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## **Immigration and Public Spending**

by

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# Immigration and Public Spending

René Böheim and Karin Mayr\*

## Abstract

We examine the effect of immigration on public spending from a theoretical (political economic) and an empirical perspective. We distinguish between public spending on private goods and on public goods. Our model implies that whether immigration increases or decreases public spending primarily depends on native's preferences for private versus public good spending. We empirically test our theoretical hypotheses, the 'fiscal effect' and the 'anti-social effect' of immigration using OECD panel data for 1990 – 2001. Estimating a system of simultaneous equations for total public spending and the share of spending on private goods, we find evidence for a negative effect of low-skilled immigration on public spending which is attributable to an anti-social effect. The effect of high-skilled immigration on public spending is positive, as suggested by a fiscal effect.

JEL: F2, H4, H5.

Keywords: immigration, cash transfers, public goods.

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# 1. Introduction

How does immigration change a country's spending policy? Conventional theory of tax competition argues that immigration constrains countries' spending policies because workers have an incentive to migrate to benefit from inter-regional differentials in taxes and benefits. Mobile high-skilled workers will move to countries where taxes are lower, other things being equal. In the same way, mobile low-skilled workers will move to countries where transfers are higher. As a result, the initial extent of public spending becomes unsustainable. Cremer and Pestieau (2004) provide a survey of the theoretical literature on labor mobility and fiscal redistribution, which yields consistent results: under labor mobility, spending is generally lower than in autarky.

Other economic studies, apart from those on arbitrage and tax competition, also argue that public spending is lower with migration. Various strands of the political economy literature have shown that immigration might induce natives to choose to redistribute less. First, immigration may decrease spending, if it increases the dependency ratio in the destination country (e.g. when immigrants are primarily low-skilled and thus more likely to become more unemployed). Razin, Sadka and Swagel (2002), for example, use a median-voter model to show that low-skilled immigration may lead to a decrease in the ratio of mean to median pre-tax income and, consequently, to a lower amount of public spending. They also find empirical evidence for this effect that they call 'fiscal leakage effect'.<sup>1</sup> It refers to the effect of immigration on spending via its effect on median voter utility derived from the public budget, and we will refer to such an effect as the 'fiscal effect' below.

The literature mentioned above does not consider spending on public goods, but models public spending as private transfers only. We model public spending on private (rival) goods and on public (non-rival) goods. In general, we expect a negative fiscal effect to arise only with spending on private goods, since natives do not experience a monetary disadvantage when immigrants use non-rival goods, the marginal cost of which is zero. Our results show that whether public spending increases or decreases with immigration crucially depends upon native preferences for private versus public goods. If natives value public goods more than

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<sup>1</sup> Using survey data, Luttmer (2001) finds empirical evidence for a 'negative exposure effect', where the taxpayers' support for welfare decreases when the number of welfare recipients increases.

private goods, spending increases. If they value private goods more than public goods, spending is likely to decrease.

A different branch of the political economy literature suggests that immigration may decrease public spending, if immigration increases the heterogeneity of the population. Many authors have documented a negative empirical relationship between the degree of racial composition of states and their levels of public spending.<sup>2</sup> Alesina and Spolaore (1995), for example, develop a model where ethnic heterogeneity decreases the utility natives derive from spending on public goods. As a consequence, they opt for lower levels of spending on the public good. Alesina, Baqir and Easterly (1999) show that the more ethnically heterogeneous a US city was in 1990, the less was spent, for example, on public schooling or on roads.

In an extension to our model, immigration decreases the utility natives derive from spending on public goods relative to spending on private goods. In line with above literature, we assume that the median voter values public goods less in societies with large shares of immigrants, who are typically ethnically different from natives – that ‘diversity makes people anti-social’.<sup>3</sup> If natives perceive immigrants to be different from them, they might derive lower utility from spending on public goods, since public goods are shared with immigrants – even if they do not encounter any monetary or otherwise observable disadvantage. Introducing such an ‘anti-social effect’ in our model, we find that results from the ‘fiscal effect’ might be reversed. That is, if natives value public goods more than private goods, public spending may now decrease. If they value private goods more than public goods, public spending can increase.

In the first part of this paper, we present the theoretical framework from which we derive testable hypotheses on the fiscal effect and the anti-social effect of immigration on public spending. We test these hypotheses using data on immigration and fiscal policies in 18 OECD

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<sup>2</sup> Compare, for example Orr (1976), Alesina and Spolaore (1995), Ribar and Wilhelm (1996), Poterba (1997) and Alesina, Baqir and Easterly (1999).

<sup>3</sup> See, for example, the article ‘The kindness of strangers?’ (The Economist, February 28, 2004), which cites a large ongoing survey of American communities that ‘seems to show...that levels of trust and co-operation are highest in the most homogenous neighbourhoods. People living in diverse areas...are not just more suspicious of people who don’t look like them; they are also more suspicious of their own kind.’

countries for the years 1990 – 2001. We explicitly distinguish immigrants by skill, because spending is more likely to increase, the higher the skills of immigrants.

In our empirical results, we find that natives value public goods more than private goods, and that low-skilled immigration decreases the amount of public spending. We therefore find evidence for an anti-social effect of low-skilled immigration. For high-skilled immigration, we find that spending increases. Thus, our data suggest that high-skilled immigration is associated with a positive fiscal effect. We cannot rule out the existence of an anti-social effect, it is however dominated by the fiscal effect.

## 2. Theory

Consider a population which consists of both natives and immigrants, whose numbers are exogenously given. There are  $n$  natives and  $m$  immigrants, both are either high-skilled or low-skilled. The number of the high-skilled and low-skilled is  $n_h, m_h$  and  $n_l, m_l$ , respectively. They earn some exogenous pre-tax incomes  $y_h$  and  $y_l$ . High-skilled workers are more productive than low-skilled workers and, therefore,  $y_h > y_l$ , for natives and immigrants alike. Natives choose the optimal size of public spending  $g$  by majority voting. Immigrants are not allowed to vote. The amount of public spending is limited by public revenue, which is levied by a flat-rate tax on labor income.<sup>4</sup> A share  $\sigma$  of public spending  $g$  is spent on private goods (mainly cash transfers, e.g. child benefits), and a share  $1-\sigma$  is spent on public goods (e.g. roads). Natives also choose the share of public spending that goes to private goods and to public goods by majority voting. Natives and immigrants are treated alike fiscally.

### 2.1 The fiscal effect

The utility function of a native individual  $i$  is given by

$$U_i = z(1-\tau)y_i + \left(\frac{\sigma g}{m+n}\right)^\alpha + ((1-\sigma)g)^{1-\alpha}, \quad (1.1)$$

$$0 < \tau < 1, \quad 0 < \alpha < 1, \quad 0 < \sigma < 1, \quad 1 < z,$$

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<sup>4</sup> That is, the budget constraint needs to hold.

where  $\tau$  is the flat-rate tax and  $\alpha$  is a preference parameter for private relative to public good spending.<sup>5</sup> Utility is the sum of net income and the individual's share in total public spending. Because of non-rivalry, the size of the population does not diminish the utility derived from public goods. This is not true for private goods.

The budget constraint implies that total spending equals total revenue:

$$g = \tau [(m_h + n_h) y_h + (m_l + n_l) y_l]. \quad (1.2)$$

Using (1.1) and (1.2), we can rewrite individual utility as follows:

$$U_i = z y_i + g^\alpha \left( \frac{\sigma}{m+n} \right)^\alpha + g^{1-\alpha} (1-\sigma)^{1-\alpha} - z s_i g, \quad i = h, l, \quad (1.3)$$

where  $s_i = \frac{y_i}{\sum y_i}$  is the share of individual income in total income, equivalent to the individual share in the cost of public spending  $g$ .

Natives choose the optimal size of total public spending  $g$  and the optimal share of public spending on private goods,  $\sigma$  by majority voting. Both parameters depend on the number of high-skilled and low-skilled immigrants.

Individual  $i$ 's preferred size of public spending  $g_i^*$  is given by the maximization of the utility function (1.3) with respect to  $g$ . The first-order condition is

$$(1-\alpha) g_i^{-\alpha} (1-\sigma_i)^{1-\alpha} + \alpha g_i^{-1+\alpha} \left( \frac{\sigma_i}{m+n} \right)^\alpha - z \frac{y_i}{\sum y_i} = 0. \quad (1.4)$$

Individual  $i$ 's preferred share of public spending on private goods  $\sigma_i^*$  is given by the maximization of the utility function (1.3) with respect to  $\sigma$ . The first-order condition is

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<sup>5</sup>  $z$  is a parameter that enhances marginal utility derived from net income relative to that derived from public spending. By setting  $z > 1$ , we can avoid that in numerical simulations, we obtain unrealistically high equilibrium values of  $g$  that would require a tax rate of larger than 1.

$$-(1-\alpha)g_i^{1-\alpha}(1-\sigma_i)^{-\alpha} + \alpha\left(\frac{g_i}{m+n}\right)^\alpha \sigma_i^{\alpha-1} = 0 \quad (1.5)$$

which can be expressed as

$$g = \left[ \frac{\alpha}{(1-\alpha)} \frac{(1-\sigma)^\alpha}{\sigma^{1-\alpha}} \frac{1}{(m+n)^\alpha} \right]^{\frac{1}{1-2\alpha}}. \quad (1.6)$$

### 2.1.1 Equilibrium

Natives vote simultaneously on the amount and composition of public spending  $g$  and  $\sigma$  by majority voting. Since voting preferences are single-peaked (the utility function is concave in  $g$  and  $\sigma$ ), the voting result will be the choice of the median voter:  $\sigma_{med}^*, g_{med}^*$ .<sup>6</sup> Our two first-order conditions (1.4) and (1.5) above give us two relations for the resulting amount and composition of public spending:

$$G: (1-\alpha)g_{med}^{-\alpha}(1-\sigma_{med})^{1-\alpha} + \alpha g_{med}^{-1+\alpha} \left(\frac{\sigma_{med}}{m+n}\right)^\alpha - z \frac{y_{med}}{\sum y_i} = 0, \quad (1.7)$$

$$S: -(1-\alpha)g_{med}^{1-\alpha}(1-\sigma_{med})^{-\alpha} + \alpha\left(\frac{g_{med}}{m+n}\right)^\alpha \sigma_{med}^{\alpha-1} = 0. \quad (1.8)$$

The public spending equilibrium  $(\sigma_{med}^*, g_{med}^*)$  is characterized by the compatibility of both conditions  $G$  and  $S$ . In the following, we will suppress the subscript and write  $\sigma^*$  and  $g^*$  for the optimal choice of the native median voter for simplicity.

**Proposition 1.** *There exists at least one public spending equilibrium  $(\sigma^*, g^*)$  characterized by  $G$  and  $S$ . The equilibrium features positive spending on private and public goods.*

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<sup>6</sup> We assume that the median voter is of the same skill (high-skilled or low-skilled) in both votes, in order to avoid transitivity problems of multi-dimensional voting.

**Proof.**

For a public spending equilibrium,  $G$  and  $S$  must cross in  $(\sigma, g)$ -space. If both  $G$  and  $S$  are downward-sloping or upward-sloping in  $(\sigma, g)$ -space, they cross at least once, if  $g$  is higher (lower) for  $\sigma=0$  according to  $S$  than according to  $G$ , while it is lower (higher) for  $\sigma=1$ .

The condition for  $G$  to be downward-sloping in  $(\sigma, g)$ -space is:

$$\frac{\partial g}{\partial \sigma} = -\frac{G_{\sigma}}{G_g} < 0. \quad (1.9)$$

Implicit differentiation of (1.7) and rearranging yields from (1.9)

$$g > \left[ \frac{\alpha^2}{(1-\alpha)^2} \frac{(1-\sigma)^{\alpha}}{\sigma^{1-\alpha}} \frac{1}{(m+n)^{\alpha}} \right]^{\frac{1}{1-2\alpha}}. \quad (1.10)$$

The condition for  $S$  to be downward-sloping in  $(\sigma, g)$ -space is:

$$\frac{\partial \sigma}{\partial g} = -\frac{S_g}{S_{\sigma}} < 0. \quad (1.11)$$

Implicit differentiation of (1.8) and rearranging yields from (1.11)

$$g > \left[ \frac{\alpha^2}{(1-\alpha)^2} \frac{(1-\sigma)^{\alpha}}{\sigma^{1-\alpha}} \frac{1}{(m+n)^{\alpha}} \right]^{\frac{1}{1-2\alpha}}, \quad (1.12)$$

which is the same as (1.10). Therefore, if  $G$  is downward-sloping (upward-sloping) in  $(\sigma, g)$ -space,  $S$  is downward-sloping (upward-sloping), as well. Moreover, comparing (1.6) with (1.10) and (1.12) shows that we can distinguish two cases: if  $\alpha < \frac{1}{2}$ ,  $G$  and  $S$  are

downward-sloping, whereas if  $\alpha > \frac{1}{2}$ , they are upward-sloping.



Further, according to  $G$ ,  $g$  is a positive finite number for  $\sigma = 0$  and  $\sigma = 1$ , while according to  $S$ ,  $g$  is infinite (zero) for  $\sigma = 0$  and zero (infinite) for  $\sigma = 1$  in the case where  $\alpha < \frac{1}{2}$  ( $\alpha > \frac{1}{2}$ ). Q. E. D.

Next, we determine the effect of immigration on the public spending equilibrium.

## 2.1.2 Immigration

**Proposition 2.** *Both high-skilled and low-skilled immigration increase public spending, if  $\alpha < 0.5$  and condition (1.14) below are fulfilled.*

**Proof.**

We determine the sign of the effect of immigration from the implicit derivatives of  $g$  in (1.7) and  $\sigma$  in (1.8) with respect to  $m_h$  and  $m_l$ , for  $\alpha < 0.5$ .

First, we use (1.7) in order to derive the effects of high-skilled and low-skilled immigration on public spending  $g$  for any given  $\sigma$ .

$\frac{\partial g}{\partial m_h} > 0$ , if and only if:

$$z \frac{y_h}{y} \frac{y_{med}}{\sum y_i} > \alpha^2 g^{-1+\alpha} \left( \frac{\sigma}{m+n} \right)^\alpha, \quad (1.13)$$

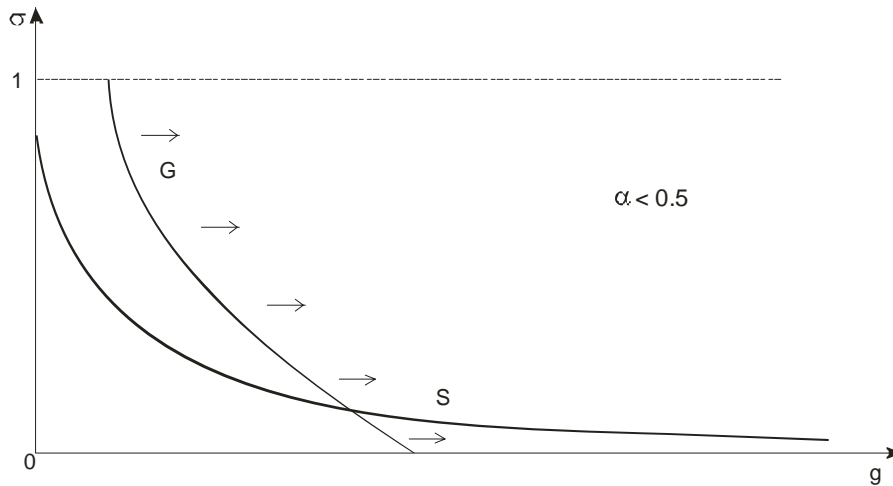
where  $\bar{y} \equiv \frac{\sum y_i}{m+n}$  is mean income.

Analogously,  $\frac{\partial g}{\partial m_l} > 0$ , if and only if:

$$z \frac{y_l}{y} \frac{y_{med}}{\sum y_i} > \alpha^2 g^{-1+\alpha} \left( \frac{\sigma}{m+n} \right)^\alpha. \quad (1.14)$$

Immigration effects median voter utility derived from public spending  $g$  in two ways. First, it decreases her marginal cost of public spending,  $\frac{y_{med}}{\sum y_i}$ , proportional to the (marginal) immigrant's share in the average financing cost,  $\frac{y_h}{y}$  or  $\frac{y_l}{y}$ . Second, immigration decreases the median voter's marginal utility of public spending on private goods,  $\alpha g^{-1+\alpha} \left(\frac{\sigma}{m+n}\right)^\alpha$ , by lowering the amount available for the median voter. Condition (1.13) [(1.14)] states that the increase in marginal utility caused by the decrease in the marginal cost of  $g$  due to high-skilled (low-skilled) immigrants is larger than the decrease in marginal utility caused by the co-using of public funds. Under this condition, immigration increases the optimal size of  $g$  for the median voter - for any given  $\sigma$ . See Figure 1. We will refer to numerical simulations that examine whether or not conditions (1.13) and (1.14) hold below.

**Figure 1. Effect of immigration on public spending,  $g$ , for any given share of spending on private goods,  $\sigma$ , for  $\alpha < 0.5$ .**



Second, we use (1.8) to derive the effect of high-skilled and low-skilled immigration on the share of public spending on private goods  $\sigma$  for any given  $g$ .

$$\frac{\partial \sigma}{\partial m_h} < 0, \text{ if and only if:}$$

$$\alpha > 0. \tag{1.15}$$

This is true by assumption.

Analogously,  $\frac{\partial \sigma}{\partial m_l} < 0$ , if and only if:

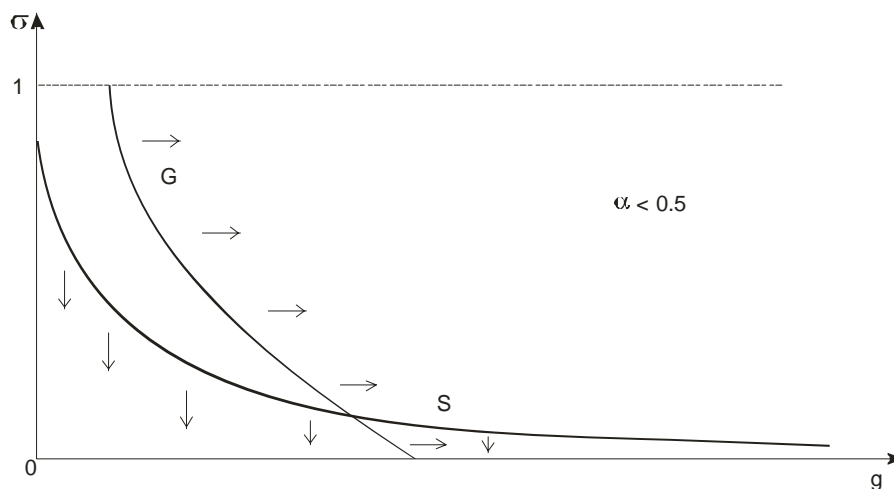
$$\alpha > 0. \tag{1.16}$$

Both high- and low-skilled immigrants decrease the optimal share of spending on private goods, because the marginal net gain from immigration is lower for spending on private goods than for spending on public goods. Immigrants increase the number of taxpayers, but they also diminish the utility of natives derived from spending on private goods, while they do not diminish utility derived from spending on public goods.

We know that high-skilled (low-skilled) immigration increases public spending  $g$ , if  $\alpha < 0.5$  and (1.13) [(1.14)] is fulfilled. If both  $S$  and  $G$  are downward-sloping in  $(\sigma, g)$ -space, a downward shift in  $S$ , together with a rightward shift in  $G$ , leads to an increase in  $g$ . See Figure 2. The median voter gains by increasing  $g$  with immigration for any given share of private good spending  $\sigma$ . In addition, she gains by reducing the share of spending on private goods, with additional immigrants co-financing public goods. Since natives value public goods more than private goods ( $\alpha < 0.5$ ), the optimal response to immigration for natives is to increase public spending  $g$ . Note that, if (1.14) is fulfilled, (1.13) is, too, since  $y_l < y_h$ .

Q. E. D.

**Figure 2. Effect of immigration on the equilibrium share of spending on private goods,  $\sigma$ , and amount of public spending,  $g$ , for  $\alpha < 0.5$ .**



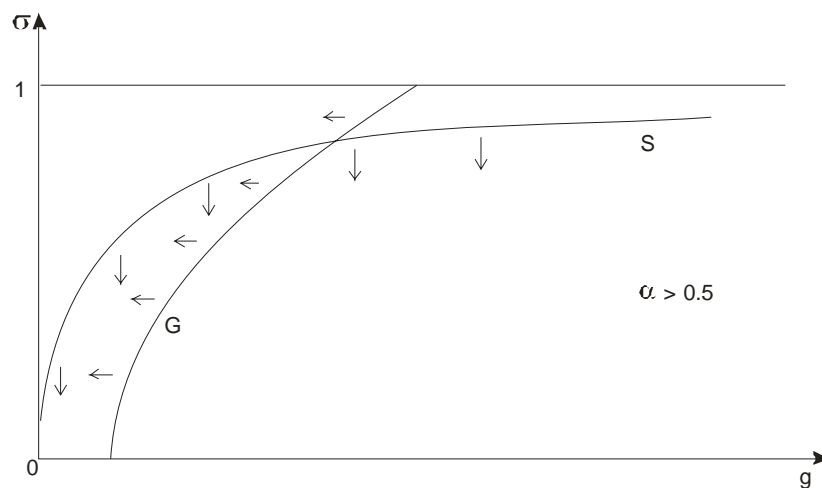
**Proposition 3.** Both high-skilled and low-skilled immigration decreases public spending, if  $\alpha > 0.5$  is fulfilled and condition (1.13) above is not fulfilled.

**Proof.**

High-skilled (low-skilled) immigration decreases public spending  $g$ , if  $\alpha > 0.5$  and (1.13) [(1.14)] is not fulfilled. If both  $S$  and  $G$  are upward-sloping in  $(\sigma, g)$ -space, a downward shift in  $S$ , together with a leftward shift in  $G$ , leads to a decrease in  $g$ . See Figure 3. The median voter gains by decreasing  $g$  with immigration for any given share of private good spending  $\sigma$ . In addition, she gains by reducing the share of spending on private goods, with additional immigrants co-financing public goods. Since natives value private goods more than public goods ( $\alpha > 0.5$ ), the optimal response to immigration for natives is to decrease public spending  $g$ . Note that, if (1.13) is not fulfilled, (1.14) is not, either, since  $y_l < y_h$ .

Q. E. D.

**Figure 3.** Effect of immigration on the equilibrium share of spending on private goods,  $\sigma$ , and amount of public spending,  $g$ , for  $\alpha > 0.5$ .



## 2.2 The anti-social effect

So far, we have assumed that immigration effects the native median voter's preferred size of public spending via the fiscal effect alone. However, immigration may also have an effect by changing natives' spending 'tastes'. In the following, we model an 'anti-social' effect of immigration, which diminishes natives' utility derived from public goods – relative to their utility derived from private goods.

We introduce the anti-social effect in the form of a positive effect of high-skilled and low-skilled immigration on the parameter  $\alpha$  in our utility function (1.3):

$$U_i = zy_i + g^\alpha \left( \frac{\sigma}{m+n} \right)^\alpha + g^{1-\alpha} (1-\sigma)^{1-\alpha} - zs_i g,$$

where  $\frac{\partial \alpha}{\partial m_h} > 0$  and  $\frac{\partial \alpha}{\partial m_l} > 0$ .

Let us assume that

$$\alpha = \beta(m_h + m_l), \text{ where } 0 < \beta < \frac{1}{(m_h + m_l)}. \quad (1.17)$$

Note that in (1.17), we assume that the anti-social effect is the same for low-skilled and for high-skilled immigrants. Alternatively, we could assume that it is relatively stronger for the low-skilled or the high-skilled and we address this issue below.

**Proposition 4.** *In the presence of an anti-social effect as described in (1.17), (i) high-skilled and low-skilled immigration can decrease public spending, if  $\alpha < 0.5$  and condition (1.14) is fulfilled and (ii) high-skilled and low-skilled immigration can increase public spending, if  $\alpha > 0.5$  and condition (1.13) is not fulfilled.*

**Proof.**

We use (1.17) to substitute for  $\alpha$  in (1.4) and, as before, derive the effects of high-skilled and low-skilled immigration on public spending  $g$  for any given  $\sigma$ . We get

$\frac{\partial g}{\partial m_h} > 0$ , if and only if:

$$-\frac{G_{m_h}}{G_g} > 0. \quad (1.18)$$

Analogously,  $\frac{\partial g}{\partial m_l} > 0$ , if and only if:

$$-\frac{G_{m_l}}{G_g} > 0. \quad (1.19)$$

(1.18) and (1.19) do not indicate the sign for the effect of immigration on the optimal amount of public spending  $g$ . In the presence of an anti-social effect, immigration decreases the marginal utility of public spending more than under a pure fiscal effect, since natives value private (rival) goods now more strongly. As a consequence, the marginal disutility from immigrants receiving private goods increases. Immigration is therefore more likely to decrease  $g$  for any given  $\sigma$  than before (compare (1.13) and (1.14)).

Now, we use (1.17) to substitute for  $\alpha$  in (1.5) to derive the effects of high-skilled and low-skilled immigration on the share of public spending on private goods  $\sigma$  for any given  $g$ . We get

$\frac{\partial \sigma}{\partial m_h} < 0$ , if and only if:

$$-\frac{S_{m_h}}{S_{\sigma^*}} < 0. \quad (1.20)$$

$\frac{\partial \sigma}{\partial m_l} < 0$ , if and only if:

$$-\frac{S_{m_l}}{S_{\sigma^*}} < 0, \quad (1.21)$$

which is the same as (1.24).

Again, (1.20) and (1.21) do not provide the sign for the effect of immigration on the optimal share of public spending on private goods  $\sigma$ . In the presence of an anti-social effect, immigration reduces the marginal utility of spending on public goods relative to that of spending on private goods. Immigration is therefore more likely to increase the share of spending on private goods  $\sigma$  for any given  $g$  than before (compare (1.15) and (1.16)).

Whether the total effect of immigration on public spending is positive or negative depends on parameter values and is ultimately an empirical issue. All that we say here is that, in the presence of an anti-social effect, our results from Proposition 2 and, analogously, the results from Proposition 3 can potentially be reversed. Q. E. D.

Of course, we could assume that the anti-social effect is relatively stronger for either low-skilled or for high-skilled immigrants. Maybe, natives do not mind sharing public goods with high-skilled immigrants as much as sharing them with low-skilled immigrants, or vice versa. In view of the fact that normally, at least in the developed world, high-skilled immigrants share certain characteristics of natives more than low-skilled immigrants do, the former case is more probable. For example, high-skilled immigrants in OECD countries usually come from other, often neighboring, OECD countries and thus resemble natives more closely in ethnic or cultural characteristics than low-skilled immigrants from mainly non-OECD countries.<sup>7</sup>

Allowing for a different effect of immigration by skill on our preference parameter  $\alpha$  gets us

$$\alpha = \beta m_h + \gamma m_l, \text{ where } 0 < \beta < \frac{1 - \gamma m_l}{m_h}, \quad 0 < \gamma < \frac{1 - \beta m_h}{m_l}. \quad (1.22)$$

Now, an anti-social effect of immigration on public spending will be larger for the low-skilled (high-skilled), if  $\gamma > \beta$  ( $\beta > \gamma$ ). For example, given that  $\gamma > \beta$ , if the anti-social effect of high-skilled immigration on public spending is negative, it will be even more negative for the low-skilled. Any positive fiscal effect of immigration on public spending will more probably be reversed by a negative anti-social effect in the case of low-skilled immigration than in the case of high-skilled immigration. Our results from Proposition 4 remain unchanged.

## 2.3 Implications

We model two arguments of how immigration may influence the optimal size of public spending. The first argument states that immigration changes public spending via a fiscal effect. According to this effect, immigration increases spending, if natives value public goods

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<sup>7</sup> See for example Docquier and Marfouk (2005) on the skills of immigrants by source country.

more than private goods ( $\alpha < 0.5$ ) and condition (1.14) is fulfilled (Proposition 2). It decreases spending, if natives value public goods less than private goods ( $\alpha > 0.5$ ) and condition (1.13) is not fulfilled (Proposition 3).

The second argument states that immigration can also change public spending via an anti-social effect. If this effect is present, the predictions above can be reversed, that is, immigration may decrease spending under the conditions of Proposition 2 and it may increase spending under the conditions of Proposition 3 (Proposition 4).

We can test for the first condition on the size of  $\alpha$  relatively easily: from (1.6) in connection with (1.10) and (1.12), we know that  $G$  and  $S$  are downward-sloping in  $(\sigma, g)$ -space, if  $\alpha < 0.5$ . They are upward-sloping, if  $\alpha > 0.5$ . Including the share of spending on private goods in total spending  $\sigma$ , in an empirical estimation of public spending  $g$ , and determining the sign of the coefficient tells us, whether  $\alpha < 0.5$  (the coefficient is negative) or  $\alpha > 0.5$  (the coefficient is positive).

Next, we have a closer look at conditions (1.13) and (1.14). When re-formulating (1.13) and (1.14), we get

$$g > \left[ \alpha^2 \left( \frac{\sigma}{m+n} \right)^\alpha \frac{1}{z} \frac{\bar{y}}{y_h} \frac{\sum y_i}{y_{med}} \right]^{\frac{1}{1-\alpha}} \quad (1.23)$$

and

$$g > \left[ \alpha^2 \left( \frac{\sigma}{m+n} \right)^\alpha \frac{1}{z} \frac{\bar{y}}{y_l} \frac{\sum y_i}{y_{med}} \right]^{\frac{1}{1-\alpha}} . \quad (1.24)$$

Numerical simulations show that if  $\alpha < 0.5$ , (1.24) [(1.14)] will typically be fulfilled, and we can conclude that the fiscal effect of immigration (both high- and low-skilled) is positive. For small values of  $\alpha$ , the marginal loss in utility from sharing spending on private goods with immigrants is low relative to the marginal utility gain from immigrants' co-financing. As a consequence, utility can be gained by increasing  $g$ . If  $\alpha$  exceeds a certain threshold value,



however, the reverse is true. (1.23) [(1.13)] will be invalidated, and we can conclude that the fiscal effect of immigration (both high- and low-skilled) on public spending is negative.<sup>8</sup>

We can test between the fiscal effect and the anti-social effect of immigration by estimating the size of public spending and using (low- and high-skilled) immigration as estimators. If the relation between  $g$  and  $\sigma$  is negative ( $\alpha < 0.5$ ), we expect the coefficient on immigration to be positive in the absence of an anti-social effect. A negative coefficient on immigration would suggest the presence of an anti-social effect. Analogously, if the relation between  $g$  and  $\sigma$  is positive ( $\alpha > 0.5$ ), we expect the coefficient on immigration to be negative in the absence of an anti-social effect. A positive coefficient on immigration would suggest the presence of an anti-social effect.

In the following, we estimate a system of structural equations of the total amount of public spending and the share of public spending on private goods. We estimate the two equations using seemingly unrelated regressions (SURE) (Zellner, 1962), where the error-terms are possibly correlated.<sup>9</sup> We distinguish between low- and high-skilled immigration because our model allows the possibility of a different effect according to skill. Theoretically, (1.13) can be fulfilled, while (1.14) is not. High-skilled immigrants could therefore increase public spending, while low-skilled immigrants decrease public spending. Numerical simulations, however, practically rule out that possibility. More importantly, in the presence of an anti-social effect, any additional negative or positive effect on public spending could be relatively larger for high-skilled or for low-skilled immigrants (see (1.22)) and produce different signs for the coefficients on immigration by skill.

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<sup>8</sup> This threshold value of  $\alpha$  might be larger than 0.5, depending on parameter values. (1.13) might therefore still be fulfilled for  $\alpha > 0.5$ , and our conclusion on the sign of the fiscal effect of immigration will be less clear.

<sup>9</sup> Alternatively, one could consider estimating the two equations by three-stage least squares (3SLS) (Zellner and Theil, 1962), where the dependent variable in one equation appears as an explanatory variable in the other equation. Estimation by 3SLS requires for each equation at least one variable not included in the other equations (an instrument) for identification. We argue that the estimation by SURE is preferred to estimation by 3SLS as the median voter will use all information available to her in either decision and the choice of instrument is therefore not clear.

### 3. Data

We use panel data for 18 OECD countries during 1990 – 2001.<sup>10</sup> The data were compiled from various sources; a detailed description of the definitions and sources is in the Appendix.<sup>11</sup>

The dependent variables in our system of equations are the total amount of public spending,  $g$ , (general government total outlays in per cent of GDP) and the share of public spending on private goods,  $\sigma$ . Our preferred indicator of the share of public spending on private goods in total spending is the share of total transfers received by households in per cent of total outlays. The scatter plot in Figure 4 below shows a negative correlation between public spending and the spending on transfers. This negative association is confirmed by a fixed-effects panel regression which is tabulated in Table 1, where we also control for immigration. According to our model, the median voter decides the optimal values of  $g$  and  $\sigma$  simultaneously. We estimate these decisions below, for the moment it is the negative association between  $g$  and  $\sigma$  which we want to stress. (Of course, the exact value of  $\alpha$  ought to be determined by micro-econometric analysis, and possibly by experiments.)

The definition of immigrants for our empirical analysis is the foreign-born of working age, or, where data on the foreign-born were not available, foreigners.<sup>12</sup> We collected data on immigrants by skill, where we use two categories of skill (low and high) derived from the International Standard Classification of Education (ISCED) 1997.<sup>13</sup> We define as the low-

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<sup>10</sup> The countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland, the United Kingdom and the USA.

<sup>11</sup> Amongst others, the OECD Labour Force Statistics, the OECD International Migration Statistics, and the World Bank's World Development Indicators.

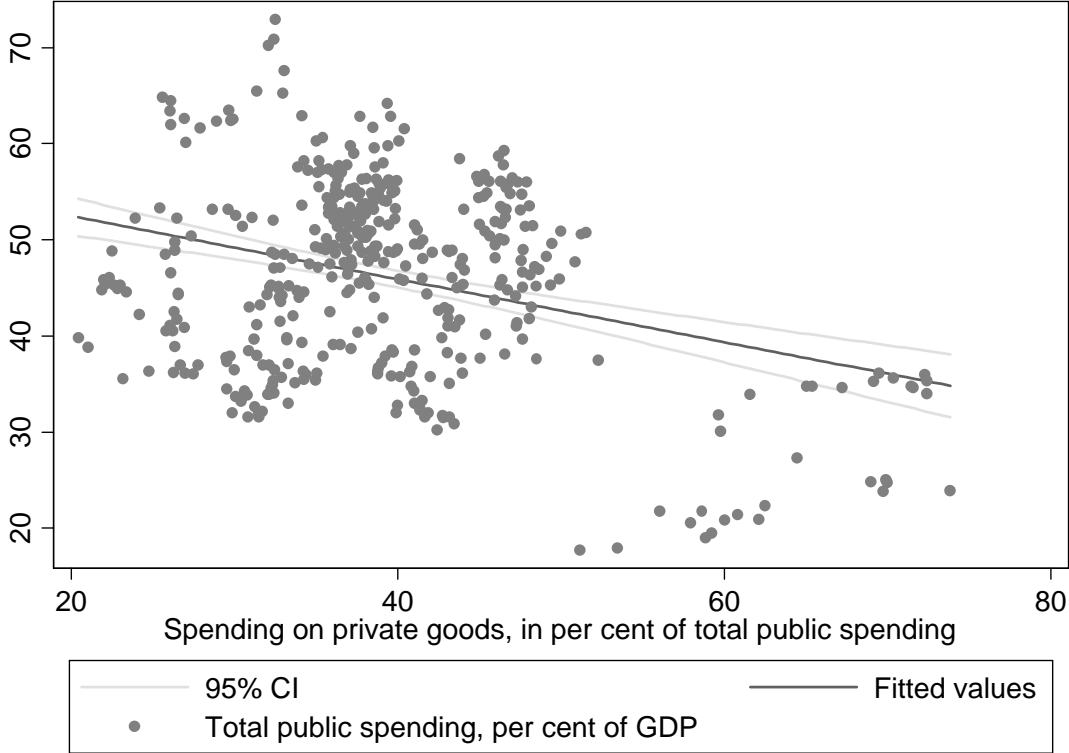
<sup>12</sup> We are more interested in the foreign-born as they comprise all the people who might be ethnically different from natives. This means that we may include (naturalized) immigrants who are allowed to vote in our empirical work, and we have to assume, according to our model, that they do not change the income of the median voter. Even if they did, however, that would most probably not change the (in)validity of conditions (1.23) and (1.24), and all our Propositions would still hold.

<sup>13</sup> The ISCED was designed and approved by UNESCO as an instrument suitable for presenting statistics of education both within and between countries. (UNESCO, 1997). Razin et al. (2002) also introduce the share of medium- and high-skilled immigrants in total population as an additional variable in their policy equations. However, they use skill-specific data of only one year (1995) as representative for their whole period.

skilled immigrants those whose highest educational level is secondary education or less (ISCED level 4 or less). The high-skilled have attained the first or second stage of tertiary education (ISCED level 5 or 6). Low- and high-skilled immigrants are expressed in percent of the total population. High-skilled and low-skilled immigrants are expressed as shares in the total population.

Control variables in the SURE regressions are GDP per capita (in constant 1995 US dollars), the age dependency rate (dependents to working age population), the unemployment rate (standardized, OECD definition), and trade openness (sum of exports and imports in percent of GDP). We also use an indicator to describe the skewness of the income distribution, the share of total income the top quintile of the population receives. The summary statistics of our estimating sample are detailed in Table 2.

**Figure 4: Total public spending and public spending on cash transfers, N=223.**



## 4. Results

The results of our estimates of total public spending  $g$  and the share of public spending on private goods  $\sigma$  are presented in Table 3. The estimations are made by seemingly unrelated regressions which allow for a simultaneous estimation of the two equations. In addition, the error-terms of the two equations are possibly correlated. Our preferred model is Model 3, because we lose many observations when we also include the top quintile's share of income (Model 5). Note that Model 4 uses a different variable for the spending on private goods than the other models (the sample size is thus slightly smaller).

The main result from our estimations is the clear negative association between public spending and low-skilled immigration. Low-skilled immigration is estimated to lower the total amount of public spending and spending on private goods. High-skilled immigration, in contrast, is estimated to increase public spending and spending on private goods. The precision of these estimates however depends on the specification of the equations.

We interpret these results as evidence for an anti-social effect of low-skilled immigration. The negative correlation between public spending and the spending share on private goods documented in Table 1 and Figure 4 suggests that the median voter prefers public over private goods. In this case, our theoretical model predicts a positive fiscal effect of immigration. The fact that low-skilled immigration is estimated to decrease public spending can be explained by anti-social preferences. High-skilled immigration is estimated to increase public spending, which is predicted by the fiscal effect.

While this does not rule out anti-social preferences, the findings show that the effect from anti-social preferences does not dominate the positive fiscal effect. Yet, in the absence of an anti-social effect, we expect the share of spending on private goods to decrease with immigration (compare (1.15) and (1.16)), which it does not for the high-skilled immigrants. Because of the positive association between high-skilled immigration and the spending share on private goods, we conclude that there is evidence for an anti-social effect for the high-skilled immigrants, too. This anti-social effect is strong enough to reverse the expected positive fiscal effect on public spending in case of low-skilled immigration, but not in the case of high-skilled immigration.

The other estimation results show that richer countries spend less on public spending than poorer countries. In addition, high unemployment increases total public spending, the association between unemployment and the share of spending on private goods is not precisely estimated, but the results suggest that the spending share on private goods is lower when unemployment is high. Openness of trade decreases both public spending and spending on private goods. There is thus no evidence for an insurance function of the welfare state against external shocks as proposed by Rodrik (1998). We also estimate that total public spending is lower when the age dependency ratio is higher and find no association between the age dependency ratio and public spending on private transfers. All of these findings are similar to those of Razin et al. (2002), who use a smaller data set to estimate the effect of immigration on transfers per capita. Regarding the negative coefficient on the dependency ratio, they argue that population aging represents a net cost to the median voter who gains by reducing the amount of public spending in response.<sup>14</sup>

In an alternative specification, Model 4, we have used all public spending on social expenditure (from the OECD) to gauge the sensitivity of our results to the choice of variable for spending on private goods. This alternative choice is less preferred to that above because it may include public expenditure on goods which are non-rival. The results however change little; our main implications from Model 3 are confirmed.

In a further specification, Model 5, we have included the ratio of the top quintile's income to the income received by the three middle quintiles to control for the skewness of the income distribution. Our model, in line with standard political economy models of redistribution, predicts that public spending increases with income skewness as expressed by the ratio of mean over median income (compare (1.7)). We estimate that the larger the top quintile's income share, the more public spending occurs, both in terms of total spending and in the share of private goods. The empirical association between the variables is as implied by theory.

The estimates may suffer from reverse causality, as immigration might not be independent from public spending (compare the welfare-magnet effect in Borjas (1999)). Allowing for such a welfare magnet effect would amount to estimating a system of equations, where

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<sup>14</sup> Compare Razin, Sadka and Swagel (2000) for a theoretical model on that effect.

immigration is not only an exogenous variable (as it is in these equations), but also a dependent, endogenous variable. This empirical implementation, however, is difficult at best, because of data limitations and because of a lack of instruments. Razin et al. (2002) mention the difference in GDP growth between the emigration and the immigration countries as a potential instrument for benefits. Even if these data were available to us, which are not, the (positive) correlation between GDP and the welfare system makes such use problematic.

## 5. Conclusion

In this paper, we examine the effect of immigration on public spending. We model the size of total public spending as a function of the share of spending on private goods and also of high-skilled and low-skilled immigration. Our model predicts that, in the absence of anti-immigration sentiments, if the median voter prefers public goods over private goods, low-skilled and high-skilled immigration unambiguously increases the size of total public spending. High-skilled and low-skilled immigration will lower total public spending, if the median voter strongly prefers private over public goods.

We extend our model to allow for anti-immigration sentiments, where immigration causes the native median voter to value public goods less than without immigration. Such disutility from immigration may offset any positive or negative fiscal effect and, in effect, lower (raise) the size of total public spending, if preferences are pro (anti) public goods.

Estimating a fixed-effects panel regression, we find that the empirical association between total public spending and the share of private good spending is negative (preferences are pro public goods).

We also estimate the empirical effect of low-skilled and high-skilled immigration on total public spending and public spending on private goods by using seemingly unrelated regressions. We consistently find that low-skilled immigration is associated with less total public spending, while high-skilled immigration is associated with greater public spending. While there is evidence for an anti-social effect with regard to both low- and high-skilled immigrants, we find that it is large enough to dominate the expected positive fiscal effect on public spending only in case of the low-skilled, but not in case of the high-skilled.

Immigration policies that are designed to select high-skilled immigrants, as they are in place in e.g. the U.S, and currently much discussed in Europe, should therefore be more likely to prevent a run down of welfare state provisions. We believe it intuitively appealing that in societies which prefer spending on public goods to spending on private goods, immigration should enhance total public spending, while the opposite should be true in societies which prefer public spending on private goods.

Of course, immigration itself might change relative preferences for public and private goods. This is also consistent with the observation that the U.S., which are relatively ethnically diverse, seem to choose to distribute fewer resources in public goods and fewer resources in total than the more homogeneous European societies. A reversal of redistribution policies in Europe could be brought about, if ongoing immigration is accompanied by anti-social preferences of the kind described. There might be a point at which immigration reduces spending preferences for public goods in European societies sufficiently for the fiscal effect of immigration to become negative.

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## Tables

**Table 1: Fixed-effects panel regression of total public spending.**

	Coefficient [t-stat]	
Share of spending on private goods	-0.198	[2.23]
Low-skilled immigration	0.014	[0.06]
High-skilled immigration	-0.960	[1.33]
Constant	56.956	[14.86]

*Note:* N=223.

**Table 2: Summary statistics of estimating sample, N=223.**

	Mean	S.D.
Total public spending		
(% of GDP), $g$	47.51	8.82
Public spending on private goods		
(% total public spending), $\sigma$	39.79	9.02
Low-skilled Immigrants		
(% of total population)	3.56	3.81
High-skilled Immigrants		
(% of total population)	1.67	2.38
GDP/capita (in 1,000 constant 1995 US dollars)	27.677	8.39
Age dependency rate	50.05	3.62
Unemployment rate (OECD definition)	7.22	3.12
Openness (% of GDP)	68.78	34.51
Top quintile income share (relative to the income share received by the three middle quintiles)*	0.77	0.12

*Note:* \* Sample size is 153 observations.

**Table 3: Estimation results for public spending and the share of spending on private goods (seemingly unrelated regressions).**

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Public Spending	Share of spending on Private Goods	Public Spending	Share of spending on Private Goods	Public Spending	Share of spending on Private Goods	Public Spending	Share of spending on Private Goods	Public Spending	Share of spending on Private Goods
	Coefficient [t-stat]	Coefficient [t-stat]	Coefficient [t-stat]	Coefficient [t-stat]	Coefficient [t-stat]	Coefficient [t-stat]	Coefficient [t-stat]	Coefficient [t-stat]	Coefficient [t-stat]	Coefficient [t-stat]
Low-skilled immigrants	-0.284 [2.300]	-0.458 [3.623]	-0.381 [3.072]	-0.529 [4.114]	-0.427 [3.519]	-0.537 [4.155]	-0.436 [3.497]	-0.362 [3.703]	-0.145 [0.831]	-0.305 [1.350]
High-skilled immigrants	0.669 [1.622]	0.721 [1.704]	0.990 [2.389]	0.956 [2.222]	1.078 [2.668]	0.971 [2.256]	1.092 [2.676]	0.474 [1.482]	1.445 [3.293]	0.096 [0.169]
GDP per capita	-0.549 [3.487]	-0.886 [5.487]	-0.381 [2.351]	-0.763 [4.539]	-0.526 [3.225]	-0.788 [4.542]	-0.458 [2.682]	-0.737 [5.512]	-0.266 [1.206]	-0.941 [3.294]
Unemployment rate	0.579 [5.372]	-0.172 [1.559]	0.601 [5.702]	-0.156 [1.425]	0.749 [6.759]	-0.130 [1.102]	0.779 [6.653]	-0.188 [2.045]	0.970 [8.116]	-0.158 [1.020]
Openness			-0.070 [3.293]	-0.051 [2.322]	-0.110 [4.676]	-0.058 [2.311]	-0.120 [4.609]	-0.114 [5.594]	-0.203 [6.291]	-0.062 [1.491]
Age dependency ratio					-0.510 [3.532]	-0.089 [0.578]	-0.546 [3.456]	-0.175 [1.416]	-0.859 [4.442]	0.077 [0.308]
Income share top 20%									3.165 [0.971]	4.697 [1.114]
Constant	48.748 [10.654]	52.969 [11.291]	45.154 [9.817]	50.341 [10.549]	75.673 [7.777]	55.657 [5.369]	75.850 [7.305]	69.684 [8.562]	82.919 [6.148]	46.744 [2.679]
N	223.000		223.000		223.000		210.000		153.000	

Note: All models control for country and year fixed-effects. Model 3 uses a different definition of spending on private goods (public social expenditure, as per cent of GDP) than the other models (spending on cash transfers, in per cent of total public spending). Sample sizes differ because of missing observations.

## Appendix: Variable description and source.

Variable	Description	Source
<i>Fiscal policy</i>		
Total public spending	General government total outlays (in percent of nominal GDP).	OECD (2004) Economic Outlook 76.
Public spending on private goods	Total transfers received by households (in percent of general government total outlays). Public social expenditure (in percent of general government total outlays).	OECD (2004) Economic Outlook 76. OECD (2004) Social Expenditure Database.
<i>Immigration</i>		
Low-skilled immigrants	Number of foreign-born or foreign of working age with primary and secondary education (in percent of total population).	Eurostat (2004), Labour Force Survey. OECD (2004), Labour Force Statistics. OECD (1997), International Migration Statistics. Docquier and Marfouk (2005). Dumont and Lemaitre (2004). Various national statistical databases.
High-skilled immigrants	Number of foreign-born or foreign of working age with tertiary education (in percent of total population).	See above.
<i>Controls</i>		
Per capita GDP	In constant 1995 US dollars.	Heston and Summers (2002) PWT 6.1.
Age dependency rate	Dependents to working age population.	World Bank (2004), World Development Indicators.
Unemployment rate	Standardised unemployment rate.	OECD (2004) Economic Outlook 75. OECD (2004) Labour Force Statistics. OECD (2005) Main Economic Indicators.
Openness	Sum of merchandise exports and imports (in percent of GDP).	World Bank (2004), World Development Indicators.
Top quintile income share	The ratio of total income received by the 20 % of the population with the highest income (top quintile) to that received by the three middle quintiles.	Deininger and Squire (1996), updated version. UNU/WIDER (2004) World Income Inequality Database, Version 2.0 beta. World Bank (2004), World Development Indicators.