

	(vi)		(vii)	(viii)	(ix)	(x)		(xi)		(xii)		(xiii)	
pension	.150 .065	**	.729 .446	.112 .125	.784 .616	.044 .071		.410 .059	***	.719 .221	***	.770 .541	
*pension*tp*	−.869 .617		−4.409 3.317	..	..	..		..		−3.112 2.916		..	
*pension*tp*fshare*	..		80.341 63.924	..	..	..		..		38.457 57.013		..	
*pension*tp2*	..		..	−.562 1.244	−5.006 5.305	..		..		..		−4.159 6.468	
*pension*tp2*fshare*	..		..	..	106.005 93.983	..		..		..		80.784 121.571	
*pension*nrr*	..		..	..	..	.012 .110		−.220 .097	**	−.142 .232		−.016 .343	
*pension*nrr*fshare*	..		..	..	..	..		12.868 2.152	***	12.579 5.695	**	7.986 8.525	
*pension*fshare*	..		−12.802 9.304	..	−15.258 11.844	..		−12.499 1.595	***	−17.077 4.470	***	−19.033 9.542	*
	(.081)		(.050)	(.262)	(.085)	(.338)		(.000)		(.000)		(.000)	
parent1	.266 .291		1.930 1.644	.148 .273	1.861 2.087	.701 .278	**	1.483 .231	***	.508 .715		−.655 1.095	
*parent1*tp*	−.058 2.017		−13.461 11.066	..	..	..		..		15.244 10.104		..	
*parent1*tp*fshare*	..		252.009 218.266	..	..	..		..		−370.891 233.785		..	
*parent1*tp2*	..		..	1.099 1.969	−13.459 15.862	..		..		..		26.410 14.387	*
*parent1*tp2*fshare*	..		..	..	274.227 317.864	..		..		..		−598.754 329.380	*
*parent1*nrr*	..		..	..	..	−.702 .372	*	−2.318 .389	***	−4.208 1.291	***	−4.177 1.220	***
*parent1*nrr*fshare*	..		..	..	..	..		40.861 5.711	***	90.266 31.863	**	86.175 31.423	**
*parent1*fshare*	..		−33.121 33.033	..	−33.492 42.284	..		−23.726 4.013	***	−4.943 13.440		20.699 22.098	
	(.054)		(.000)	(.024)	(.000)	(.029)		(.000)		(.000)		(.000)	

(continued ...)

Table A3.4 (Continued)

	(vi)		(vii)		(viii)		(ix)		(x)		(xi)		(xii)		(xiii)	
originp	−.304	***	−.302	***	−.304	***	−.304	***	−.307	***	−.304	***	−.302	***	−.304	***
	.047		.047		.047		.047		.046		.047		.047		.047	
originr	.045		.042		.044		.044		.041		.045		.041		.043	
	.128		.127		.128		.128		.126		.128		.129		.129	
friend1	.390	***	.388	***	.390	***	.389	***	.390	***	.388	***	.384	***	.387	***
	.072		.072		.072		.072		.073		.072		.073		.073	
friend2	.613	***	.608	***	.613	***	.609	***	.611	***	.610	***	.607	***	.609	***
	.125		.124		.124		.124		.123		.123		.124		.124	
ethlive0	−.152	**	−.152	**	−.151	**	−.153	**	−.154	**	−.155	**	−.157	**	−.155	**
	.069		.068		.069		.068		.068		.068		.069		.068	
ethlive2	−.157	***	−.156	***	−.156	***	−.156	***	−.154	***	−.155	***	−.160	***	−.157	***
	.049		.050		.049		.050		.050		.050		.050		.050	
econ	.123	***	.124	***	.123	***	.124	***	.123	***	.123	***	.123	***	.123	***
	.013		.013		.013		.013		.013		.013		.013		.013	
polit	.121	***	.121	***	.121	***	.120	***	.122	***	.121	***	.121	***	.121	***
	.035		.035		.035		.035		.035		.035		.035		.035	
media	.072	***	.072	***	.072	***	.071	***	.072	***	.071	***	.070	***	.070	***
	.017		.017		.017		.017		.017		.017		.017		.017	
happy	.059	***	.058	***	.059	***	.059	***	.060	***	.058	***	.057	***	.057	***
	.009		.010		.009		.009		.009		.009		.010		.009	
edu0	.024		−.005		.028		.001		.027		.018		.011		.019	
	.126		.121		.128		.121		.128		.119		.121		.119	
edu1	−.009		−.026		−.009		−.024		−.008		−.015		−.022		−.017	
	.106		.104		.107		.105		.110		.105		.101		.102	
edu2	−.115		−.119		−.115		−.119		−.107		−.115		−.119		−.117	
	.091		.091		.091		.091		.092		.090		.091		.091	
edu4	.085		.081		.085		.079		.089		.085		.086		.084	
	.155		.157		.156		.157		.155		.156		.157		.157	
edu5	.362	***	.357	***	.363	***	.357	***	.361	***	.363	***	.357	***	.362	***
	.115		.115		.114		.114		.113		.113		.115		.113	
edu6	.674	***	.676	***	.673	***	.667	***	.674	***	.675	***	.707	***	.678	***
	.071		.078		.071		.075		.067		.072		.080		.073	
fparent	.309	**	.313	**	.309	**	.314	**	.311	**	.316	**	.317	**	.315	**
	.109		.110		.109		.109		.108		.108		.110		.109	
female	−.033		−.035		−.034		−.035		−.034		−.037		−.033		−.034	
	.061		.061		.062		.062		.063		.062		.060		.061	
age	−.002	*	−.002	*	−.002	*	−.002	*	−.002	*	−.002	*	−.002		−.002	*
	.001		.001		.001		.001		.001		.001		.001		.001	
obs.	17,788		17,788		17,788		17,788		17,788		17,788		17,788		17,788	
$\bar{R}^2$	.120		.120		.120		.120		.120		.121		.121		.121	

Heteroscedasticity-robust standard errors in a small font, adjusting for intracountry correlation

The significance levels indicated by * (10%), ** (5%) and *** (1%)

Dummies for *origin*, *friend*, *ethlive* and *edu* respectively jointly significant at the 1% level in all the estimated equations

Table A3.4 (Continued)

	xiv		xv		xvi		xvii	
relinc	−.072		−.083		−.113		−.101	
	.080		.057		.106		.066	
*relinc*tp*	.433		−.111		..		..	
	.842		.534					
*relinc*tp2*	..		..		.856		.135	
					1.080		.725	
*relinc*nrr*	.080		−.015		.079		−.019	
	.060		.050		.065		.049	
*relinc*fshare*	..		2.317	*	..		2.194	*
			1.185				1.152	
	(.612)		(.317)		(.649)		(.366)	
benefit	−.417		−.430	*	−.125		−.279	
	.253		.215		.370		.364	
*benefit*tp*	−4.260	**	−2.874		..		..	
	1.895		1.641					
*benefit*tp2*	..		..		−6.007	**	−3.296	
					2.615		2.764	
*benefit*nrr*	1.172	**	1.504	***	.932	*	1.255	**
	.423		.441		.472		.476	
*benefit*fshare*	..		−6.321	***	..		−5.840	**
			1.929				1.986	
	(.012)		(.000)		(.022)		(.000)	
pension	.123		.125		.101		.035	
	.086		.073		.134		.118	
*pension*tp*	−1.087	*	−.261		..		..	
	.570		.865					
*pension*tp2*	..		..		−.662		1.043	
					1.279		1.503	
*pension*nrr*	.083		.204		.034		.205	
	.134		.147		.117		.134	
*pension*fshare*	..		−2.947	*	..		−3.769	**
			1.632				1.552	
	(.072)		(.001)		(.421)		(.007)	
parent1	.552	*	.564	**	.441		.568	*
	.275		.257		.293		.319	
*parent1*tp*	1.831		.073		..		..	
	1.675		1.831					
*parent1*tp2*	..		..		2.914		.025	
					2.072		3.280	
*parent1*nrr*	−.798	**	−1.082	**	−.773	**	−1.087	**
	.352		.447		.351		.466	
*parent1*fshare*	..		6.355		..		6.471	
			4.808				5.508	
	(.042)		(.002)		(.036)		(.000)	

(continued ...)

Table A3.4 (Continued)

	(xiv)		(xv)		(xvi)		(xvii)	
originp	−.304	***	−.304	***	−.305	***	−.305	***
	.047		.047		.047		.047	
originr	.046		.045		.045		.044	
	.128		.127		.128		.128	
friend1	.388	***	.387	***	.388	***	.387	***
	.073		.073		.073		.072	
friend2	.612	***	.610	***	.611	***	.609	***
	.124		.124		.124		.124	
ethlive0	−.155	**	−.155	**	−.154	**	−.154	**
	.068		.068		.068		.068	
ethlive2	−.155	***	−.155	***	−.154	***	−.155	***
	.050		.050		.050		.049	
econ	.123	***	.123	***	.123	***	.123	***
	.013		.013		.013		.013	
polit	.121	***	.121	***	.121	***	.121	***
	.035		.035		.035		.035	
media	.071	***	.071	***	.071	***	.071	***
	.017		.017		.017		.017	
happy	.059	***	.058	***	.059	***	.058	***
	.010		.010		.009		.009	
edu0	.025		−.009		.026		.006	
	.124		.123		.126		.124	
edu1	−.004		−.017		−.007		−.020	
	.106		.106		.107		.107	
edu2	−.112		−.116		−.112		−.116	
	.091		.090		.091		.090	
edu4	.088		.085		.087		.084	
	.155		.155		.155		.156	
edu5	.361	***	.362	***	.362	***	.362	***
	.114		.114		.113		.113	
edu6	.675	***	.672	***	.673	***	.671	***
	.070		.073		.069		.073	
fparent	.313	**	.314	**	.312	**	.314	**
	.109		.109		.109		.108	
female	−.035		−.035		−.036		−.036	
	.062		.062		.062		.062	
age	−.002	*	−.002	*	−.002	*	−.002	*
	.001		.001		.001		.001	
obs.	17,788		17,788		17,788		17,788	
$\bar{R}^2$	.120		.120		.120		.120	

Table A3.5 *relinc* version of models i to vi in Table 3.6

	i		ii		iii		iv		v		vi	
*isub*labor*	..		..		..		.006 .004		..		..	
isub	..		..		−.004 .021		−.034 .039		..		..	
							(.095)					
*osub*labor*	..		..		..		..		..		−.002 .005	
osub	..		..		..		..		−.079 .055		−.068 .053	
											(.370)	
*unemploy*labor*	..		..		..		−.003 .033		..		−.005 .037	
unemploy	..		..		−.038 .093		−.020 .127		−.057 .108		−.036 .122	
							(.932)				(.856)	
*employer*labor*	..		..		..		−.096 .020	***	..		−.098 .020	***
employer	..		..		−.126 .105		.332 .181	*	−.043 .090		.419 .161	**
							(.000)				(.000)	
labor	..		.072 .010	***	.072 .007	***	.072 .003	***	.075 .009	***	.085 .008	***
crime	.093 .014	***	.079 .013	***	.085 .011	***	.084 .011	***	.090 .014	***	.089 .014	***
culture	.163 .008	***	.145 .009	***	.141 .007	***	.141 .007	***	.143 .010	***	.143 .010	***

(continued ...)

NB: To avoid multicollinearity, the *be* dummy is dropped in models including *isub*, while dummies for *be*, *fr* and *se* are dropped in models including *osub*.

Dummies for *edu* and *friend* are respectively jointly significant at the 1% level.

Dummies for *origin* are jointly significant at the 1% level in models i to iv, the 10% in v but insignificant at the 10% in vi. Dummies for *ethlive* are jointly insignificant at the 10% level except in model i.

Table A3.5 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)	
originp	−.103	***	−.101	***	−.088	***	−.088	***	−.077	*	−.075	*
	.033		.031		.028		.028		.041		.041	
originr	−.006		−.033		−.011		−.014		.005		.003	
	.081		.080		.089		.091		.113		.116	
friend1	.204	***	.190	***	.202	***	.203	***	.207	***	.209	***
	.041		.043		.040		.041		.050		.051	
friend2	.306	***	.279	***	.295	***	.294	***	.294	***	.290	***
	.029		.034		.039		.038		.056		.052	
ethlive0	−.056	**	−.044	*	−.051		−.051		−.071	*	−.071	*
	.028		.026		.039		.039		.042		.041	
ethlive2	−.015		−.002		−.027		−.026		−.022		−.021	
	.057		.059		.046		.046		.065		.066	
econ	.025	*	.020		.021		.020		.012		.012	
	.013		.013		.013		.013		.015		.016	
polit	.045	***	.044	***	.044	***	.044	***	.061	***	.060	***
	.014		.013		.015		.015		.013		.013	
media	.035	***	.032	***	.025		.025		.022		.022	
	.012		.011		.016		.016		.019		.019	
happy	.028	**	.024	**	.027	***	.027	***	.032	***	.032	***
	.012		.011		.010		.010		.010		.009	
relinc	.052	***	.049	***	.051	***	.052	***	.049	***	.050	***
	.014		.013		.013		.014		.014		.015	
edu0	−.151	**	−.138	*	−.185	***	−.184	***	−.106		−.101	
	.058		.070		.063		.067		.065		.065	
edu1	−.091	***	−.081	***	−.102	***	−.104	***	−.030		−.035	
	.027		.023		.031		.029		.038		.036	
edu2	−.085	**	−.081	**	−.107	**	−.106	**	−.132	***	−.129	***
	.035		.035		.043		.042		.036		.037	
edu4	.012		.001		−.012		−.018		−.009		−.017	
	.063		.059		.058		.057		.064		.062	
edu5	.228	***	.209	***	.196	***	.194	***	.176	***	.173	***
	.044		.040		.048		.050		.050		.053	
edu6	−.000		−.014		−.057		−.061		−.008		−.011	
	.076		.073		.068		.071		.101		.106	
fparent	.083		.067		.075		.071		−.004		−.006	
	.077		.076		.075		.074		.037		.038	
female	−.011		−.006		−.000		−.002		−.018		−.016	
	.035		.037		.043		.043		.042		.043	
age	−.004	***	−.004	***	−.003	***	−.004	***	−.003	***	−.003	***
	.001		.001		.001		.001		.000		.000	
s.d. of *host**	1.218		1.229		1.233		1.235		1.227		1.228	
obs.	17,420		17,167		14,692		14,692		12,412		12,412	
log pseudo-likelihood	−17,521		−17,147		−14,609		−14,596		−12,527		−12,515	
pseudo-R^2	.141		.147		.150		.151		.145		.146	

Table A3.6 *relinc* version of models i to vii in Table 3.7

	i	ii	iii	iv	v	vi	vii
*benefit*fiscal*nrr*fshare*	..	..	..	..	−22.147 ***	..	−24.514 ***
					7.491		4.731
*benefit*fiscal*nrr*	..	..	..	.465 ***	1.183 ***	.374 ***	1.230 ***
				.085	.218	.124	.133
*benefit*fiscal*tp*fshare*	..	..	..	..	52.295 *	..	..
					27.903		
*benefit*fiscal*tp*	..	..	..	−.865 ***	−2.838 **	..	..
				.225	1.274		
*benefit*fiscal*tp2*fshare*	..	..	..	..	..	..	92.950 ***
							31.474
*benefit*fiscal*tp2*	..	..	..	..	..	−.825	−4.534 ***
						.597	1.696
*benefit*fiscal*fshare*	..	..	..	..	8.441 *	..	5.794
					4.972		5.981
*benefit*fiscal*	..	..	.023	−.207 ***	−.421 ***	−.158 *	−.275
			.018	.059	.159	.091	.229
benefit	..	−.097	−.186	−.181	−.171	−.181	−.173
		.083	.140	.139	.137	.140	.137
			(.413)	(.000)	(.000)	(.016)	(.000)
*pension*fiscal*nrr*fshare*	..	..	..	..	−2.100 **	..	−.267
					.883		1.943
*pension*fiscal*nrr*	..	..	..	−.049 ***	.029	−.037 ***	.026
				.013	.039	.013	.073
*pension*fiscal*tp*fshare*	..	..	..	..	22.222 **	..	..
					9.658		
*pension*fiscal*tp*	..	..	..	.295 *	−.824	..	..
				.157	.629		
*pension*fiscal*tp2*fshare*	..	..	..	..	..	..	28.118
							23.152
*pension*fiscal*tp2*	..	..	..	..	..	.143	−1.506
						.222	1.119
*pension*fiscal*fshare*	..	..	..	..	−1.504 *	..	−2.973
					.811		1.858
*pension*fiscal*	..	..	−.016	−.020	.068	−.009	.158
			.010	.017	.059	.025	.097
pension	..	.041	.106 **	.103 **	.108 **	.108 **	.108 **
		.029	.051	.049	.050	.049	.050
			(.115)	(.005)	(.000)	(.001)	(.000)

(continued ...)

NB: Dummies for *origin*, *friend* and *edu* are respectively jointly significant at the 1% level. Dummies for *ethlive* are jointly insignificant at the 10% level.

Table A3.6 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)	
*parent1*fiscal*nrr*fshare*	..		..		..		..		10.843 2.277	***	..		9.491 3.548	***
*parent1*fiscal*nrr*	..		..		..		.074 .047		−.345 .096	***	.078 .042	*	−.316 .130	**
*parent1*fiscal*tp*fshare*	..		..		..		..		−84.932 18.761	***	..		..	
*parent1*fiscal*tp*	..		..		..		.134 .406		4.122 1.050	***	..		..	
*parent1*fiscal*tp2*fshare*	..		..		..		..		..		..		−128.386 36.983	***
*parent1*fiscal*tp2*	..		..		..		..		..		.034 .530		6.259 1.793	***
*parent1*fiscal*fshare*	..		..		..		..		4.279 1.585	***	..		9.508 2.668	***
*parent1*fiscal*	..		..		.009 .052		−.045 .061		−.320 .099	***	−.036 .072		−.555 .158	***
parent1	..		.001 .047		−.040 .209		−.076 .218		−.042 .214		−.072 .215		−.034 .213	
					(.977)		(.004)		(.000)		(.005)		(.000)	
*relinc*fiscal*nrr*fshare*	..		..		..		..		.376 .602		..		.902 .760	
*relinc*fiscal*nrr*	..		..		..		−.035 .012	***	−.036 .022		−.034 .011	***	−.059 .027	**
*relinc*fiscal*tp*fshare*	..		..		..		..		17.888 5.775	***	..		..	
*relinc*fiscal*tp*	..		..		..		.036 .108		−.944 .281	***	..		..	
*relinc*fiscal*tp2*fshare*	..		..		..		..		..		..		19.817 10.844	*
*relinc*fiscal*tp2*	..		..		..		..		..		.071 .142		−1.091 .542	**
*relinc*fiscal*fshare*	..		..		..		..		−2.627 .429	***	..		−2.955 .842	***
*relinc*fiscal*	..		..		.002 .010		.018 .014		.142 .022	***	.014 .018		.162 .045	***
relinc	.059 .018	***	.057 .018	***	.046 .034		.052 .032		.047 .031		.052 .032		.048 .031	
					(.000)		(.000)		(.000)		(.000)		(.000)	
fiscal	.071 .009	***	.071 .009	***	.070 .019	***	.073 .018	***	.072 .018	***	.073 .018	***	.072 .018	***
crime	.073 .012	***	.073 .012	***	.073 .012	***	.073 .012	***	.073 .012	***	.073 .012	***	.073 .012	***
culture	.146 .008	***	.146 .008	***	.146 .008	***	.147 .008	***	.147 .008	***	.147 .008	***	.147 .008	***

(continued ...)

Table A3.6 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)	
originp	−.090	***	−.092	***	−.091	***	−.089	***	−.088	***	−.090	***	−.089	***
	.031		.031		.031		.032		.032		.032		.032	
originr	−.020		−.023		−.025		−.026		−.028		−.028		−.028	
	.073		.074		.075		.075		.075		.076		.075	
friend1	.197	***	.198	***	.197	***	.196	***	.193	***	.195	***	.194	***
	.044		.043		.043		.042		.042		.042		.042	
friend2	.296	***	.296	***	.295	***	.296	***	.295	***	.295	***	.297	***
	.036		.036		.038		.038		.038		.037		.038	
ethlive0	−.051	*	−.052	*	−.052	*	−.049	*	−.049	*	−.050	*	−.050	*
	.028		.028		.028		.027		.027		.027		.027	
ethlive2	−.013		−.012		−.011		−.014		−.017		−.014		−.016	
	.060		.060		.059		.059		.061		.059		.060	
econ	.020		.020		.020		.021		.021		.021		.021	
	.014		.014		.014		.013		.013		.013		.013	
polit	.041	***	.041	***	.041	***	.041	***	.042	***	.041	***	.042	***
	.015		.015		.015		.015		.015		.015		.015	
media	.032	***	.032	***	.032	***	.034	***	.034	***	.034	***	.034	***
	.011		.011		.011		.011		.011		.011		.011	
happy	.027	**	.026	**	.025	**	.024	**	.024	**	.024	**	.023	*
	.013		.012		.013		.012		.012		.012		.012	
edu0	−.159	**	−.164	**	−.158	**	−.163	**	−.172	***	−.165	***	−.164	**
	.064		.063		.064		.063		.064		.063		.068	
edu1	−.109	***	−.108	***	−.106	***	−.106	***	−.113	***	−.108	***	−.109	***
	.023		.024		.025		.029		.028		.028		.028	
edu2	−.086	**	−.087	***	−.086	***	−.084	***	−.088	***	−.085	***	−.087	***
	.033		.032		.033		.031		.030		.031		.030	
edu4	.007		.007		.008		.008		.006		.008		.009	
	.060		.060		.060		.060		.061		.060		.061	
edu5	.219	***	.218	***	.218	***	.221	***	.217	***	.222	***	.219	***
	.044		.045		.044		.042		.040		.042		.040	
edu6	−.008		−.007		−.009		−.003		.001		−.004		−.000	
	.071		.071		.072		.070		.071		.070		.070	
fparent	.076		.077		.076		.072		.074		.073		.073	
	.080		.079		.078		.077		.078		.077		.078	
female	−.008		−.009		−.008		−.008		−.006		−.007		−.005	
	.035		.035		.035		.034		.033		.034		.033	
age	−.004	***	−.004	***	−.004	***	−.004	***	−.004	***	−.004	***	−.004	***
	.001		.001		.001		.001		.001		.001		.001	
s.d. of *host**	1.229		1.230		1.230		1.233		1.235		1.233		1.235	
obs.	17,066		17,066		17,066		17,066		17,066		17,066		17,066	
log pseudo-likelihood	−17,040		−17,036		−17,033		−16,999		−16,977		−17,005		−16,979	
pseudo-R^2	.148		.148		.148		.150		.151		.149		.151	

Table A3.7 ***relinc*** **version of models i to ix in Table 3.8**

	i	ii		iii		iv		v		vi		vii		viii		ix	
*benefit*fiscal*nrr*fshare*	..	−20.605	***	−12.803	*	−20.902	***	−18.969	*	..		..		..		..	
		4.138		7.176		6.181		10.472									
*benefit*fiscal*nrr*	..	1.154	***	.850	***	1.304	***	.988	***	.436	***	.442	***	.372	***	.372	***
		.151		.249		.189		.360		.076		.060		.097		.088	
*benefit*fiscal*tp*fshare*	..	84.113	***	33.158		..		..		..		..		..		..	
		22.152		53.969													
*benefit*fiscal*tp*	..	−4.229	***	−1.940		..		..		−.652	***	−.697	***	..		..	
		1.036		2.375						.251		.069					
*benefit*fiscal*tp2*fshare*	..	..		..		143.940	***	55.797		..		..		..		..	
						28.617		126.640									
*benefit*fiscal*tp2*	..	..		..		−6.629	***	−2.603		..		..		−.747		−.739	*
						1.468		5.645						.546		.378	
*benefit*fiscal*fshare*	..	2.770		4.496		1.448		6.793		..		..		..		..	
		2.305		3.196		4.666		10.556									
*benefit*fiscal*	..	−.198	**	−.306	*	−.072		−.348		−.208	***	−.197	***	−.163	**	−.154	***
		.096		.177		.180		.499		.049		.047		.070		.058	
benefit	..	−.174		−.165		−.172		−.164		−.180	*	−.172		−.178		−.171	
		.124		.113		.124		.113		.124		.114		.125		.114	
		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
*pension*fiscal*nrr*fshare*	..	−3.135	***	−1.620		−3.588	*	−3.282		..		..		..		..	
		1.153		2.354		1.909		3.147									
*pension*fiscal*nrr*	..	.037		−.012		.078		.066		−.080	***	−.060	***	−.059	***	−.040	**
		.052		.080		.082		.104		.018		.013		.017		.016	
*pension*fiscal*tp*fshare*	..	27.076	**	13.280		..		..		..		..		..		..	
		12.759		25.023													
*pension*fiscal*tp*	..	−.786		−.217		..		..		.529	***	.441	***	..		..	
		.762		1.301						.172		.106					
*pension*fiscal*tp2*fshare*	..	..		..		69.067	***	62.638	*	..		..		..		..	
						26.596		37.992									
*pension*fiscal*tp2*	..	..		..		−3.090	**	−2.826		..		..		.406		.290	
						1.413		1.743						.287		.278	
*pension*fiscal*fshare*	..	−1.473		−.514		−5.700	**	−5.010	*	..		..		..		..	
		1.075		1.704		2.457		2.701									
*pension*fiscal*	..	.062		.013		.284	**	.253	*	−.030		−.029	*	−.024		−.021	
		.070		.106		.128		.142		.018		.015		.029		.030	
pension	..	.101	*	.103		.102	*	.107		.099	*	.102		.103	*	.108	
		.054		.078		.053		.078		.053		.078		.053		.078	
		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.077)	

(continued ...)

NB: Dummies for *friend* and *edu* are respectively jointly significant at the 1% level. Dummies for *ethlive* are jointly insignificant at the 10% level.
Dummies for *origin* are jointly significant at the 1% level in models i, iv, vi and viii, the 2% level in model ii, but insignificant at the 10% level in models iii, v, vii and ix.

Table A3.7 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)		(viii)		(ix)	
*parent1*fiscal*nrr*fshare*	..		12.960 2.242	***	2.804 .600	***	16.831 2.524	***	7.986 2.720	***	..		..		..		..	
*parent1*fiscal*nrr*	..		−.456 .099	***	−.147 .024	***	−.598 .111	***	−.316 .097	***	.054 .054		−.057 .013	***	.060 .050		−.044 .016	***
*parent1*fiscal*tp*fshare*	..		−107.965 18.514	***	−13.352 5.713	**	..		..		..		..		..		..	
*parent1*fiscal*tp*	..		5.314 .944	***	1.071 .248	***	..		..		.215 .446		.554 .080	***	..		..	
*parent1*fiscal*tp2*fshare*	..		..		..		−199.747 30.818	***	−78.670 33.562	**	..		..		..		..	
*parent1*fiscal*tp2*	..		..		..		9.318 1.523	***	3.956 1.426	***	..		..		.092 .651		.650 .166	***
*parent1*fiscal*fshare*	..		5.975 1.420	***	−.074 .465		13.005 2.218	***	4.176 2.408	*	..		..		..		..	
*parent1*fiscal*	..		−.433 .089	***	−.142 .024	***	−.770 .146	***	−.364 .106	***	−.064 .059		−.130 .016	***	−.054 .077		−.141 .024	***
parent1	..		.079 .203		.346 .052	***	.085 .203		.338 .054	***	.026 .210		.347 .053	***	.028 .208		.345 .053	***
			(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.001)		(.000)	
*relinc*fiscal*nrr*fshare*	..		.545 .768		1.853 .642	***	.472 1.152		4.342 2.111	**	..		..		..		..	
*relinc*fiscal*nrr*	..		−.043 .029		−.082 .024	***	−.045 .042		−.173 .074	**	−.039 .014	***	−.030 .011	***	−.039 .012	***	−.031 .010	***
*relinc*fiscal*tp*fshare*	..		18.170 7.197	**	3.820 5.147		..		..		..		..		..		..	
*relinc*fiscal*tp*	..		−.978 .352	***	−.331 .244		..		..		.012 .112		−.052 .043		..		..	
*relinc*fiscal*tp2*fshare*	..		..		..		26.864 15.452	*	−28.505 25.367		..		..		..		..	
*relinc*fiscal*tp2*	..		..		..		−1.433 .733	*	1.108 1.124		..		..		.031 .152		−.044 .071	
*relinc*fiscal*fshare*	..		−2.823 .536	***	−1.869 .346	***	−3.546 1.121	***	.380 1.683		..		..		..		..	
*relinc*fiscal*	..		.153 .028	***	.105 .016	***	.195 .058	***	−.007 .083		.022 .014		.031 .012	***	.020 .018		.031 .013	**
relinc	.056 .018	***	.047 .029		.014 .029		.049 .029	*	.012 .031		.053 .030	*	.017 .028		.053 .029	*	.017 .027	
			(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
fiscal	.057 .007	***	.060 .014	***	.057 .019	***	.060 .014	***	.055 .020	***	.061 .014	***	.058 .019	***	.061 .014	***	.057 .019	***

(continued ...)

Table A3.7 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)		(viii)		(ix)	
*isub*labor*	..		.005 .004		..		.005 .004		..		.005 .005		..		.005 .005		..	
isub	..		−.027 .037		..		−.029 .037		..		−.028 .038		..		−.028 .037		..	
			(.460)				(.448)				(.448)				(.416)			
*osub*labor*	..		..		−.001 .006		..		−.001 .006		..		−.001 .005		..		−.001 .005	
osub	..		..		−.075 .060		..		−.076 .060		..		−.072 .061		..		−.073 .060	
					(.360)				(.356)				(.377)				(.381)	
*unemploy*labor*	..		−.012 .031		−.008 .033		−.011 .031		−.006 .033		−.010 .032		−.008 .033		−.009 .032		−.006 .034	
unemploy	..		.048 .096		.017 .091		.042 .095		.011 .090		.040 .098		.011 .090		.036 .097		.006 .090	
			(.880)		(.969)		(.906)		(.980)		(.918)		(.969)		(.932)		(.977)	
*employer*labor*	..		−.102 .026	***	−.107 .025	***	−.100 .027	***	−.105 .026	***	−.102 .026	***	−.106 .026	***	−.101 .027	***	−.105 .026	***
employer	..		.369 .218	*	.474 .196	**	.364 .219	*	.467 .198	**	.368 .217	*	.469 .198	**	.364 .217	*	.466 .199	**
			(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)		(.000)	
labor	.059 .009	***	.059 .006	***	.069 .008	***	.059 .005	***	.068 .009	***	.059 .006	***	.070 .008	***	.059 .005	***	.069 .008	***
crime	.066 .011	***	.072 .010	***	.075 .013	***	.072 .010	***	.075 .013	***	.071 .010	***	.075 .013	***	.072 .010	***	.075 .013	***
culture	.135 .009	***	.131 .007	***	.133 .010	***	.131 .007	***	.133 .010	***	.131 .007	***	.133 .010	***	.131 .007	***	.133 .010	***
originp	−.091 .030	***	−.075 .029	**	−.059 .042		−.076 .029	***	−.060 .042		−.075 .029	**	−.060 .041		−.076 .029	***	−.062 .041	
originr	−.041 .078		−.036 .091		−.025 .119		−.037 .091		−.024 .118		−.032 .090		−.026 .119		−.035 .091		−.028 .120	

(continued ...)

Table A3.7 (Continued)

	(i)		(ii)		(iii)		(iv)		(v)		(vi)		(vii)		(viii)		(ix)	
friend1	.189	***	.199	***	.208	***	.200	***	.208	***	.201	***	.209	***	.201	***	.209	***
	.045		.043		.052		.043		.051		.042		.052		.042		.051	
friend2	.280	***	.293	***	.289	***	.293	***	.290	***	.296	***	.289	***	.295	***	.288	***
	.039		.046		.067		.046		.067		.046		.067		.046		.066	
ethlive0	−.043		−.044		−.066	*	−.045		−.068	*	−.044		−.068	*	−.045		−.069	*
	.027		.037		.038		.037		.038		.037		.038		.037		.038	
ethlive2	−.001		−.024		−.004		−.026		−.006		−.022		−.005		−.022		−.007	
	.060		.047		.067		.047		.067		.046		.067		.045		.067	
econ	.017		.019		.010		.019		.010		.019		.010		.019		.010	
	.014		.013		.015		.013		.015		.013		.015		.013		.015	
polit	.041	***	.042	***	.060	***	.042	***	.060	***	.041	**	.059	***	.041	**	.059	***
	.014		.016		.013		.016		.013		.016		.013		.016		.013	
media	.029	***	.024		.022		.024		.023		.023		.022		.024		.023	
	.010		.015		.018		.015		.018		.015		.018		.015		.018	
happy	.024	*	.025	**	.033	***	.025	**	.033	***	.026	**	.033	***	.026	**	.033	***
	.012		.010		.008		.010		.008		.010		.008		.010		.008	
edu0	−.147	*	−.202	***	−.104		−.194	***	−.100		−.190	***	−.092		−.194	***	−.097	
	.076		.066		.066		.068		.070		.067		.059		.067		.061	
edu1	−.098	***	−.124	***	−.041		−.116	***	−.033		−.115	***	−.035		−.116	***	−.035	
	.022		.035		.041		.037		.040		.035		.046		.036		.046	
edu2	−.084	**	−.105	***	−.116	***	−.105	***	−.119	***	−.099	***	−.118	***	−.101	***	−.121	***
	.033		.035		.034		.035		.033		.036		.034		.037		.033	
edu4	−.000		−.021		−.015		−.020		−.015		−.018		−.018		−.018		−.018	
	.058		.057		.061		.056		.061		.056		.061		.056		.061	
edu5	.205	***	.191	***	.176	***	.192	***	.175	***	.195	***	.174	***	.196	***	.175	***
	.041		.045		.049		.045		.050		.048		.049		.048		.049	
edu6	−.018		−.055		−.026		−.055		−.025		−.055		−.016		−.056		−.020	
	.070		.066		.107		.065		.107		.065		.104		.065		.104	
fparent	.065		.069		−.009		.070		−.006		.067		−.009		.067		−.009	
	.078		.075		.033		.075		.033		.074		.033		.074		.033	
female	−.005		.003		.021		.004		.021		.000		.021		.001		.022	
	.037		.041		.044		.041		.044		.041		.044		.041		.044	
age	−.004	***	−.003	***	−.004	***	−.004	***	−.004	***	−.004	***	−.003	***	−.004	***	−.004	***
	.001		.000		.000		.000		.000		.000		.000		.000		.000	
s.d. of *host**	1.236		1.248		1.244		1.248		1.243		1.246		1.242		1.245		1.241	
obs.	16,854		14,438		12,184		14,438		12,184		14,438		12,184		14,438		12,184	
log pseudo-likelihood	−16,757		−14,220		−12,172		−14,222		−12,175		−14,240		−12,180		−14,247		−12,187	
pseudo-R^2	.152		.158		.154		.158		.154		.157		.154		.156		.153	

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Part 2

Migrant Smuggling

CHAPTER 4

Exploitation of Migrants

This chapter examines the labour exploitation of migrants in the migrant smuggling market. We use an asymmetric information framework where potential migrants are unable to distinguish between exploitative and non-exploitative smugglers. We find that when the equilibrium is characterised by adverse selection, policies that diminish the availability of smuggling services to potential migrants inevitably raise the mean exploitation of smuggled labour. When the equilibrium is not of adverse selection, the effects of anti-illegal migrant policy and anti-trafficking policy may offset each other. We also suggests that the market may converge to a stable state where only exploitative smugglers are active.

4.1. Introduction

The migrant smuggling market has features that are worth microeconomic analysis. First of all, there exists no legally enforceable contract between the providers and the consumers of illicit border crossing services. In addition, the consumption of such services requires a loss of the consumers' control over the assets they carry with them while travelling——their own bodies and labour. Smuggling agents increasingly gain power to control these assets against the will of the owners once the provision of smuggling services is implemented. Nevertheless, this shift of asset control that increases the vulnerability of the consumers vis-a-vis the service providers has not caused the migrant smuggling market to vanish because not all smugglers exercise the power they gain in order to exploit their

clients to their advantage. Some smugglers have the technology to utilise migrant labour, while others do not.

There has been little analysis of the migrant smuggling market in economics so far, even though smuggling and trafficking in migrants[1] have recently become one of the major international concerns.[2] Friebel and Guriev (2006) theoretically examined the interaction between migrants and smuggling agents. In their model, not all potential migrants are able to pay for smuggling services upfront. A worker may therefore enter into a debt contract with a smuggler if migrating and must then pay back the debt through work in the destination. Their analysis shows that, while stricter border enforcement discourages both financially constrained and unconstrained workers to migrate illegally, better detection in the formal employment sector not only discourages the illegal entry of the latter type but encourages that of the former, leading to a bias in the composition of illegal immigrants towards the poorer end. In their model, while smugglers face a risk that migrants may default debt repayments, migrants do not face the risk of being exploited by their smugglers.[3]

Dessy and Pallage (2006) theoretically argue that the risk of child trafficking serves as a deterrent to parents who send their children to labour markets. The effort to reduce the incidence of child trafficking therefore increases the parental supply of child labour. Their analysis concentrates on the household utility maximisation with respect to the supply of child labour, and traffickers are not modelled explicitly. Dessy, Mbiekop and Pallage (2005) present a general equilibrium model with producers who choose between the legal sector and child trafficking.[4] They emphasise the importance of demand for trafficked children in influencing the incidence of child trafficking. These two studies address the issue of abuse,

[1]We distinguish later in this introduction between smuggling and trafficking in migrants.

[2]For instance, a recent report by the Global Commission on International Migration (2005) touches on the related problems throughout the text. At the same time, its acknowledgment section on page 88 indicates that economists' contributions to the report were scarce.

[3]Guzman, Haslag and Orrenius (2002) model migrant smuggling explicitly, but their analysis in a two-country dynamic general equilibrium framework treats smugglers as suppliers of cost-saving border crossing services, and migrants do not face a risk of exploitation. It belongs to the theoretical macroeconomic literature on illegal immigration and border enforcement that began with Ethier (1986), Djajić (1987) and Bond and Chen (1987) but does not attempt to provide microeconomic analysis of interactions between migrants and smugglers.

[4]They model a small open source country in the sense that the price per child sold abroad is exogenously given.

but children are treated as commodities and do not make any decision. Hence these do not cover the problem we examine in this chapter.

Our objective is to provide the first microeconomic analysis of the migrant smuggling market where we allow the fact that smugglers gain control over their clients by smuggling them. In our model, each smuggler's decision as to whether it exploits its clients after successful smuggling is endogenous in the workers' expectation of exploitation in the destination, and a weakened position of a migrant vis-a-vis the smuggler does not necessarily result in exploitation. This chapter thus provides a solution to one of Väyrynen's (2003: 3) criticisms about economic approaches to migrant smuggling, ie, inadequate attention paid to exploitative aspects. We focus on the equilibrium proportion of exploitative smugglers as well as the number of active smuggling agents in the market. The more exploitative the market, the greater the welfare loss. Our analysis, however, implies that there is a tradeoff between the number of active suppliers of illicit border crossing services and the extent of exploitation: policymakers face a dilemma as to whether to improve the welfare of smuggled migrants or to diminish the availability of smuggling services.

We begin by adapting Akerlof's (1970) model of asymmetric information for the migrant smuggling market. We assume smugglers exogenously differ in their capacities to exploit their clients in the destination and make two decisions at a given smuggling fee: enter the market or not, and exploit or not if smuggling. The exploitation decision depends on the workers' expectation of exploitation in the destination which determines the smuggling fee. Note that the way we endogenise the quality of a smuggling service is different from Kim's (1985). In his model, the quality of a secondhand car depends on the level of maintenance by the owner, and car owners exogenously differ in their marginal utility gains from the car quality. A car owner chooses the level of maintenance and also decides whether she/he sells or keeps the car. In our analysis, the exploitation decision of a smuggler depends on the fee that cannot be chosen by the smuggler when exploitation capacities are private information.

We find that, when workers cannot distinguish between heterogeneous smugglers, an adverse selection problem may arise: only exploitative smugglers provide border crossing

services even though workers are willing to pay a higher fee to hire non-exploitative smugglers. As in Wilson (1980), multiple equilibria can arise depending on the distribution of exploitation capacities.

We subsequently examine the market equilibrium over time by incorporating two common findings from surveys of smuggled and trafficked migrants. One is that the most common initial source of information about smuggling agents they hire is the social network: parents, relatives, friends and other acquaintances. Another is that it is very difficult for workers to identify exploitative smugglers. Victims of trafficking may communicate what happened to them via family/social networks but are often afraid of pointing out who did it because of the fear of retaliation. Moreover, they may not communicate the incidence at all if the nature of work they were forced to do overseas, eg, prostitution, is likely to stigmatise themselves in their home communities.

We assume only those smugglers who did not exploit their clients are identified by the information transmission through social networks. The incidence of trafficking is communicated, but potential migrants cannot identify traffickers. Accordingly, the migrant smuggling market is segmented into two: one in which information is symmetric, and the other where it is asymmetric. As a result, with a constant flow of potential smuggling agents into the economy, identified non-exploitative smugglers charging the full information fee and unidentified exploitative and non-exploitative smugglers charging a lower fee coexist in a transitional equilibrium. We show that the informationally asymmetric part of the market becomes increasingly exploitative over time, which in turn biases the composition of new entries towards the more exploitative. In the long run, a new entry of non-exploitative smugglers ceases, and the equilibrium converges to a stable state characterised by adverse selection. The dynamics we employ in this chapter are similar to those of Janssen and Karamychev (2002) and Janssen and Roy (2004) but with exogenous information transmission common in the migrant smuggling market.[5]

[5]Janssen and Karamychev (2002) generalise Janssen and Roy (2004) who use the uniform distribution of different qualities. Both studies deal with durable goods, and each seller can supply only once.

In the rest of this introduction, we explain our working definitions of migrant smuggling and trafficking in this chapter. In Section 4.2, we gather stylised facts about these activities from non-economic studies. Section 4.3 presents a benchmark model where information is symmetric between smugglers and migrants. In Section 4.4, we assume that different exploitation capacities are private information. Section 4.5 examines the dynamics of the market equilibrium under the above mentioned information transmission. Section 4.6 concludes with policy implications.

The terms, smuggling and trafficking, have been used interchangeably by some researchers and practioners but with clear distinction by others. A lack of consensus as to the use of the terms complicates the analysis of these activities.[6] However, recent effort to create legal instruments to fight against human smuggling and trafficking has given a clear distinction between these activities. In December 1998, the General Assembly of the United Nations established an ad hoc committee for the purpose of setting up its Convention against Transnational Organized Crime and supplementing protocols specific to human smuggling and trafficking. As a result, the Protocol against the Smuggling of Migrants (UN, 2000b) entered into force on 28 January 2004, while the Protocol to Prevent, Suppress and Punish Trafficking in Persons (UN, 2000a) did so earlier on the Christmas day of 2003.

In this chapter, we closely follow these two protocols.[7] Our working definitions are that a *smuggler* (or non-exploitative smuggler) is an agent who provides illegal border crossing services without exploiting its clients in the post-smuggling period, while a *trafficker* (or exploitative smuggler) is an agent who also provides the same border crossing services but with exploitation of its clients after successful smuggling.[8] We define *exploitation* as that of the labour of a smuggled client, and we ignore for the sake of economic analysis elements of intimidation and violence that often seem involved in both trafficking and smuggling. These working definitions of ours will become clear when we describe our analytical framework in Section 4.3.

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[6]Salt and Hogarth discuss this problem in Laczko and Thompson (2000: 18-23).

[7]See Appendix A for the relevant excerpts from these UN protocols.

[8]Whether exploitation of migrants is involved or not is often taken as a distinguishing criterion between trafficking and smuggling, eg, Kelly and Regan (2000: 3), Salt (2000: 33-4) and Interpol (www.interpol.int).

4.2. Stylised facts

Several non-economic studies have made crude estimates as to the scale of smuggling and trafficking in migrants, based on apprehension data, court cases, survey questionnaires, interviews and best guesses. Salt (2003: Table 20) gathers and compares such estimated figures and suggests the annual total number of either smuggled or trafficked migrants is approximately 4 million in the world in the second half of the 1990s. According to the US government (USDS, 2004: 23), approximately 600,000 to 800,000 persons were trafficked across international borders worldwide in 2003. Although these figures are not comparable, the incidence of trafficking appears to be lower than that of smuggling.[9]

This section does not provide a thorough collection of stylised facts about migrant smuggling and trafficking but only a selection of them that are relevant to our analysis.[10] Note that, while increasingly available surveys of smuggled and trafficked migrants reveal the demand side of the market, its interaction with the supply side and the consequences, they do not inform us much about the supply side, ie, smugglers and traffickers. Studies of smugglers and traffickers describe their characteristics and activities by referring to mass media reports or quoting what was told by police officers, crime investigators, immigration officers, charity personnel and smuggled and trafficked migrants, but hardly by smugglers and traffickers themselves. This implies that our knowledge of the supply side of the market is rather limited.

4.2.1. Motives for migration

Existing surveys of smuggled migrants, victims of trafficking and the like indicate, although economic reasons are not the only factors that influence migration decision making, these seem to be the major factors.[11] They can be divided into two: economic hardship, such as

[9]We should remain sceptical of these estimates, for the nature of both smuggling and trafficking in migrants is clandestine. However, the UK government (IND, 2001: 75) also expressed the same view that trafficking takes place less frequently than smuggling, concerning illegal immigration in the country. See also IOM (2002a) for Armenia and Budapest Group (1999: 15).

[10]Salt and Hogarth provide an empirical literature review in Laczko and Thompson (2000).

[11]Noneconomic reasons include civil wars, ethnic conflicts, political prosecutions, family/relationship problems at home, family reunions and desires for adventure.

unemployment and poverty, at home countries and better economic prospects at destination countries. The former is the so-called economic push, and the latter the economic pull.

Economic hardship was found to be the most common reason for migration among smuggled or trafficked migrants in Armenia (IOM, 2002a: 16), Georgia (IOM, 2001: 14), Ukraine (Uehling, 2004: 90-1) and Southeastern Europe (CTRCP, 2003).[12] In Azerbaijan, Bickley (2001: 27) found the same, but IOM (2002b: 16-7, 21) suggests both push and pull factors influence an individual's migration decision simultaneously. This is natural because, if economic prospects are not thought to be any better overseas than at home, there would not be an incentive to leave his/her country. However, there also seem to be those whose migration decisions are influenced purely by the economic pull. Pieke (2002: 32) and Chin (1999: 14, referred by Skeldon, 2000b: 17) found such individuals are more common in China. Lăzăroiu and Alexandru (2003: 34-7) found females with higher aspiration are more vulnerable to trafficking in Romania, suggesting the economic pull is important.

In this chapter, we take a traditional economic approach to migration decision making and assume the migration decision positively depends on the income gap between the origin and the destination. More specifically, we assume each worker can earn zero income at home, ie, she/he has no employment prospect at home, while she/he is employed with certainty at the destination.[13]

4.2.2. Demand for smuggling services

A number of authors have argued that restrictive immigration policies of destination countries increase the number of migrants who choose to resort to clandestine border crossing and smugglers who can organise it, eg, Ghosh (1998: 148), Budapest Group (1999: 15-6), Schloenhardt (1999: 212), Kelly and Regan (2000: 5), Skeldon (2000a), Andreas in Kyle and Koslowski (2001: 116), Cornelius (2001: 668), Marshall (2001), ILO (2002: 4), Gallagher (2002: 28), Taran and Chammartin (2003: 5-6), Väyrynen (2003: 3) and NCIS (2003: 37),

[12] See also IOM (1996).

[13] Accordingly, we will focus on migrants whose decisions are affected by both push and pull factors. Our analysis can be generalised by introducing a range of income levels at home among potential migrants.

although there is no firm statistical evidence to prove this.[14] Futo and Jundl (2004: 78, 151-2, 158) report that recently apprehended illegal immigrants in Hungary, Turkey and Ukraine have increasingly relied on smugglers. The UK government (IND, 2001: 76) estimates that smugglers and traffickers are involved in approximately 75 percent of detected cases of illegal border crossing. Koser's (2000: 102-3) survey found some asylum seekers in the sample turning to smugglers because of restrictive policies against them.[15,16]

However, a host country's government is unlikely to adopt a tolerant immigration policy because, while it may reduce the dependence of irregular migrants on smuggling agents and their vulnerability to traffickers, the number of illegal immigrants is likely to increase. For instance, according to the European Commission (2004: 9), the Belgian regularisation programme of 1999 that allowed illegal residents in the country to submit asylum applications seems to have encouraged illegal immigration subsequently.

In this chapter, we simply assume individuals need to hire smugglers if they wish to migrate. We thus assume the host country has restrictive immigration policies so that migrating individuals cannot enter the destination legitimately. Our analysis is limited in the sense that migrants do not choose between illegal entries by themselves and entries arranged by smugglers.

4.2.3. Information transmission

We have mentioned economic push and pull are the major reasons for migration. Note, while economic hardship is something that is actually experienced by potential migrants in home countries before migration, better economic prospects are not. Pull factors are based

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[14]Donato, Durand and Massey (1992: 153) found weak evidence with a small sample, while Singer and Massey (1997: Table 4) found a significant positive relation between the number of US linewatch hours and the use of smugglers in Mexico. On the other hand, Gathmann (2004: Table 6b) found the direct effect of strengthened border enforcement on the demand for a smuggler is little.

[15]See Morrison and Crosland (2001: 27-39) who explain the restrictive nature of European immigration policies against asylum seekers.

[16]Another reason to hire a smuggler might be that of cost minimisation. Skeldon (2000a: 9-10) speculates that the use of smuggling services is often less costly than that of official channels because the latter involves a significant amount of time and bribes. However, bribery is rife in the process of both smuggling and trafficking, and hence its costs are likely to be included in smuggling fees.

on migrants' expectations. That is, even if better economic prospects at destinations are real, there is no guarantee that migrants will have access to them after migration.[17]

Many of those who are planning to migrate, and first-time migrants in particular, gain information about destinations, jobs and also smugglers from family members, relatives, friends and acquaintances, eg, Frejka, Okólski and Sword (1999: 51) in Ukraine, IOM (2002a: 18) in Armenia, Içduygu (2003: 35, 46) in Turkey and UNICRI (2003: 48-9) in the Philippines. Social networks are useful for obtaining reliable information and lowering the risks involved in migration, such as apprehension by the border police and deception by the smuggler. Positive correlations between the availability of family/social networks and the decision to migrate might be interpreted by this reduction in implicit costs related to migration, eg, Espinosa and Massey (1997) and Orrenius (1999). In general, potential migrants in a community become better and better informed, over time, of the costs and benefits involved in migration when the community regularly sends its members abroad, expanding its social networks, eg, Giza in Frejka, Okólski and Sword (1998: Chapter 7) in Poland. Singer and Massey's (1997: Table 4) empirical analysis shows a strong correlation between a migrant's chance of hiring a smuggler and the prevalence of experienced migrants in his community, which may suggest migrants with previous positive experiences with smugglers do share information with their community members.[18]

However, information transmission through social networks is likely to be lopsided: non-exploitative smugglers are more easily identified by potential migrants than traffickers. Victims of trafficking may communicate what happened to them via family/social networks but usually are afraid of pointing out who did it because of the fear of traffickers' reprisals against themselves and their loved ones.[19] Moreover, exploited migrants often have bitter experiences that they would prefer not to share with others in their communities. For example, regardless of having been forced or voluntarily accepted, the fact that a migrant

[17]This feature is modelled by Todaro (1969; 1970) and Harris and Todaro (1970) in the context of rural-urban migration under unemployment risk. Todaro and Maruszko (1987) adopt the same approach to illegal migration.

[18]This in turn implies that those who are not socially well connected are vulnerable to traffickers. IOM's (2001: 16-7) survey of victims of trafficking in Georgia found the majority of the sample could not rely on help and advice through social networks and had to look for smuggling agencies by themselves.

[19]Violence is frequently used to control victims, eg, Aronowitz (2001: 177).

was a prostitute overseas would stigmatise the person in many cultural settings. As a result, trafficked victims of this type are likely to remain silent, eg, IOM (2001: 36).[20] In addition, even if the incidence of trafficking is well known, traffickers may hardly be identified by potential migrants because they would disappear from the community after successful trickery and abuses, eg., Frejka, Okólski and Sword (1999: 52) and IOM (2001: 16).

In Section 5 where we examine the market equilibrium over time, we take into account this feature of information transmission. For simplicity, we assume that both exploited and unexploited migrants in one period communicate what happened to them in their community in the next period, but only smugglers who did not exploit their clients can be identified.

4.2.4. Charges for smuggling services

Charges for smuggling services as well as payment methods vary widely, and known figures and methods are based on individual cases. Therefore, we do not list these here.[21] However, there appears to be a common observation in this market. Namely, non-exploitative smugglers charge their clients for border crossing services, while traffickers may or may not explicitly charge their prey for smuggling.[22] For instance, an IOM study of trafficked women in Belgium found that, while most of them did not have to pay a fee to the traffickers, they found themselves indebted on arrival.[23]

Provided the exploitation of smuggled persons at the destination is sufficiently profitable, it is understandable that some traffickers need not charge them for border crossing. In addition, traffickers are better off pretending they are non-exploitative if migrants are capable of paying for smuggling services. In our model, traffickers can mimic the fee chargeable

[20] An IOM study in Poland (referred by Ghosh, 1998: 67) suggests migrants tend to pretend to be better off than they actually are, and failure abroad is not readily admitted.

[21] IOM (2003: Table 17.21) lists ranges of smuggling fees by origin and destination. See also Ghosh (1998: 31-2).

[22] Traffickers make an excuse when exploiting smuggled migrants that they became heavily indebted while being smuggled, so they charge for smuggling implicitly through exploitation. In this paper, we concentrate on commercial smugglers and do not deal with non-exploitative smugglers who do not charge migrants at all. An example is someone who assist an asylum seeker to cross a border on a humanitarian basis.

[23] Referred by Ghosh (1998: 22)

by non-exploitative smugglers because the shut-down fee is lower for the former than the latter.[24] Hence signalling is not available for the latter under asymmetric information.

We assume migrants pay the smuggling fee only after successful border crossing. Since there are cases where migrants must pay the smuggling fee upfront, or where they pay it by instalments, our analysis is not comprehensive. In our model, migrants are rational: paying the fee upfront could give a smuggler an incentive to default on the provision of border crossing services, and the migrants should therefore condition the fee payment on successful smuggling. According to Donato, Durand and Massey (1992: 151) for Mexico, Içduygu and Toktas (2002: 38-9) for the Middle East and Futo and Jandl (2004: 18) for Central and Eastern Europe, it is not uncommon that the fee payment is made only after the client is smuggled as promised.

We also assume migrants are able to pay for the fee without being indebted to smugglers. Hence we do not examine the case where a migrant enters a debt contract with a smuggler.[25] This is analysed by Friebel and Guriev (2006) without allowing smugglers to exploit their clients.

4.2.5. Exploitation

Migrants become vulnerable once they depart their countries of origin. They are often deprived of their true identities in the form of a passport in order to enter the destination clandestinely. Subject to legal prosecution under the immigration laws of destination countries and devoid of financial means, smuggled migrants often find their freedom of movement severely curtailed, eg, IOM (2001: 32). Victims of trafficking often become aware that they are duped during their journeys or on arrival at the destination planned by traffickers. There are two ways of exploiting smuggled migrants. One is by using them directly, and the other by selling them.

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[24] A smuggler's shut-down fee is the fee at or below which it does not supply a smuggling service and becomes inactive in the market.

[25] A financially constrained person does not necessarily enter a debt contract with a smuggler to finance clandestine migration if there is an alternative source of credit such as family members' credit. See Genicot and Senesky (2004: Tables 4 and 5) for some empirical evidence.

The sex industry can illustrate the financial gain from the coercive use of smuggled migrants. Leskinen (2003) reports detailed figures from the seized bookkeeping of an exposed case in which 5 to 8 Estonian females were working as prostitutes in 5 apartments under a criminal leader of the same nationality with Finnish pimps in Helsinki in 2001. A 20-minute visit to one of these apartments cost 300 markaa, which are divided into 200 for the pimps and 100 for the female worker.[26] The bookkeeping showed the number of clients was about 1,000 per month, which implies the monthly revenue of 200,000 markaa to the pimps. The estimated profit to the criminal group after deducting the costs of running the business was at least 100,000 markaa per month, ie, almost 17,000 euros.[27]

Smugglers who are not employers of their clients can still exploit the migrants simply by selling them. Home Office (2004: 77) for example reports that the price of a Thai female sold to brothel organisers operating in the United Kingdom was 6,000 pounds sterling in the case uncovered by Operation Horsley.[28] The money paid to the smugglers seem to become debts that the females are forced to repay. In such a case, they receive little money from their work, eg, Hughes (2000: 633-4).

Females managed by exploitative smugglers can be repeatedly traded during the smuggling process. IOM and ICMC's (2002: 7-10) report suggests, in Yugoslavia, the existence of trading houses was identified where females for exploitation were exhibited and purchased before border crossing, and higher prices seem to be paid to those who bring younger females to the market. Pobortscha (2002) suggests similar quasi-slave trading in Moldova, and Erder and Kaska (2003: 63) in Turkey.

In our model, exploitation is defined as the use of labour without remuneration, thus ignoring the case where trafficked migrants are sold in the destination. Smugglers are exogenously endowed with different exploitation capacities. As a result, not all smugglers exploit their clients, and traffickers exploit migrants at various levels, which appears realistic, eg, IOM (2001: 33-4).

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[26] 100 markaa $\simeq$ 16.82 euros, according to the report.

[27] The extent of economic and sexual exploitation by coercive pimps might be similar among native and migrant prostitutes. See May, Harocopos and Hough (2000) for the British case.

[28] See Metropolitan Police (2003: 32) for the details of this police operation.

4.3. Benchmark

We now set up a two-country model with a fixed number of identical workers and a fixed number of heterogeneous smugglers. All the workers legally reside in one of the two countries, and we call it the home. The other country is called the destination to which they may attempt to migrate. Economic prospects for the workers are better in the destination than in the home in the sense that the exogenously given earnings per unit of labour are higher in the former than in the latter.

We assume that a worker has no means to migrate from the home to the destination except by hiring a smuggler. A smuggler is capable of delivering such a worker from the home to the destination. Migrants would pay for smuggling services only if border crossing were successful.[29]

Let us normalise the total measure of the smugglers to 1, and each of them has the capacity of supplying 1 unit of border crossing services without the loss of generality. That is, it can be hired by at most one worker. The total measure of the workers is $m \gg 1$. All the agents are risk-neutral.

Let $\beta_j \in (0,1)$ denote the given probability of apprehension at the border for $j \in \{M, S\}$ where M denotes migrant and S smuggler. Let $\lambda_j \in (0,1)$ denote that of apprehension inland. We distinguish between β and λ, for they usually differ from each other and $\lambda_j < \beta_j$ in many countries.[30] It also becomes useful to distinguish between the probabilities for migrants and smugglers when we conduct comparative statics. We commonly observe $\beta_M > \beta_S$ and $\lambda_M > \lambda_S$ in the real world. Smugglers are often able to abandon their clients in order to evade capture. Also, for example, the driver might be apprehended at the border, but it is often difficult to uncover the whole operation and organisation.[31]

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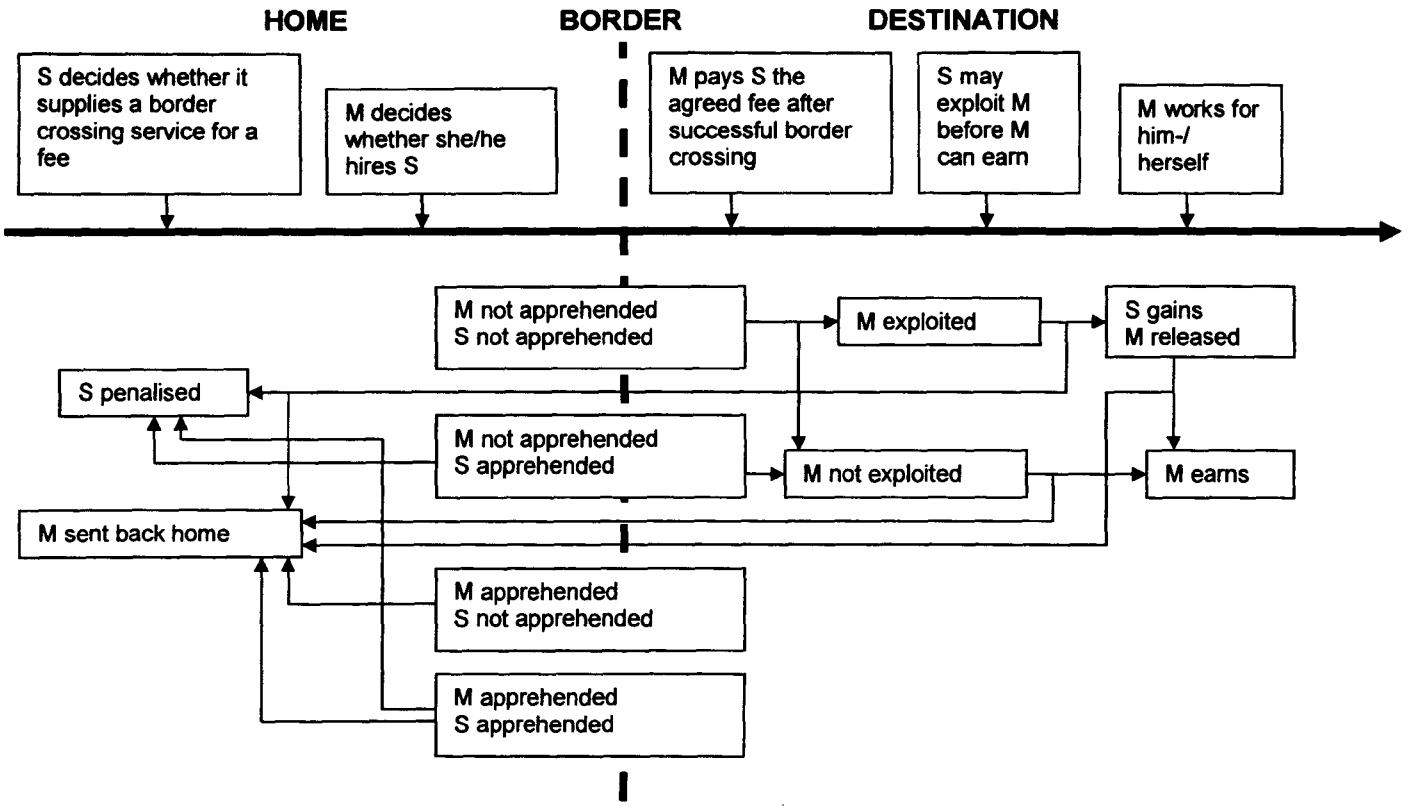
[29]With this payment method, a smuggler cannot have an incentive to default on the provision of smuggling services after receiving a fee, though it does not solve the incentive problem of exploitative smugglers.

[30]See for instance Miller in Kyle and Koslowski (2001: Chapter 12).

[31]Aronowitz (2001: 169) notes forced prostitutes are likely to have more contacts with those other than traffickers than non-sexual forced labourers. In order to minimise the risk of apprehension, victims are often rotated geographically. Raviv and Andreani (2004) found human trafficking operations have become increasingly invisible in the Balkan region.

Fig. 4.1 Order of events



4.3.1. Smugglers

We assume a smuggler's decision to exploit its client depends on its capacity to do so which determines the profitability of exploitation. Exploitation of smuggled migrants in the destination requires relevant facilities to conduct illicit business, evade capture and restrict the freedom of the exploited. Criminal syndicates are likely to be well endowed with such facilities.

Smugglers exogenously differ in their capacities to exploit their smuggled clients in the destination. We define exploitation as the use of labour without remuneration. Let $k \in [0,1]$ denote the given capacity of a smuggler to exploit its migrated client's labour net of exploitation costs.

We suppose each worker is endowed with one unit of labour that can generate $y > 0$ in the destination. Therefore, if exploitation takes place, the smuggler's gain per migrant is ky while the client's earnings are reduced from y to $(1-k)y$.

Let $\Phi(k)$ be a distribution function, and $\phi(k) > 0 \ \forall \ k \in [0,1]$ is the corresponding density function. Hence $\Phi(\cdot)$ is nondegenerate.

Suppose a smuggling operation resulted in successful border crossing. The migrant then paid a smuggling fee, f. The smuggler's expected profit from the post-smuggling exploitation is

$$\tilde{\pi} = (1-\lambda_S)ky - \lambda_S(f+p+kq) \tag{4.1}$$

where $p > 0$ represents the fixed penalty for smuggling and $q > 0$ the marginal penalty for exploitation in pecuniary terms. The expression assumes the fee payment by a client is seized and forfeited in the case of apprehension.[32] Note that, the first term indicates, when exploitation takes place, the smuggled migrant and the smuggler are always caught together with the apprehension probability of λ_S. We thus assume k takes into account the capacity to reduce λ_M to zero.

[32]This is equivalent to assuming the total penalty is increasing in the fee received. This innocent looking assumption is crucial when we endogenise the ratio between smugglers and traffickers.

Let $e(k) \in \{0,1\}$ be a binary variable that is 1 if a type-k smuggler decides to exploit its client and 0 if it does not. We assume a smuggler exploits its client iff $\tilde{\pi}(k) > 0$, ie,

$$(4.2) \qquad e(k) = \begin{cases} 0 & \text{if } \tilde{\pi}(k) \leq 0 \\ 1 & \text{otherwise.} \end{cases}$$

Since the success of border crossing is uncertain at the pre-smuggling stage, a smuggler's total expected profit from smuggling is

$$(4.3) \qquad \hat{\pi} = (1-\beta_S)(1-\beta_M)(f+e\tilde{\pi}) - \beta_S p - c$$

where $c > 0$ denotes the sum of smuggling costs such as expenditures on transportation, hiding places, fraudulent documents and bribes. The first term implies a smuggler does not face a risk of apprehension inland if it decides not to exploit its client.[33] It also assumes a smuggler must deliver its client to the destination in order to receive the fee, f.

Let $\bar{\pi} > 0$ denote the alternative profit available for each smuggler, and we assume $\hat{\pi} > \bar{\pi}$ is both necessary and sufficient for it to supply a border crossing service.

4.3.2. Workers

Each worker is endowed with one unit of labour which is supplied inelastically in either the home or the destination.[34] Let $y > 0$ denote the earnings per unit of labour in the destination.[35] Let us normalise a worker's alternative income, ie, the earnings in the home,

[33] Commonly, apprehended illegal workers are not questioned for the purpose of tracing the smugglers and traffickers who brought them in.

[34] We thus ignore the case where a worker supplies a fraction of the labour endowment in the home and the rest in the destination.

[35] We ignore the possibility of smuggled migrants being unemployed in the destination because there appears to be high demand for illegal migrants who are usually willing to accept lower wages than natives. See OECD (2000: Chapter 3) for an overview. Profitability of hiring unauthorised migrants is exemplified by Ghosh (1998: 77): the convicted employers of irregular migrants in the Netherlands in 1991 made a significant financial gain even after paying for penalties and out-of-court settlements. Furthermore, Anderson and O'Connell Davidson (2003: 21, 25) found some features specific to migrants are preferred by consumers.

to zero. If apprehended, a worker is sent back to the home without paying a penalty.[36] If the apprehension takes place at the border, the worker need not pay a smuggling fee, either.

Suppose each smuggler's k is known to the workers. Suppose (4.1), (4.2) and (4.3) are also known to them. The expected utility of a successfully smuggled worker at the post-smuggling stage is

$$\tilde{u} = (1 - \lambda_M)(1 - e\lambda_S)(1 - ek)y. \tag{4.4}$$

Note that, when a migrant is exploited, λ_S has to be taken into account because there is no chance to expect $(1 - \lambda_M)(1 - k)y$ if the smuggler and the migrant are caught together during the exploitation process. We thus assume if exploitation takes place it does before a migrant can make use of any labour being unused by the smuggler.

At the pre-migration stage, a worker's expected total utility from hiring a smuggler is

$$\hat{u} = (1 - \beta_S)(1 - \beta_M)(\tilde{u} - f) \tag{4.5}$$

which assumes the smuggling fee, f, is paid only if border crossing is successful. We suppose workers are not wealth-constrained in financing assisted clandestine migration.

We assume $\hat{u} \geq 0$ is both necessary and sufficient for a worker to hire a smuggler. (4.5) implies the following participation constraint under symmetric complete information:

$$f \leq (1 - \lambda_M)(1 - e\lambda_S)(1 - ek)y \tag{4.6}$$

which needs to be met if a worker decides to hire a type-k smuggler.

4.3.3. Equilibrium

Under symmetric complete information, the workers know the exploitation capacity of each smuggler as well as its exploitation decision rule. Accordingly, (4.6) and $m \gg 1$ imply there

[36]This assumption may not be reasonable in some cases. Pacurar (2003) points out that, although migrants are not subject to criminal prosecution for being the object of smuggling, they can be prosecuted for holding fraudulent documents or/and directing the third party to smuggle themselves. We assume throghout the paper that migrants are not prosecuted but sent back to the home country without compensation for what the smuggler took from them. This seems to apply to most of the cases.

is a competitive equilibrium fee for each exploitation capacity, ie,

$$(4.7) \qquad f(k) = (1 - e\lambda_S)(1 - ek) f^\circ$$

$$\text{where } f^\circ \equiv (1 - \lambda_M) y.$$

f° is the fee a worker is willing to pay for a non-exploitative smuggling service. By substituting (4.7) into (4.1) with $e = 1$, the exploitation condition, $\tilde{\pi}(f(k), k) > 0$, can be rewritten as follows:

$$(4.8) \qquad k > \tilde{k} \equiv \frac{\lambda_S (1 - \lambda_S) f^\circ + \lambda_S p}{\lambda_S (1 - \lambda_S) f^\circ + (1 - \lambda_S) y - \lambda_S q}$$

Therefore, we can rewrite the exploitation decision rule (4.2) as follows:

$$(4.2') \qquad e(k) = \begin{cases} 1 & \text{if } k > \tilde{k} \\ 0 & \text{otherwise} \end{cases}$$

If $\tilde{k} \geq 1$, or equivalently $y \leq \frac{\lambda_S}{1-\lambda_S}(p + q)$, no smuggler would exploit its clients because $k \in [0, 1]$. All the smugglers are exploitative if $\tilde{k} < 0$ or equivalently $y < \frac{\lambda_S}{1-\lambda_S}\left(\frac{q}{1+\lambda_S(1-\lambda_M)}\right)$, ie, the denominator of $\tilde{k}$ is negative. Accordingly, we need $y > \frac{\lambda_S}{1-\lambda_S}(p + q)$ to have $\tilde{k} \in (0, 1)$.

For those who cannot exploit smuggled migrants profitably, ie, $k \leq \tilde{k}$, the participation constraint, $\hat{\pi}(k \leq \tilde{k}) > \bar{\pi}$, can be rewritten as

$$(4.9) \qquad f > \bar{f} \equiv \frac{\beta_S p + c + \bar{\pi}}{(1 - \beta_S)(1 - \beta_M)}$$

where $\bar{f}$ is the non-exploitative smuggler's shut-down fee at or below which it does not supply a smuggling service.

Exploitative smugglers with $k > \tilde{k}$ may not participate in the market because (4.7) suggests, the more exploitative a smuggler, the lower the fee it can charge. Their participation constraint, $\hat{\pi}(k > \tilde{k}) > \bar{\pi}$, is equivalent to the following:

$$(4.10) \qquad k > \hat{k} \equiv \frac{\bar{f} + \lambda_S p - (1 - \lambda_S)^2 f^\circ}{(1 - \lambda_S) y - \lambda_S q - (1 - \lambda_S)^2 f^\circ}$$

If $\hat{k} \geq 1$, or equivalently $y \leq \frac{\lambda_S}{1-\lambda_S}(p+q) + \frac{\bar{f}}{1-\lambda_S}$, no trafficker enters the market. All the traffickers are active if $\hat{k} < 0$ or equivalently either (a) a combination of a negative numerator and a positive denominator in the expression for $\hat{k}$, ie, $\bar{f} + \lambda_S p < (1-\lambda_S)^2 f^\circ < (1-\lambda_S) y - \lambda_S q$ or (b) that of a positive numerator and a negative denominator, ie, $\bar{f} + \lambda_S p > (1-\lambda_S)^2 f^\circ > (1-\lambda_S) y - \lambda_S q$. In order to have $\hat{k} \in (0,1)$, we need either

$$(4.11) \quad (1-\lambda_S) y - \lambda_S q > \bar{f} + \lambda_S p > (1-\lambda_S)^2 f^\circ$$

or $(1-\lambda_S)^2 f^\circ > \bar{f} + \lambda_S p > (1-\lambda_S) y - \lambda_S q$. The former implies both the denominator and the numerator of $\hat{k}$ are positive, while both are negative for the latter. Note $(1-\lambda_S) y - \lambda_S q > \bar{f} + \lambda_S p$ or equivalently $y > \frac{\lambda_S}{1-\lambda_S}(p+q) + \frac{\bar{f}}{1-\lambda_S}$ guarantees $\tilde{k} \in (0,1)$. Let us assume (4.11) holds throughout so as to examine the market with $\hat{k}, \tilde{k} \in (0,1)$.

Assumption 4.1

$y > \frac{\bar{f} + \lambda_S (p+q)}{1-\lambda_S} > \frac{(1-\lambda_S)^2 (1-\lambda_M) y + \lambda_S q}{1-\lambda_S}$ holds.

In addition to restricting the threshold exploitation capacities, $\tilde{k}$ and $\hat{k}$, over the open interval $(0,1)$, this assumption implies the following.

Lemma 4.1 *There is at least a trafficker who provides a border crossing service even without receiving a smuggling fee under* Assumption 4.1.

Proof. (4.1), (4.2) and (4.3) suggest a trafficker with $k > \frac{\bar{f} + \lambda_S p}{(1-\lambda_S) y - \lambda_S q}$ is active even if $f = 0$. Since $k \in [0,1]$, such a trafficker exists iff $y > \frac{\bar{f} + \lambda_S (p+q)}{1-\lambda_S}$, which is met by the first part of Assumption 4.1. □

As we mentioned in Section 4.2, this is an important feature of the migrant smuggling market.

Note both threshold exploitation capacities, $\tilde{k}$ and $\hat{k}$, are exogenous, as shown in (4.8) and (4.10). The relationship between $\tilde{k}$ and $\hat{k}$ is ambiguous without restrictions on the parameters in the expressions. We have the following three possible situations under Assumption 4.1.

Proposition 4.1 *The market equilibrium is characterised as follows under symmetric complete information and* Assumption 4.1*:*

	(a)	(b)	(c)
Environment	$\gamma\bar{f} < f^\circ$	$\bar{f} < f^\circ \leq \gamma\bar{f}$	$f^\circ \leq \bar{f}$
Nonexploitative smugglers	$\Phi(\tilde{k})$	$\Phi(\tilde{k})$	0
Exploitative smugglers	$1-\Phi(\tilde{k})$	$1-\Phi(\hat{k})$	$1-\Phi(\hat{k})$
Inactive smugglers	0	$\Phi(\hat{k})-\Phi(\tilde{k})$	$\Phi(\hat{k})$

where γ is a constant greater than unity.

Proof. (4.7) and (4.9) imply all the non-exploitative smugglers participate in the market iff $f^\circ > \bar{f}$. (4.8) and (4.10) suggest all the exploitative smugglers participate in the market iff $\tilde{k} > \hat{k} \Leftrightarrow f^\circ > \gamma\bar{f}$ where $\gamma \equiv \frac{\lambda_S(1-\lambda_S)(1-\lambda_M)y+(1-\lambda_S)y-\lambda_S q}{(1-\lambda_S)[(1-\lambda_S)y-\lambda_S(p+q)]} > 1$ under Assumption 4.1. When $\tilde{k} \leq \hat{k}$, there are $\Phi(\hat{k})-\Phi(\tilde{k})$ smugglers who can exploit migrants profitably in the destination but do not participate in the market, for the cost of smuggling is too high, ie, $\hat{\pi}(k > \tilde{k}) \leq \bar{\pi}\ \forall\ k \in (\tilde{k}, \hat{k}]$. □

In case (a), every smuggling agent supplies a border crossing service. In case (b), there are $\Phi(\hat{k})-\Phi(\tilde{k})$ agents who can exploit their smuggled clients profitably, which negatively affects the overall profit via a reduction in their fees under symmetric complete information so that they decide not to supply border crossing services. As a result, "modestly exploitative" smugglers, ie, $k \in (\tilde{k}, \hat{k}]$, do not operate. Active smugglers are either non-exploitative, ie, $k \in [0, \tilde{k}]$, or "highly exploitative", ie, $k \in (\hat{k}, 1]$.

In case (c), not only "modestly exploitative" but also non-exploitative smugglers do not supply border crossing services. However, "highly exploitative" smugglers continue to operate, for they can profit from post-smuggling exploitation sufficiently enough to offset their low smuggling fees. Note that, under symmetric complete information, any of these outcomes is Pareto-efficient, and each worker pays according to the observable exploitation capacity of each smuggler.

4.4. Asymmetric information

Let us now suppose the exploitation capacity of each smuggler is private information. Potential migrants are then unable to distinguish between the smugglers with different exploitation capacities. Accordingly, the smuggling fee is determined independently of the type of the smuggler whom a migrant hires. Because workers are identical, every one of them forms the same expectation of exploitation in (4.7), ie, there is a single smuggling fee in the market. Let f be a function of the expected exploitation capacity denoted by κ. In the previous section, we saw that the threshold exploitation capacities, $\tilde{k}$ and $\hat{k}$, were exogenously determined under symmetric information. In this section, we endogenise these in the expected exploitation via the smuggling fee, $f(\kappa)$.

The exploitation condition, $\tilde{\pi}(f(\kappa), k) > 0$, can be rewritten as

$$(4.12) \qquad f(\kappa) < \tilde{f}(k) \equiv \left(\frac{1-\lambda_S}{\lambda_S} y - q\right) k - p.$$

The exploitation decision of a smuggler thus depends on its k. If $y > \frac{\lambda_S}{1-\lambda_S} q$, smugglers with higher exploitation capacities are more likely to decide to exploit their clients. This is the case under Assumption 4.1.

Those with k at which $\tilde{f}(k) \leq f(\kappa)$ are non-exploitative and enter the market iff $f(\kappa) > \bar{f}$, as shown in (4.9). That is, the participation decision of a non-exploitative smuggler does not depend on its own type.

Those with k at which $\tilde{f}(k) > f(\kappa)$ are exploitative and enter the market iff $\hat{\pi}(f(\kappa), k) > \bar{\pi}$ which can be rewritten as

$$(4.13) \quad f(\kappa) > \hat{f}(k) \equiv \frac{\bar{f} + \lambda_S p}{1 - \lambda_S} - \left(y - \frac{\lambda_S}{1 - \lambda_S} q\right) k.$$

It shows the participation decision of an exploitative smuggler depends on its k. If $y > \frac{\lambda_S}{1-\lambda_S} q$, more exploitative smugglers have lower shut-down fees because of higher expected gains from exploitation in the post-smuggling period. Again, this is the case under Assumption 4.1. In addition, by Lemma 4.1, we know there is at least a trafficker who is active but need not charge a fee.

Lemma 4.2 *Non-exploitative smugglers cannot use a different fee to distinguish themselves from exploitative smugglers under* Assumption 4.1.

Proof. Assumption 4.1 suggests $\mathrm{d}\hat{f}/\mathrm{d}k < 0$ in (4.13), while the non-exploitative smuggler's shut-down fee is fixed at $\bar{f}$ in (4.9). There exists at least a trafficker for whom $\hat{f} < \bar{f}$ because $\hat{f} < \bar{f} \Leftrightarrow k > \frac{\lambda_S(\bar{f}+p)}{(1-\lambda_S)y-\lambda_S q} \in (0,1)$ under Assumption 4.1, implying non-exploitative smugglers cannot use a lower-than-the-market fee for signalling. Since (4.1), (4.2) and (4.3) indicate $\mathrm{d}\hat{\pi}(\tilde{\pi} > 0)/\mathrm{d}f > 0$, neither can a higher-than-the-market price be used for signalling. □

This suggests there always are exploitative smugglers who are willing to mimic any fee that non-exploitative smugglers might charge. Hence rational workers should ignore any fee signalling by non-exploitative smugglers.

Expressions (4.12) and (4.13) can be rewritten in a way analogous to (4.8) and (4.10) as follows:

$$(4.14) \quad k > \tilde{k}' \equiv \frac{\lambda_S f(\kappa) + \lambda_S p}{(1 - \lambda_S) y - \lambda_S q}$$

and

$$(4.15) \qquad k > \hat{k}' \equiv \frac{\bar{f} + \lambda_S p - (1-\lambda_S) f(\kappa)}{(1-\lambda_S) y - \lambda_S q}$$

Notice, while $\tilde{k}$ and $\hat{k}$ are exogenously given in (4.8) and (4.10) under symmetric information, $\tilde{k}'$ and $\hat{k}'$ are dependent on the workers' expectation, κ, via the market fee. Expressions (4.14) and (4.15) imply

$$(4.16) \qquad \bar{f} < f(\kappa) \Leftrightarrow \hat{k}'(\kappa) < \tilde{k}'(\kappa)$$

which leads to the following lemma.

Lemma 4.3 *The total number of active smuggling agents is non-decreasing in the fee, and the average exploitation is strictly decreasing in it.*

Proof. (i) If $f > \bar{f}$, (4.9) suggests all non-exploitative smugglers are active. (4.16) suggests all traffickers are also active. Hence the number of active suppliers totals to measure one. If $f \leq \bar{f}$, all non-exploitative smugglers are inactive. There are $1 - \Phi(\hat{k}')$ active traffickers where (4.15) suggests $\partial \hat{k}'/\partial f < 0$. (ii) If $f > \bar{f}$, the average exploitation capacity is $\int_{\tilde{k}'}^{1} k\phi(k)\mathrm{d}k$ where (4.14) suggests $\partial \tilde{k}'/\partial f > 0$. If $f \leq \bar{f}$, it is $(\int_{\hat{k}'}^{1} \phi(k)\mathrm{d}k)^{-1} \int_{\hat{k}'}^{1} k\phi(k)\mathrm{d}k$. (4.15) suggests $\partial \hat{k}'/\partial f < 0$. Hence the denominator and the numerator are both strictly increasing in f. But $\forall \hat{k}'_0, \hat{k}'_1 \in (0,1)$ with $\hat{k}'_0 > \hat{k}'_1$, we have $\int_{\hat{k}'_1}^{\hat{k}'_0} k\phi(k)\mathrm{d}k < \int_{\hat{k}'_1}^{\hat{k}'_0} \phi(k)\mathrm{d}k$. □

The following table summarises the two possible situations:

	(a)	(b)
Environment	$\bar{f} < f(\kappa)$	$f(\kappa) \leq \bar{f}$
Nonexploitative smugglers	$\Phi(\tilde{k}')$	0
Exploitative smugglers	$1 - \Phi(\tilde{k}')$	$1 - \Phi(\hat{k}')$
Inactive smugglers	0	$\Phi(\hat{k}')$

Compared to the table in Proposition 4.1, there is no case where some traffickers are inactive while non-exploitative smugglers are active. Such a case was a possibility in the previous section because shut-down fees of "modestly exploitative" traffickers might be higher than non-exploitative smugglers' under symmetric information.

Let us now characterise the market equilibrium. The set of exploitation capacities of the smugglers who are willing to participate in the market at a given fee is

$$(4.18') \quad K(f) = \left\{ k \in [0,1] : \begin{array}{ll} f > \bar{f} & \text{for } k \leq \tilde{k}'(f) \\ f > \hat{f}(k) & \text{otherwise} \end{array} \right\}.$$

Since every worker believes the average exploitation capacity in the market is κ, (4.6) and $m \gg 1$ suggest each smuggler can charge for a clandestine border crossing service

$$(4.17') \quad f(\kappa) = (1 - \lambda_S)(1 - \kappa) f^{\circ}.$$

Note, as shown in the table after Lemma 4.3, there is no environment where only non-exploitative smugglers are active in the market. Therefore, $\kappa > 0$, and hence $-\lambda_S$ is present in (4.17').[37]

As in standard adverse selection models, we define the equilibrium as the situation where the workers' expectation of the average exploitation capacity equals the actual average.[38] That is, we assume all the agents in the market know the distribution of the k parameter among the smugglers, and hence the workers' beliefs correctly reflect the actual average exploitation capacity of the smugglers who are active in the market. Accordingly, $\kappa = E[ek | k \in K]$.

Definition 4.1 Under asymmetric information, an equilibrium is characterised by a pair of a smuggling fee, f^*, and a set, K^*, of exploitation capacities being present in the market such that

$$(4.17) \quad f^* = (1 - \lambda_S) f^{\circ} (1 - \kappa^*)$$

[37] For simplicity, we do not discount $-\lambda_S$ by the ratio between traffickers and smugglers.
[38] See for instance Mas-Colell, Whinston and Green (1995: 439).

where $\kappa^* = E[ek|k \in K^*]$,

$$(4.18) \quad K^* = \left\{ k \in [0,1] : \begin{array}{ll} f^* > \bar{f} & \text{for } k \leq \tilde{k}^* \\ f^* > \hat{f}(k) & \text{otherwise} \end{array} \right\}$$

where $\tilde{k}^* \equiv \tilde{k}'(f^*)$ and, with $\hat{k}^* \equiv \hat{k}'(f^*)$,

$$(4.19) \quad \kappa^* = \begin{cases} \int_{\tilde{k}^*}^1 k\phi(k)\mathrm{d}k & \text{if } f^* > \bar{f} \\ \left(\int_{\hat{k}^*}^1 \phi(k)\,\mathrm{d}k\right)^{-1} \int_{\hat{k}^*}^1 k\phi(k)\mathrm{d}k & \text{otherwise.} \end{cases}$$

Proposition 4.2 *Under asymmetric information and* Assumption 4.1, *if* $f^* \leq \bar{f}$, *the market equilibrium is characterised by adverse selection: only traffickers are active even though each worker is willing to pay* $f^\circ > \bar{f}$ *to a non-exploitative smuggler.*

Proof. (4.9) implies all non-exploitative smugglers are inactive iff $f^* \leq \bar{f}$. (4.16) and (4.15) indicate traffickers with $k > \hat{k}^*$ are active regardless of f^*. By Lemma 4.1, such traffickers exist. □

Thus, in this market for migrant smuggling, the equilibrium might be of adverse selection first characterised by Akerlof (1970): all non-exploitative smugglers are driven out of the market while migrants are willing to pay a high fee to hire such a supplier.

The equilibrium is not necessarily unique, as in Wilson (1980). The multiplicity depends on $\Phi(k)$. Rose (1993) argued that multiple equilibria are rare possibilities in this type of adverse selection model. Hence let us focus on the environment where a static equilibrium is unique.

Let us now analyse *ceteris paribus* effects of changes in policy instruments. There are two equilibrium situations: $f^* > \bar{f}$ and $f^* \leq \bar{f}$. In the former case, all smugglers are active, while all non-exploitative smugglers are absent in the latter. The following proposition is for the full participation equilibrium before a policy change.

Proposition 4.3 *When all smugglers are active in initial equilibrium, ie, $f^* > \bar{f}$, we have the following:*

(i) *Improved border apprehension, either β_M or β_S, does not directly affect the average exploitation by affecting exploitation decision making. However, it may drive away all non-exploitative smugglers from the market by raising their shut-down fee.*

(ii) *An increase in the penalty for migrant smuggling, p, decreases the average exploitation. It increases both non-exploitative smugglers' shut-down fee and the equilibrium fee, and hence it is ambiguous whether it tends to drive away all non-exploitative smugglers from the market.*

(iii) *An increase in the marginal penalty for exploitation, q, decreases the average exploitation. It also maintains the full participation by increasing the equilibrium fee.*

(iv) *Improved inland apprehension of successfully smuggled migrants, λ_M, increases the average exploitation. It may drive away all non-exploitative smugglers from the market by reducing the equilibrium fee.*

(v) *Improved inland apprehension of traffickers, λ_S, increases the average exploitation if λ_S remains sufficiently small: $\frac{(y+q)\tilde{k}^*+(1-\lambda_M)y(1-\kappa^*)+p}{2(1-\lambda_M)y(1-\kappa^*)} > \lambda_S$ in particular. If this condition is met, it may drive away all non-exploitative smugglers from the market by reducing the equilibrium fee. (If this condition is not met, the average exploitation is non-increasing in it, and its effect on the equilibrium fee is ambiguous.)*

Proof. See Appendix B. □

The intuition behind Part (i) of the proposition is that border control does not directly affect the exploitation decision making because exploitation takes place after border crossing. That is, the decision is made, assuming successful border crossing. However, it raises the shut-down fee for non-exploitative smugglers in (4.9). This also affects the shut-down fees for exploitative smugglers in (4.13). This increase is to compensate an increased risk of apprehension at the border. As (4.16) implies, the least capable of exploitation will exit the market first.

Parts (ii) and (iii) of the proposition result from the fact that these measures negatively influence the profitability of migrant exploitation via (4.1), and an increase in these implies a smaller number of smugglers to become exploitative. The marginal penalty for exploitation does not affect the profitability of smuggling, as far as the smuggler decides not to exploit its customer. Hence the full participation is maintained. However, the penalty for smuggling negatively affects both the profitability of exploitation and smuggling, as (4.1) and (4.3) imply. As a result, its effect on the number of active smugglers remains ambiguous.

The intuition behind Part (iv) of the proposition is that a high probability of catching smuggled migrants reduces each worker's expected gain from migration. This will be reflected in the equilibrium fee in (4.17). A fall in f then lowers $\tilde{k}^*$, which increases the average exploitation by increasing the ratio of exploitative to non-exploitative smugglers. Lemma 4.2 indicates that the higher the exploitation capacity, the lower the shut-down fee. Hence sufficiently high λ_M will drive away non-exploitative smugglers from the market.

Part (v) of the proposition suggests that the effect of improved inland apprehension of exploitative smugglers is similar to that of improved inland apprehension of smuggled migrants, as far as the apprehension rate remains low. If λ_S exceeds a certain level given in the proposition as a result of improved apprehension effort, the average exploitation decreases because $\tilde{k}^*$ would then be increased. Its effect on the equilibrium fee then becomes ambiguous, and hence it is not clear whether the full participation is maintained.

Compared to this full participation case, we have a simple unambiguous result when the initial equilibrium is characterised by adverse selection, ie, the absence of non-exploitative smugglers.

Proposition 4.4 *When all non-exploitative smugglers exit the market in initial equilibrium, ie, $f^* \leq \bar{f}$, the number of active exploitative smugglers is decreasing in any of the anti-smuggling measures, while the average exploitation in the market is increasing in it.*

Proof. See Appendix B. □

The implication is that, under adverse selection, policymakers face a dilemma of whether to reduce the average exploitation that each smuggled migrant suffers from or the availability of smuggling services to potential migrants.

4.5. Over time

Our static analysis has shown that a market equilibrium requires either the full participation of both smugglers and traffickers or the participation of only traffickers. Over time, however, the static equilibrium ratio between smugglers and traffickers is not necessarily stable. The reason is that the informational structure is likely to change when the experiences of migrants can be communicated only imperfectly to workers who intend to hire smugglers. Potential migrants often gather information about reliable smugglers via social networks that they trust very much, but traffickers usually know how to remain unidentifiable in the market.

Consider overlapping generations of smuggling agents over the discrete time horizon $t = 0, 1, 2, ..., \infty$. Suppose each of them operates only for two consecutive periods. In every period, a cohort of potential smuggling agents arises in the economy, totalling to measure one. The distribution of exogenous exploitation capacities in each cohort is time-invariable, ie, $\Phi(k)$. Let $\delta \in [0, 1]$ represent the time-invariable impatience parameter common to all smugglers: $\delta = 0$ implies smugglers are completely impatient. In period 0, the first cohort of smuggling agents arises in the economy, and none of the workers is informed of the exploitation capacity of any particluar smuggler at the pre-smuggling stage.[39] We call a smuggler who arises in the economy in period t a period-t smuggler.

If social networks are so efficient that k of all period-t smuggling agents can be known to all potential migrants in period $t + 1$, the migrant smuggling market consists of two parts from period 1 onwards: one with period-t agents under symmetric information and the other with period-$t + 1$ agents under asymmetric information. In this case, for all $t = 1, 2, ..., \infty$, the symmetric part's equilibrium is characterised by Proposition 4.1, and the asymmetric

[39]For example, we can imagine a sudden increase in the number of potential migrants who cannot obtain information about migration via their social networks, eg, immediately after the collapse of the Soviet Union (Hughes, 2000).

part's by Definition 4.1. In period 0, the whole market is informationally asymmetric, and the equilibrium is characterised by Definition 4.1. The equilibrium fees in the market are stable over time because we assume the distribution of exploitation capacities is fixed.

Let us now assume that social networks are so trusted that smugglers who do not exploit their clients in period t can charge f°, the maximum fee a worker is willing to pay a non-exploitative smuggler, in period $t+1$. This may generate an incentive for some smugglers to refrain from exploiting their clients initially even though their exploitation capacities are high enough to have $\tilde{\pi}(k) > 0$. For simplicity, let us also assume potential migrants do not trust traffickers at all: a period-t trafficker cannot charge a client $f(k)$ by allowing its k to be known in period $t+1$. A period-t trafficker then must belong to the informationally asymmetric part of the market during its two consecutive periods.[40] Information transmission is thus imperfect.

4.5.1. Deception via social networks

Given the trust in social networks and the distrust in traffickers, we show a worker could hire a trafficker while he/she thinks it is a non-exploitative smuggler. Suppose a smuggling agent is active during its two consecutive service periods, ie, $f_t^*, f_{t+1}^* > \bar{f}$. There are then four possible operations: EN, EE, NN and NE where, for example, EN means 'exploit in the first period and do not exploit in the second.' In the first period, it can charge f_t^* regardless of its service. In the second period, it can charge f_{t+1}^* if it exploits in the first period but f° if it does not exploit in that period. The following table presents the expected profit, Π, for each operation, where $D \equiv (1-\beta_S)(1-\beta_M)$ and $C \equiv \beta_S p + c$.

[40] Alternatively, we can assume potential migrants seek only non-exploitative smuggling services. Without this assumption, we need allow period-t traffickers to choose between $f(k)$ and f_{t+1}^*, which complicates the determination of the rational workers' expectation of exploitation.

OPERATION	PERIOD	Π
EN	1st	$[f_t^* + (1-\lambda_S)yk - \lambda_S(f_t^* + p + qk)]D - C$
	2nd	$+\{f_{t+1}^* D - C\}\delta$
EE	1st	$[f_t^* + (1-\lambda_S)yk - \lambda_S(f_t^* + p + qk)]D - C$
	2nd	$+\{[f_{t+1}^* + (1-\lambda_S)yk - \lambda_S(f_{t+1}^* + p + qk)]D - C\}\delta$
NN	1st	$f_t^* D - C$
	2nd	$+\{f^\circ D - C\}\delta$
NE	1st	$f_t^* D - C$
	2nd	$+\{[f^\circ + (1-\lambda_S)yk - \lambda_S(f^\circ + p + qk)]D - C\}\delta$

Let us first look at the second-period exploitation decision making. Suppose a smuggler exploited in the first period. It can then charge f_{t+1}^* and exploits in the second period iff $\Pi^{EE} > \Pi^{EN}$ or equivalently $k > \tilde{k}_{t+1}^*$. Suppose a smuggler did not exploit in the first period. It can then charge f° and exploits in the second period iff $\Pi^{NE} > \Pi^{NN}$ or equivalently $k > \tilde{k}^\circ \equiv \lambda_S(f^\circ + p)/[(1-\lambda_S)y - \lambda_S q]$.

Since $f^\circ > f_{t+1}^*$, we have (a) those with $k \in [0, \tilde{k}_{t+1}^*]$ who do not exploit in the second period regardless of their first-period exploitation decision, (b) those with $k \in (\tilde{k}_{t+1}^*, \tilde{k}^\circ]$ who exploit iff they exploit in the first period and (c) those with $k \in (\tilde{k}^\circ, 1]$ who exploit regardless of their first-period exploitation decision, assuming $\tilde{k}^\circ < 1$. Given these three groups, we can now examine the first-period exploitation decision making.

Those in group (a) exploit in the first period iff $\Pi^{EN} > \Pi^{NN}$ or equivalently

$$k > \frac{(f^\circ - f_{t+1}^*)\delta + \lambda_S(f_t^* + p)}{(1-\lambda_S)y - \lambda_S q}.$$

Such a smuggler exists iff $\tilde{k}_{t+1}^* > \frac{(f^\circ - f_{t+1}^*)\delta + \lambda_S(f_t^* + p)}{(1-\lambda_S)y - \lambda_S q}$ which is equivalent to $(f_{t+1}^* - f_t^*)\lambda_S > (f^\circ - f_{t+1}^*)\delta$.

Those in group (b) exploit in the first period iff $\Pi^{EE} > \Pi^{NN}$ or equivalently

$$k > \frac{[f^\circ - (1-\lambda_S)f_{t+1}^*]\frac{\delta}{1+\delta} + \lambda_S\left(f_t^*\frac{1}{1+\delta} + p\right)}{(1-\lambda_S)y - \lambda_S q}.$$

Such a smuggler exists iff $\tilde{k}^\circ > \frac{\left[f^\circ-(1-\lambda_S)f^*_{t+1}\right]\frac{\delta}{1+\delta}+\lambda_S\left(f^*_t\frac{1}{1+\delta}+p\right)}{(1-\lambda_S)y-\lambda_S q}$ or equivalently $\left(f^\circ - f^*_t\right)\frac{\lambda_S}{1-\lambda_S} > \left(f^\circ - f^*_{t+1}\right)\delta$.

Those in group (c) exploit in the first period iff $\Pi^{\mathrm{EE}} > \Pi^{\mathrm{NE}}$ or equivalently

$$k > \frac{(1-\lambda_S)\left(f^\circ - f^*_{t+1}\right)\delta + \lambda_S\left(f^*_t + p\right)}{(1-\lambda_S)\,y - \lambda_S q}.$$

Such a smuggler exists iff $1 > \frac{(1-\lambda_S)\left(f^\circ-f^*_{t+1}\right)\delta+\lambda_S(f^*_t+p)}{(1-\lambda_S)y-\lambda_S q}$ or equivalently $y-\left(f^*_t+p+q\right)\frac{\lambda_S}{1-\lambda_S} > \left(f^\circ - f^*_{t+1}\right)\delta$.

The following table summarises the conditions regarding the first-period exploitation we derived above by the three groups.

k	A TRAFFICKER EXISTS IF	ALL ARE TRAFFICKERS IF
$[0, \tilde{k}^*_{t+1}]$	$\left(f^*_{t+1} - f^*_t\right)\lambda_S > \left(f^\circ - f^*_{t+1}\right)\delta$	N.A.
$(\tilde{k}^*_{t+1}, \tilde{k}^\circ]$	$\left(f^\circ - f^*_t\right)\frac{\lambda_S}{1-\lambda_S} > \left(f^\circ - f^*_{t+1}\right)\delta$	$\left(f^*_{t+1} - f^*_t\right)\lambda_S \geq \left(f^\circ - f^*_{t+1}\right)\delta$
$(\tilde{k}^\circ, 1]$	$y - \left(f^*_t + p + q\right)\frac{\lambda_S}{1-\lambda_S} > \left(f^\circ - f^*_{t+1}\right)\delta$	$\left(f^\circ - f^*_t\right)\frac{\lambda_S}{1-\lambda_S} \geq \left(f^\circ - f^*_{t+1}\right)\delta$

The last row of this table suggests there are those who do not exploit in the first period but do so in the second iff

$$(4.20) \qquad y - \left(f^*_t + p + q\right)\frac{\lambda_S}{1-\lambda_S} > \left(f^\circ - f^*_{t+1}\right)\delta > \left(f^\circ - f^*_t\right)\frac{\lambda_S}{1-\lambda_S}.$$

To meet this condition, we require $y - \left(f^*_t + p + q\right)\frac{\lambda_S}{1-\lambda_S} > \left(f^\circ - f^*_t\right)\frac{\lambda_S}{1-\lambda_S}$ or equivalently $y > \frac{\lambda_S(p+q)}{1-\lambda_S(2-\lambda_M)}$ which does not necessarily hold under Assumption 4.1. If this is the case, the above condition may be satisfied, depending on δ. Thus, it is possible to have a smuggler who does not exploit in the first period but does so in the second. This section thus derived a condition where some migrants might feel unfairly deceived by traffickers because social networks are so trusted.

Proposition 4.5 *When potential migrants seek non-exploitative smuggling services and trust social networks, there is a fraction of migrants who pay a high price with a belief that*

they are hiring non-exploitative smugglers but are eventually exploited by them after border crossing iff the inequality (4.20) *holds.*

To find out an equilibrium path over time, we need take into account the participation decision of each smuggling agent as well as its exploitation decision. This complicates the rational optimisation problem because, as the above table shows, f^*_{t+1} must be known in period t to decide on both exploitation and participation. But f^*_{t+1} needs to take into account the exploitation and participation decisions of all smuggling agents in that period which in turn depend on f^*_{t+2} and so on. In addition, Proposition 4.5 implies rational potential migrants need take into account the risk of hiring a trafficker at f°.

In the next section, we solve for the equilibrium path of a special case: all smugglers are completely impatient, ie, $\delta = 0$. This significantly simplifies the analysis.

4.5.2. Impatient smugglers

When $\delta = 0$, the first-period decision making of smugglers does not depend on the future. Smugglers thus make their exploitation and participation decisions in the first period without taking into account the endogeneity of the second-period profit. This implies a static equilibrium in Section 4.4 is reached initially. Let us assume a full participation equilibrium is reached in period 0, ie, $\bar{f} < f^*_0$. Accordingly, there are $\Phi(\tilde{k}^*_0)$ non-exploitative smugglers and $1 - \Phi(\tilde{k}^*_0)$ traffickers in period 0.

In period 1, there are 1 period-0 smuggling agents and 1 new smuggling agents in the economy. Because all period-0 non-exploitative smugglers are identified through social networks, they are able to charge the full information fee, f°, in period 1 if there is no incentive for them to become exploitative in that period.

Lemma 4.4 *An impatient smuggler who does not exploit its client in its first period neither does so in the second.*

Proof. (i) A period-t smuggler with $k \leq \tilde{k}^*_t$ exploits its client in period $t+1$ if $\tilde{\pi}(f^\circ, k) > 0$. However, $\tilde{\pi}(f^\circ, k) > 0 \Leftrightarrow k > \tilde{k}^\circ$. Since $f^\circ > f^*_t \Rightarrow \tilde{k}^\circ > \tilde{k}^*_t$ by Lemma 4.1, $\tilde{\pi}(f^\circ, k) < 0$

$\forall\, k \in [0, \tilde{k}_t^*]$. (ii) A period-$t$ smuggler with $k \leq \tilde{k}_t^*$ also exploits its client in period $t+1$ if $\hat{\pi}\left(f^\circ, \tilde{\pi}=0\right) \leq \hat{\pi}\left(f_{t+1}^*, \tilde{\pi}\left(f_{t+1}^*, k\right)\right)$ by charging f_{t+1}^* instead of f°. This condition can be rewritten as

$$k \geq \tilde{k}_{t+1}^\dagger \equiv \frac{\left[1-(1-\lambda_S)^2\left(1-\kappa_{t+1}^*\right)\right] f^\circ + \lambda_S p}{(1-\lambda_S)\, y - \lambda_S q}$$

which implies iff $\tilde{k}_{t+1}^\dagger \leq \tilde{k}_t^*$ there is such a smuggler whose capacity is $k \in [\tilde{k}_{t+1}^\dagger, \tilde{k}_t^*]$. By (4.14), $\tilde{k}_{t+1}^\dagger \leq \tilde{k}_t^* \Leftrightarrow 1-(1-\lambda_S)^2\left(1-\kappa_{t+1}^*\right) \leq \lambda_S\left(1-\lambda_S\right)\left(1-\kappa_t^*\right)$, which is impossible as $1-\lambda_S\kappa_t^* - (1-\lambda_S)\,\kappa_{t+1}^* < \frac{1}{1-\lambda_S}$. □

Part (ii) of the proof suggests non-exploitative period-t smugglers do not choose to remain unidentifiable in period $t+1$. Lemma 4.1 implies, if there is any non-exploitative smuggler in the informationally asymmetric part of the market in period t, it then operates in the informationally symmetric part of the market in period $t+1$.

For period-0 traffickers and all period-1 potential suppliers, the exploitation capacity is private information. Hence they can charge f_1^*. They cannot pretend to be non-exploitative smugglers and charge f° because rational workers who could not hire a period-0 non-exploitative smuggler who is identified via social networks should expect to hire in the informationally asymmetric part of the market.

Lemma 4.5 *The average exploitation capacity in the asymmetric part of the market is non-decreasing over time. It coverges to κ_x^* in period x such that $f_x^* \leq \bar{f}$ and $f_{x-1}^* > \bar{f}$.*

Proof. Lemma 4.1 implies there are always some period-$t-1$ traffickers operating in period t. The average capacity in period 0 is written out in (4.19). For period 1 onwards, with time-invariable $\Phi(k)$, it is

(4.21)

$$\kappa_t^* = \begin{cases} \left(2\int_0^1 k\phi(k)\,\mathrm{d}k - \int_0^{\tilde{k}_{t-1}^*} k\phi(k)\,\mathrm{d}k - \int_0^{\tilde{k}_t^*} k\phi(k)\,\mathrm{d}k\right)\left(2-\Phi(\tilde{k}_{t-1}^*)\right)^{-1} & \text{if } f_t^* > \bar{f} \\ \left(\int_0^1 k\phi(k)\,\mathrm{d}k - \int_0^{\hat{k}_x^*} k\phi(k)\,\mathrm{d}k\right)\left(1-\Phi(\hat{k}_x^*)\right)^{-1} & \text{otherwise.} \end{cases}$$

(4.17), (4.14) and (4.21) imply $\kappa_0^* < \kappa_1^* \Rightarrow f_1^* < f_0^* \Rightarrow \tilde{k}_1^* < \tilde{k}_0^* \Rightarrow \kappa_0^* < \kappa_1^*$ if $f_1^* > \bar{f}$. When $f_{x-1}^* > \bar{f}$ and $f_x^* \leq \bar{f}$, there is no active period-x non-exploitative smuggler. In addition, period-$x-1$ traffickers with $k \in (\tilde{k}_{x-1}^*, \hat{k}_x^*]$ do not operate. Only period-$x-1$ and period-x traffickers with $k \in (\hat{k}_x^*, 1]$ are active. With time-invariable $\Phi(k)$, the average capacity does not change from period-$x+1$ onwards. In period x, the fact that $1 - \Phi(\hat{k}_x^*)$ period-$x-1$ traffickers with $k \in (\hat{k}_x^*, 1]$ are active results in $f_x^* \leq \bar{f}$. In period $x+1$, there are $1 - \Phi(\hat{k}_x^*)$ active period-x traffickers with $k \in (\hat{k}_x^*, 1]$, so $f_{x+1}^* = f_x^* \leq \bar{f}$. □

Lemma 4.5 suggests traffickers in their first period continue to be exploitative, if active, in the second.

Corollary 4.1 *An impatient smuggler who exploits its client in the first period also does so, if active, in the second.*

Lemmas 4.4 and 4.5 suggest the behaviour of an impatient smuggling agent over time is rather simple. They lead to the following proposition about the equilibrium over time.

Proposition 4.6 *Suppose $f_0^* > \bar{f}$. If smuggling agents are impatient and if it is not possible for workers to identify traffickers, there exists a unique dynamic equilibrium path where the number of active non-exploitative smugglers decreases over time while the average exploitative capacity rises. In the long run, the equilibrium converges to the one characterised by adverse selection: only traffickers are active even though each worker is willing to pay $f^\circ > \bar{f}$ to a non-exploitative smuggler.*

Proof. If $\delta = 0$, Definition 4.1 characterises the period-0 equilibrium. $f_0^* > \bar{f}$ suggests all smuggling agents are active in period 0. (i) By Lemma 4.4, as far as $f_t^* > \bar{f}$, there is at least one active non-exploitative smuggler in period $t+1$, charging f°. Lemma 4.5 suggests the number of non-exploitative smugglers who move from the informationally asymmetric part in t to the symmetric in $t+1$ is decreasing over time. In period x, there is no active non-exploitative smuggler in the informationally asymmetric part of the market because $f_x^* \leq \bar{f}$.

Lemma 4.5 then implies there is no non-exploitative smugglers in either part of the market from period $x+1$ onwards. (ii) In the informationally asymmetric part of the market, there are 1 period-t smuggling agents and period-$t-1$ traffickers from period 1 onwards. All of them are active as far as $f_t^* > \bar{f}$. Lemma 4.5 implies the number of non-exploitative smugglers is decreasing over time. In period x, only traffickers with $k \in (\hat{k}_x^*, 1]$ are active because $f_x^* \leq \bar{f}$. By Lemma 4.5, we have $f_t^* = f_x^*$ and $\hat{k}_t^* = \hat{k}_x^*$ for all $t = x+1, x+2, ..., \infty$. (i) and (ii) then suggest the long-run equilibrium requires the participation of only traffickers and is stable once non-exploitative smugglers stop operating in the market. □

The migrant smuggling market thus becomes increasingly exploitative in the long run because of the cumulative effect of incumbent traffickers. Since the equilibrium becomes stable once all non-exploitative smugglers stop being active, the market does not vanish but continues to exist with only traffickers. Although the result is a special case where all smuggling agents are impatient, its significance is that it is the very attempt of migrants to reduce the risk of hiring traffickers that subjects the migrant smuggling market to adverse selection over time.

The dynamics of our model is similar to Janssen and Karamychev (2002) and Janssen and Roy (2004). In their model, the average quality in the market rises over time because the stock of high-quality suppliers increases relative to low-quality suppliers. As a result, all goods are eventually traded over time when the market price rises sufficiently high. In our model, there is information transmission via social networks, which is imperfect and divides the market into two parts. In the informationally asymmetric part of the market, the average exploitation capacity rises over time because non-exploitative smugglers exit to the informationally symmetric part of the market through social networks. A new entry of non-exploitative smugglers eventually ceases, and the market reaches a stable state where only exploitative agents are active, resulting in adverse selection in the long run.

4.6. Discussion

This paper formalised the migrant smuggling market where migrants face a risk of being exploited by the service providers after successful border crossing. Our model is a variant of Akerlof's (1970) lemons framework.

The comparative statics analysis provided us with policy implications by linking the fight against illegal migration with the risk of exploitation that migrants face when using smuggling services.

We found that, in the market where all migrants are more or less exploited by smuggling agents (Proposition 4.4), policies that reduce the number of active smuggling agents inevitably raise the average exploitation. Policymakers are thus likely to face a dilemma of whether to minimise the mean exploitation of trafficked migrants or to reduce the availability of smuggling services. Accordingly, if exploitation is becoming severer than before, it might be a byproduct of a successful reduction in the number of smuggling activities overall.

We also found that, in the market where there are some unexploited migrants (Proposition 4.3), unlike the adverse selection case, different policy instruments do not have the same effect on the average exploitation and the number of active smugglers.

A severe marginal penalty for labour exploitation (Part iii) is a policy choice for those who are concerned with the welfare of smuggled migrants because it reduces the average exploitation. Regardless of how severe it is, an increase in the marginal penalty avoids the exit of all non-exploitative smugglers that results in a sudden increase in the average exploitation.

A large penalty for migrant smuggling (Part ii) also reduces the average exploitation. However, it raises both non-exploitative smugglers' shut-down fee and the equilibrium fee, and it remains ambiguous whether a large penalty for smuggling can avoid a sudden increase in the average exploitation due to the exit of all non-exploitative smugglers.

An improvement in border control (Part i) is not recommended because, while it has no effect on the average exploitation as far as the equilibrium fee is higher than non-exploitative smugglers' shut-down fee, it raises the latter by increasing the risk of conducting the illicit

business. Improved border apprehension then indicates the market moves to the adverse selection state.

Improved inland apprehension of smuggled migrants (Part iv) is not a choice either if the welfare of smuggled migrants is important, while our result leaves ambiguity as to the effect of improved inland apprehension of traffickers on the mean exploitation and the number of active smugglers (Part v).

If a sufficient resource is available under this initially non-adverse selection equilibrium, inland apprehension of smuggled migrants (λ_M) and border apprehension (β_M and β_S) can be used to first push the market to the adverse selection state, and then any instrument may be used to reduce the number of active smugglers to zero. However, such a sufficient resource is unlikely to be available in practice.

Policymakers may also note the conflicting effects among the instruments. For instance, a combination of a large marginal penalty for exploitation (q) and a high probability of apprehending smuggled migrants inland (λ_M) would imply that one effect is likely to offset the other. When q increases, a smaller number of smugglers decide to exploit because the profitability of post-smuggling exploitation falls. Accordingly, the mean exploitation decreases, and hence the market fee increases. On the other hand, when λ_M increases, a migrant's expected gain from migration falls. As a result, the market fee falls. Then, the average exploitation increases because more exploitative smugglers have lower shut-down fees. An implication is that a combination of anti-trafficking measure q and anti-illegal immigration measure λ_M might result in a situation where neither of the instruments appear effective *ex post*.

We have also provided preliminary results for a dynamic case. The trust in social networks can be welfare worsening because it may generate an incentive for some traffickers to alternate their actions between not exploiting and exploiting over time. As a result, there may be potential migrants who pay high fees by thinking they are hiring non-exploitative smugglers but are eventually exploited in the destination. (Proposition 4.5)

In the short run, the market may be supplied by both smugglers and traffickers. However, with impatient smuggling agents and potential migrants' distrust in agents who are

not introduced by social networks, non-exploitative smugglers eventually cease to operate. In the long run, the market converges to a state where only traffickers of various exploitation capacities serve potential migrants. (Proposition 4.6)

This result may be a special case where no trafficker can be identified through social networks. If potential migrants can identify a fraction of traffickers, this might help keep the smuggling fee above the non-exploitative smugglers' shut-down fee and hence sustain the coexistence of smugglers and traffickers over time.

Our analysis is limited in several ways. For example, we have assumed that exploitation capacities are exogenously distributed among smugglers. However, the assumption may be too strong, for smugglers could choose to invest in capacity building. In the case of endogenous exploitative capacities, the impact of apprehension effort on the welfare of migrants is *a priori* ambiguous. One possibility is that initially non-exploitative smugglers may decide to invest in exploitative capacities in order to compensate a reduction in profitability in the smuggling business due to a stricter border control. In such a case, the endogeneity reinforces our result.

Another major limitation is our simplifying assumption used in the dynamic section, ie, impatient smugglers. In order to generalise the results in the long run, our analysis needs to be extended to the case of patient smuggling agents.

An additional research topic related to the exploitation of migrants is international cooperation. We analysed the topic in a single-country model where the government had two instruments: border apprehension and inland apprehension. We were interested in potential consequences of government action in the destination country. Study in a multi-country setting would be complementary, for it is suitable for examining the issue of international cooperation in the battle against the exploitation of migrants.

4.7. Appendix

A. Excerpts from UN (2000a) and UN (2000b)

- *UN 2000b, Article 3(a)* "Smuggling of migrants" shall mean the procurement, in order to obtain, directly or indirectly, a financial or other material benefit, of the illegal entry of a person into a State Party of which the person is not a national or a permanent resident;
- *UN 2000b, Article 3(b)* "Illegal entry" shall mean crossing borders without complying with the necessary requirements for legal entry into the receiving State;
- *UN 2000a, Article 3(a)* "Trafficking in persons" shall mean the recruitment, transportation, transfer, harbouring or receipt of persons, by means of the threat or use of force or other forms of coercion, of abduction, of fraud, of deception, of the abuse of power or of a position of vulnerability or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. Exploitation shall include, at a minimum, the exploitation of the prostituion of others or other forms of sexual exploitation, forced labour or services, slavery or practices similar to slavery, servitude or the removal of organs;
- *UN 2000a, Article 3(b)* The consent of a victim of trafficking in persons to the intended exploitation set forth in subparagraph (a) of this article shall be irrelevant where any of the means set forth in subparagraph (a) have been used;

B. Proof of Propositions 4.3 and 4.4 (comparative statics)

First, we show how the expected labour exploitation changes with respect to a change in the threshold exploitation capacity. Second, we show how the threshold exploitation capacity changes with respect to a change in each policy instrument. Using the obtained results, we summarise how the average exploitation changes with respect to a change in each policy instrument. Finally, we show how the gap between the equilibrium fee and the shut-down fee for non-exploitative smugglers changes with repect to a change in each policy instrument

because, as (4.16) implies, the number of active smuggling agents depends on the equilibrium fee in relation to the shut-down fee.

(4.19) suggests $\mathrm{d}\kappa^*/\mathrm{d}\tilde{k}^* < 0$ if $f^* > \bar{f}$. Otherwise, $\mathrm{d}\kappa^*/\mathrm{d}\hat{k}^* > 0$ because $\hat{k}^* \in (0,1)$ although both the denominator and the numerator of κ^* are decreasing in $\hat{k}^*$. That is, the size of the decrease in the numerator is smaller than that in the denominator. Note $\mathrm{d}\kappa^*/\mathrm{d}\tilde{k}^* \in (-1,0)$ and $\mathrm{d}\kappa^*/\mathrm{d}\hat{k}^* \in (0,1)$.

Let us rearrange $\tilde{k}^*(p,q,\lambda_M,\lambda_S)$ in (4.14) as follows:

$$\begin{aligned} F_1 &\equiv [(1-\lambda_S)y - \lambda_S q]\tilde{k}^* - \lambda_S(1-\lambda_S)(1-\lambda_M)y(1-\kappa^*) - \lambda_S p \\ &= 0. \end{aligned}$$

By applying the implicit function theorem to F_1, we obtain the following derivatives:

$$\begin{aligned} \frac{\mathrm{d}\tilde{k}^*}{\mathrm{d}p} &= \frac{\lambda_S}{\partial F_1/\partial \tilde{k}^*} \\ \frac{\mathrm{d}\tilde{k}^*}{\mathrm{d}q} &= \frac{\lambda_S \tilde{k}^*}{\partial F_1/\partial \tilde{k}^*} \\ \frac{\mathrm{d}\tilde{k}^*}{\mathrm{d}\lambda_M} &= \frac{-\lambda_S(1-\lambda_S)y(1-\kappa^*)}{\partial F_1/\partial \tilde{k}^*} \\ \frac{\mathrm{d}\tilde{k}^*}{\mathrm{d}\lambda_S} &= \frac{(y+q)\tilde{k}^* + p + (1-2\lambda_S)(1-\lambda_M)y(1-\kappa^*)}{\partial F_1/\partial \tilde{k}^*} \end{aligned}$$

where $\partial F_1/\partial \tilde{k}^* = (1-\lambda_S)y\left[1+\lambda_S(1-\lambda_M)(\mathrm{d}\kappa^*/\mathrm{d}\tilde{k}^*)\right] - \lambda_S q$. Note that $\partial F_1/\partial \tilde{k}^* > 0 \Leftrightarrow (1-\lambda_S)y\left[1+\lambda_S(1-\lambda_M)(\mathrm{d}\kappa^*/\mathrm{d}\tilde{k}^*)\right] > \lambda_S q \Leftrightarrow$

$$y > \frac{\lambda_S(1-\lambda_S)(1-\lambda_M)y(\mathrm{d}\kappa^*/\mathrm{d}\tilde{k}^*) + \lambda_S q}{1-\lambda_S}$$

which is the case under Assumption 4.1. Hence $\mathrm{d}\tilde{k}^*/\mathrm{d}p > 0$, $\mathrm{d}\tilde{k}^*/\mathrm{d}q > 0$ and $\mathrm{d}\tilde{k}^*/\mathrm{d}\lambda_M < 0$. The sign of $\mathrm{d}\tilde{k}^*/\mathrm{d}\lambda_S$ is determined by the numerator. $\mathrm{d}\tilde{k}^*/\mathrm{d}\lambda_S > 0$ if $(y+q)\tilde{k}^* + p + (1-2\lambda_S)(1-\lambda_M)y(1-\kappa^*) > 0$ or

$$\frac{(y+q)\tilde{k}^* + (1-\lambda_M)y(1-\kappa^*) + p}{2(1-\lambda_M)y(1-\kappa^*)} > \lambda_S.$$

Let us rearrange $\hat{k}^*(p, q, \lambda_M, \lambda_S, \beta_M, \beta_S)$ in (4.15) as follows:

$$\begin{aligned} F_2 \equiv & \frac{\beta_S p + c + \bar{\pi}}{(1-\beta_S)(1-\beta_M)} + \lambda_S p \\ & - (1-\lambda_S)^2 (1-\lambda_M) y (1-\kappa^*) - [(1-\lambda_S) y - \lambda_S q] \hat{k}^* \\ = & \ 0. \end{aligned}$$

By applying the implicit function theorem to F_2, we obtain the following derivatives:

$$\begin{aligned} \frac{\mathrm{d}\hat{k}^*}{\mathrm{d}p} &= \frac{\beta_S/(1-\beta_S)(1-\beta_M) + \lambda_S}{-\partial F_2/\partial \hat{k}^*} \\ \frac{\mathrm{d}\hat{k}^*}{\mathrm{d}q} &= \frac{\lambda_S \hat{k}^*}{-\partial F_2/\partial \hat{k}^*} \\ \frac{\mathrm{d}\hat{k}^*}{\mathrm{d}\lambda_M} &= \frac{(1-\lambda_S)^2 y (1-\kappa^*)}{-\partial F_2/\partial \hat{k}^*} \\ \frac{\mathrm{d}\hat{k}^*}{\mathrm{d}\lambda_S} &= \frac{2(1-\lambda_S)(1-\lambda_M) y (1-\kappa^*) + (y+q)\hat{k}^* + p}{-\partial F_2/\partial \hat{k}^*} \\ \frac{\mathrm{d}\hat{k}^*}{\mathrm{d}\beta_M} &= \frac{(\beta_S p + c + \bar{\pi})/(1-\beta_S)(1-\beta_M)^2}{-\partial F_2/\partial \hat{k}^*} \\ \frac{\mathrm{d}\hat{k}^*}{\mathrm{d}\beta_S} &= \frac{(p + c + \bar{\pi})/(1-\beta_S)^2 (1-\beta_M)}{-\partial F_2/\partial \hat{k}^*} \end{aligned}$$

where $-\partial F_2/\partial \hat{k}^* = (1-\lambda_S) y \left[1 - (1-\lambda_S)(1-\lambda_M)(\partial \kappa^*/\partial \hat{k}^*)\right] - \lambda_S q$. Note that $\partial F_2/\partial \hat{k}^* < 0 \Leftrightarrow (1-\lambda_S) y \left[1 - (1-\lambda_S)(1-\lambda_M)(\partial \kappa^*/\partial \hat{k}^*)\right] > \lambda_S q \Leftrightarrow$

$$y > \frac{(1-\lambda_S)^2 (1-\lambda_M) y (\partial \kappa^*/\partial \hat{k}^*) + \lambda_S q}{1-\lambda_S}$$

which is the case under Assumption 4.1. Hence the six total derivatives are all positive.

To summarise the results so far, if $f^* > \bar{f}$,

$$\frac{\mathrm{d}\kappa^*}{\mathrm{d}\tilde{k}^*}\frac{\mathrm{d}\tilde{k}^*}{\mathrm{d}p} < 0, \ \frac{\mathrm{d}\kappa^*}{\mathrm{d}\tilde{k}^*}\frac{\mathrm{d}\tilde{k}^*}{\mathrm{d}q} < 0, \ \frac{\mathrm{d}\kappa^*}{\mathrm{d}\tilde{k}^*}\frac{\mathrm{d}\tilde{k}^*}{\mathrm{d}\lambda_M} > 0, \text{ and}$$

$$\begin{aligned} \frac{\mathrm{d}\kappa^*}{\mathrm{d}\tilde{k}^*}\frac{\mathrm{d}\tilde{k}^*}{\mathrm{d}\lambda_S} &> 0 \text{ if } \frac{(y+q)\tilde{k}^* + (1-\lambda_M) y (1-\kappa^*) + p}{2(1-\lambda_M) y (1-\kappa^*)} > \lambda_S \\ &\leq 0 \text{ otherwise.} \end{aligned}$$

If $f^* \leq \bar{f}$,

$$\frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{d\beta_M} > 0, \frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{d\beta_S} > 0, \frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{dp} > 0, \frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{dq} > 0,$$

$$\frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{d\lambda_M} > 0, \text{ and } \frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{d\lambda_S} > 0.$$

We now turn to the number of active smugglers in the market. As (4.16) and Lemma 4.3 indicate, it is dependent on the gap between the market fee and the shut-down fee for non-exploitative suppliers. Let

$$\begin{aligned} D(\beta_M, \beta_S, p, q, \lambda_M, \lambda_S) &\equiv f^* - \bar{f} \\ &= (1-\lambda_S)(1-\lambda_M)y(1-\kappa^*) - \frac{\beta_S p + c + \bar{\pi}}{(1-\beta_S)(1-\beta_M)}. \end{aligned}$$

Lemma 4.3 implies the full participation when $D > 0$. The relevant threshold capacity is $\tilde{k}^*$. We have

$$\begin{aligned} \frac{dD}{d\beta_M} &= \frac{-(\beta_S p + c + \bar{\pi})}{(1-\beta_S)(1-\beta_M)^2} < 0 \\ \frac{dD}{d\beta_S} &= \frac{-(p + c + \bar{\pi})}{(1-\beta_S)^2(1-\beta_M)} < 0 \\ \frac{dD}{dp} &= -(1-\lambda_S)(1-\lambda_M)y\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{dp} - \frac{\beta_S}{(1-\beta_S)(1-\beta_M)} \\ \frac{dD}{dq} &= -(1-\lambda_S)(1-\lambda_M)y\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{dq} > 0 \\ \frac{dD}{d\lambda_M} &= -(1-\lambda_S)y(1-\kappa^*) - (1-\lambda_S)(1-\lambda_M)y\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{d\lambda_M} < 0 \\ \frac{dD}{d\lambda_S} &= -(1-\lambda_M)y(1-\kappa^*) - (1-\lambda_S)(1-\lambda_M)y\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{d\lambda_S} \end{aligned}$$

When $D \leq 0$, the relevant threshold capacity is $\hat{k}^*$. We then have all the six derivatives negative.

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