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Abstract

We consider the fiscal impact of work related high skilled immigration to a generous welfare state. In a simple theoretical model, we show that, even though a generous welfare state tends to attract immigrants with a high demand for public services, the high skilled immigrants may still be selected among individuals with a relatively low demand of public services. In the empirical analysis we apply a unique Danish data set containing very detailed information on all residents in Denmark, including information on migration. Denmark is interesting, because it has one of the most generous welfare states in the world, and, in spite of that, it turns out that high skilled immigration gives rise to a big net fiscal surplus. Further, high skilled immigrants seem to be selected among those having a relatively low demand of public services.

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1. Introduction

There is a large literature on how the public budget is affected by immigration, and in most studies the effects are found to be quite small (see e.g. Rowthorn, 2008). The reason is that the entire stock of immigrants usually consists of a variety of individuals of different ages, and with different education, experience and residence permit. Since some types of individuals are net contributors, while others are net receivers of public resources, the net result becomes small and ambiguous. However, different types of individuals have different motives to migrate, and they also have different opportunities to migrate. These differences make it interesting to analyze how selective groups of immigrants affect public finances. The focus of this paper is *work related migration of high skilled workers*, and this type of migration is particularly interesting, because, in many countries, the immigration policy specifies special rules concerning work related immigration of high skilled workers (see e.g. Kahanec and Zimmermann, 2010). The purpose of these rules is often to attract or retain high skilled immigrants.

The fiscal impact of immigrants depends on how they are selected, and a standard proposition in the migration literature is that economic migrants tend to be favourably "self-selected" for labour market success (see e.g. Chiswick, 2000). Since labour market success has a big impact on the net contribution to the welfare state, this proposition also suggests that immigrants are favourably self-selected with respect to the financing of the welfare state. On the other hand, countries differ with respect to the generosity of the welfare state, and some countries may be "welfare magnets" (see e.g. Borjas, 1999). This implies a selection of immigrants demanding a lot of welfare services to countries with a generous welfare state. The question is to which extend these mechanisms are at work when restricting attention to high skilled immigrants? This is the research question addressed in this study.

The empirical analysis in this paper applies a unique Danish dataset containing very detailed information on all residents in Denmark, including dates of immigration and re-emigration. The information on each resident includes labour market performance, and the use of public services, such as doctors, hospitals, schools as well as the receipt of social benefits and the payment of taxes. This information implies that it is possible to identify high skilled immigrants as well as high skilled natives, and it is possible to calculate quite exact values of each person's net impact on public finances.

The Danish case is interesting, because Denmark is a very generous welfare state where public services such as treatments by doctors and hospitals, education and child care are free of charge or heavily subsidized. Besides that, there is a generous social benefit system in case of unemployment. Moreover, in order to finance the welfare state, taxes are very high, and, according to OECD (2012), Denmark is the OECD country with the highest level of taxes.

In the empirical analysis we calculate the fiscal costs and benefits of high skilled immigration, and it turns out that high skilled immigrants give rise to a big positive net contribution to the public budget. The median length of stay of high skilled immigrants is 4 years. During these years, the net fiscal contribution of singles is approximately 500.000 DKK (approximately 67.000 Euros), while that of couples is 1 million DKK (134.000 Euros).

The net fiscal contribution of high skilled immigrants turns out to be very similar to that of similar Danes. Immigrants tend to be younger on average than natives, and when matching on age and gender, the net fiscal contribution of immigrants, who are singles, is a bit lower than that of natives, while the net fiscal contribution of immigrant couples is a bit higher than that of native couples. However, even though the net fiscal contributions of high skilled immigrants and natives are very similar, there are big differences between the two groups with respect to payment of taxes and use of public services. Immigrants tend to pay less in taxes than natives, but they also use public services, such as doctors, hospitals, daycare and schooling of children, much less than natives. The low use of public services among high skilled immigrants indicates that the level of public services in destination countries cannot be particularly important for their choice of location.

The sample of immigrants, used in the calculation of public costs and benefits of immigration, consists of immigrants who came to Denmark during the period 2002 to 2008, and who are still present in Denmark in 2009. Hence, the calculations are on a stock of immigrants in 2009, which consists of different cohorts of immigrants. However, in our sample, the average high skilled immigrant has been present in Denmark for a shorter period than the average high skilled immigrant in the population. This may give rise to a bias in our estimates of public costs and benefits of high skilled immigration. To get information on the size of a possible bias, we follow the cohorts of high skilled immigrants arriving in 2002 and 2003. For each year, we calculate the public costs and benefits of each family, and in a duration model, we estimate how these costs and benefits are related to re-emigration. It turns out that, the more the family pays in taxes in a particular year, the less likely is re-emigration in that year, and the more the family makes use of public services, the less likely is re-emigration. Hence, with respect to the fiscal impact there are counteracting effects. When considering the net fiscal impact, there is a weak tendency that among singles, the re-emigrants contribute by less than those staying longer, while, among couples, there is no difference between re-emigrants and other immigrants. These results indicate that there may be a small downward bias in our estimates of the fiscal contribution of high skilled immigration. Moreover, they also support the conclusion that the public services of the welfare state are not very important for the migration decisions of high skilled labour.

The rest of the paper is organized as follows. In Section 2, we relate our analysis to similar analyses in the literature. In section 3, we set up a simple theoretical model to discuss how taxes and the level of public services in the destination country may affect the selection of immigrants. Section 4 presents the data, and, in Section 5, we calculate the net fiscal impact of high skilled immigration. In Section 6 we look at the relationship between re-emigration and the use of public services and payment of taxes. Finally, in Section 7 we conclude.

2. Related literature

Analyses of the fiscal impact of immigration has been performed for many countries, see e.g. Rowthorn (2008) for a survey. There are two main approaches in this type of analyses – a static and a dynamic. The static approach considers a group of immigrants for a period of time, typically a year, and calculates the taxes they pay and the amount of government expenditures they absorb – the difference between taxes

and expenditures is their net fiscal contribution. A recent example of this type of analysis is given in Dustmann *et* al. (2010), which considers the costs and benefits of A8 (i.e. Eastern European) migration to the UK since the EU-enlargement in 2004. It is found that A8 immigrants are less likely to receive benefits or live in social housing than natives, and they contribute more to the tax and benefit system than they receive. Hence, A8 immigrants have a positive fiscal impact in the UK, and the main reason being that they are younger, better educated and have fewer children than native UK citizens.

An example of the dynamic approach is Storesletten (2000), which uses a general equilibrium model of overlapping generations calibrated for the USA. This model explicitly accounts for differences between natives and immigrants, and it is found that the Net Present Value (NPV) of the average immigrant to the US is $7,400. In the model, it is possible to distinguish between low, medium, and high skilled immigrants, and there are big differences in their NPV. For low skilled, the NPV is -$36,000, for medium skilled it is -$2,000, and for high skilled it is $96,000.

In this paper, we apply the static approach in the sense that we use historical data to calculate the fiscal impact of immigrants, and we do not specify an equilibrium model which can be used to predict the fiscal implications of future immigration. However, we do follow immigrants for a number of years, and for many immigrants we have detailed data on their entire stay in Denmark.

A standard assumption in studies of the fiscal impact of immigration is that native employment is unaffected by immigration. However, there is a literature on the employment consequences of immigration, where the focus has been on the net employment consequences for a group of individuals (typically defined over regions or industries) if there is an increase in the supply of immigrant workers. Examples of such analyses are Borjas *et al.* (1997) and Card (2001), both using U.S. data, Dustmann *et al.* (2005), using U.K. data, Pischke and Velling (1997), using German data, and Angrist and Kugler (2003), using EU data. There is substantial variation in the results from these analyses, but the general conclusion is that immigration has a very small negative effect on employment of native workers; see Longhi *et al.* (2006) for an overview. Malchow-Møller *et* al. (2009) provides a study applying Danish data, and it is found that employment of immigrants do not displace native workers. Hence, assuming that immigration does not have an impact on employment of native workers does not seem to give rise to a big bias in the calculations of the fiscal impact of immigration.

Our analysis is also closely related to the literature on the selection of migrants. In Sjaastad (1962), it is argued that migrants are a positively selected group of individuals with respect to labour market performance (see also Chiswick, 2000). The reason is that the benefit of migrating, relative to the monetary and non-monetary costs of migrating, tends to be higher for individuals who are more successful at the labour market. Related to this some studies find that immigrants are healthier than others, i.e. there is a "healthy immigrant effect" (see e.g. McDonald and Kennedy, 2004 and Kennedy, McDonald and Biddle, 2006). However, there may be other mechanisms at stake, which affect the selection of immigrants. Borjas (1987) suggests that high skilled workers tend to migrate to countries where skill prices are relatively high. There is a big literature analyzing whether this is actually the case, and the empirical evidence is mixed (see e.g. Dustmann and Glitz, 2011). In our analysis, we restrict attention to high skilled immigration, and, therefore, the question is, what are the characteristics of the high skilled immigrants, and what are the characteristics of the high skilled who re-emigrate? Since Denmark is a very egalitarian country with a lot of

redistribution through taxes and public expenses, the logic of Borjas (1987) suggests that, within the group of high skilled, those who immigrate to Denmark are in the lower end of the income distribution. Further, Borjas and Bratsberg (1996) suggest that those who re-emigrate are those who become disappointed with the economic prospects in a country. In a recent study by Kennan and Walker (2011) using US data, it is found that it is the least successful who tend to re-emigrate. However, using the logic of Borjas and Bratsberg, those who become disappointed in a country like Denmark, where there is a strong redistributive tax system, might as well be the most successful, because they do not get as high a return on their skills as in many other countries.

3. A simple stylized model

Before we turn to the empirical analysis of the fiscal impact of high skilled immigration, this section presents a very simple and stylized "human capital migration model" (see e.g. Sjaastad, 1962 and Chiswick, 2000) to discuss the selection of immigrants.

We consider a potential migrant who can choose between staying in the source country and moving to the destination country. For simplicity, we assume that the decision is permanent, and that the working life is infinite. Further, we assume that there are no post-migration human capital investments. This rules out temporary migration as analyzed in e.g. Dustmann, Fadlon and Weiss (2011). For simplicity, we also assume that there is only one type of public services. The life time utility of a potential migrant, living in country *i* – which is either the source country (*s*) or the destination country (*d*) – is:

$$U_i = \frac{(1-t_i)W_i+B_i}{r}, i = s, d, \tag{1}$$

where t_i is the tax rate, W_i is the per period wage income and B_i is the per period utility from public services; *r* is the discount rate. We will further assume that there is a fixed cost (C) of migrating from country *s* to country *d*. With respect to the utility of public services, we assume that it is given as:

$$B_i = nb_i, i = s, d, \tag{2}$$

where *n* is the demand level of the potential migrant for freely supplied public services, and b_i is a measure of the generosity of the supply of public services in country *i*. Hence, an individual having a big demand of public services like treatments by doctors or hospitals, daycare and schooling of children (i.e. *n* is high) gets a high utility from living in a country where the generosity (i.e. b_i) is high.

It follows that migration takes place, if

$$U_d - C > U_s, \tag{3}$$

or

$$\frac{(W_d-W_s)-(t_dW_d-t_sW_s)+n(b_d-b_s)}{C} > r, \tag{4}$$

A necessary condition for migration is that the per period utility, when living in the destination country, is higher than the per period utility, when living in the source country, i.e. the numerator at the left hand side must be positive. This at least requires that, either the wage income is higher in the destination country

than in the source country (i.e. $W_d > W_s$), the taxes are lower (i.e. $t_d < t_s$), or the public service is more generous (i.e. $b_d > b_s$). However, even if the per period utility from living in the destination country is higher than in the source country, migration only takes place if the fixed cost of migration (C) is not too large and/or the discount rate is not too large (r).

The fixed cost of migration may consist of monetary costs of moving, earnings foregone while searching for a new job in the destination country, and non-monetary or "psychic" costs (see e.g. Sjaastad, 1962). What is important with respect to the impact on fiscal costs and benefits in the destination country is that some of these costs may be related to a person's use of public services (i.e. $C = C(n)$, *and* $C'(n) > 0$). It e.g. seems likely that the cost of migration is particularly high if members of the family are in regular treatment by a hospital or a doctor; or if there are children who are well-integrated into the schooling system. Hence, if the destination country and the source country are equally generous with respect to public services (i.e. $b_d = b_s$), the migrants will be selected among those whose use of public services is at a relatively low level (i.e. n is low, and, therefore, C is low). This is consistent with a "healthy immigrant effect" (see e.g. McDonald and Kennedy, 2004). On the other hand, if the destination country is sufficiently generous relative to the source country (i.e. $b_d > b_s$), the migrants may become selected among those whose use of public services is at a relatively high level (i.e. n is high). In other words, the destination country may become a "welfare magnet" (see e.g. Borjas, 1999).

The payment of taxes also affects the incentive to migrate, but it is in general ambiguous how taxes affect the selection of immigrants. To show that this is the case, assume that the use of public services (n) is independent of the wage rate. Further, assume that the wage, which a potential immigrant obtains in the destination country is proportional to the wage obtained in the source country, i.e. $W_d = \gamma W_s = \gamma W$. From (4), it then follows that the marginal immigrant, i.e. the one who is indifferent between staying in the source country and migrating to the destination country, is defined as:

$$[(1 - t_d)\gamma - (1 - t_s)]\, W^m = rC - n^m(b_d - b_s), \tag{5}$$

where W^m is the wage in the source country of the marginal immigrant, and n^m is her demand of public services. The wage of the marginal immigrant is an implicit function of the tax rate in the destination country, and it follows that:

$$\frac{dW^m}{dt_d}\frac{t_d}{W^m} = \frac{\gamma t_d}{(1-t_d)\gamma-(1-t_s)}. \tag{6}$$

The sign of this expression is ambiguous. It is increasing in t_d if $\gamma > (1-t_s)/(1-t_d)$. In this case, the marginal migrant earns a higher after tax income in the destination country than in the source country, and an increase in the tax rate in the destination country implies that the wage also has to increase in order to make migration an optimal decision. If $\gamma < (1-t_s)/(1-t_d)$, the expression in (6) is negative. In this case, the marginal migrant earns a lower after tax income in the destination country than in the source country. The reason why migration is an optimal possibility is that the utility of public services is higher in the destination country than in the source country (i.e. $n^m(b_d - b_s) > rC$). Under these circumstances, the income disadvantage of migrating to the destination country is increasing in the wage rate. A higher tax rate in the destination country makes the destination country less attractive, and in order to "re-establish" the relative attractiveness of the destination country, the wage rate of the marginal migrant decreases.

To summarize, we find that, in a generous welfare state, the selection of immigrants is ambiguous with respect to their use of public services as well as with respect to their payment of taxes. However, the less generous the welfare state is, the more likely it is that immigrants are positively selected (seen from the perspective of the welfare state) with respect to their use of public services.

4. Data and descriptive statistics

From the Integrated Database of Labour Market Research (IDA), we hold information on all Danish residents in the period 1980-2009.[2] These data are merged with a number of other registers containing information on each person's use of public services and payment of taxes. Finally, we use the migration register to obtain information on all migrations into and out of Denmark. The migration register includes information on date of migration, country of citizenship, source country of immigrants and destination country of emigrants. By combining the information from the migration register with information from IDA and the other registers, it is possible to identify immigrants and follow their performance at the labour market, their payment of taxes and their use of public services.

Defining high skilled immigrants

The main part of our analysis proceeds by using information on the stock of high skilled immigrants in 2009. An immigrant is defined as *a foreign-born resident of Denmark plus dependent children living with two foreign-born parents or a foreign-born lone parent.*[3] Below, we focus at the net fiscal impact of an immigrant family, where the family is defined as a *head of family* plus partner and dependent children living at the same address in Denmark. The head of family is the one in the family having the highest income, or if they have the same income, it is the person who is not registered as spouse in the residence permit. If none are registered as spouse, the head of the family is the one who participates in a high skill employment group (see below), and if they both do that, the head of the family is assumed to be the male. Since our focus is the immigrant family, we exclude immigrants who have or have had a native partner. Further, we only consider families where the age of the head of the family is between 22 and 65 in 2009.

Ideally, we would define a high skilled as an individual with a *long further education*. However, while the information on formal education obtained in Denmark is very reliable in our data set, the same is not the case with respect to education obtained outside Denmark. Therefore, we choose to identify high skilled in an indirect way. All jobs in firms with more than 10 employees are classified in 794 different types of occupations according to DISCO, the Danish version of the International Standard Classification of Occupations. For each occupation, we find the share of Danes who have a long further education. If this share is above 50 percent, we classify the occupation as a *high skilled occupation*, and we classify all the employees in these occupations as *high skilled employees*. In the same way, we are able to define *unskilled employees* as those working in occupations where more than 50 percent of the Danes are unskilled. Those who are neither high skilled or unskilled are per definition *intermediate skilled.*

[2] For more details on the IDA data base, see Abowd and Kramarz (1999).
[3] This definition is very similar to the one used by e.g. Gott and Johson, 2002.

We also choose to focus on *employment related immigration*. In order to allow for a certain lack to become registered as employed, and to diminish the importance of the arrival month of the year, we choose to classify immigration as employment related, if the immigrant is employed in the calendar year following the arrival year to Denmark. Hence, in our dataset, high skilled immigrants are immigrants who are employed in a high skilled occupation in the calendar year following the arrival year. However, it is important to emphasize that, after this initial employment, an immigrant can be out of job or employed in non-high skilled jobs in the following years and still be included in our dataset as a high skilled immigrant.

The current version of the DISCO classification goes back to 2003, and, therefore, we consider the immigrants coming to Denmark during the years 2002 to 2008.[4] For this group of immigrants we apply information on the use of public services, payment of taxes etc. in 2009. Hence, we only use information for the immigrants who are still present in Denmark in 2009. Note that this implies that the 2009 stock of high skilled immigrants consists of different cohorts of immigrants, and there will be a difference in the fiscal impact of these different cohorts. It is, for example, the case that those arriving in 2008 will all be having a job in 2009 as this is a *requirement* to be classified as high skilled in our dataset. The further back in time of arrival, the longer period an immigrant has had to lose the initial job.

To get a comparison group of natives, we define high skilled natives in the exact same way as high skilled immigrants. We follow the native Danish population from 2003 to 2009, and we classify their skill level from their first registered job during that period. Hence, a native employed in 2003 is classified as high skilled if he or she is employed in a high skilled occupation. If it is e.g. a low skilled occupation, this person is classified as low skilled, even if he or she later on gets a job classified as a high skilled occupation. The focus is on the head person of the family defined in the same way as the head person of the immigrant family.

In Table 1, we show how *employment related* immigrants and Danes are distributed according to level of education, and we distinguish between immigrants from western and non-western countries.[5] Further, we distinguish between couples and singles. For the immigrants, singles are defined as singles in the Danish economy in 2009,[6] and they may have a partner in another country.

Table 1: Educational distribution of employment related immigration, percent

	Single			With partners		
	Western countries	Non-western countries	Danish	Western countries	Non-western countries	Danish
Unskilled	36	50	29	32	50	18
Other education	51	38	67	53	39	75
High education	13	12	4	15	11	7
Total	100(9,254)	100(4,485)	100(714,998)	100(3,676)	100(3,181)	100(1,021,494)
Note: The total number of immigrants is given in parenthesis						

High skilled workers constitute between 11 and 13 percent of employment related immigration. Hence, the share of high skilled among the immigrants is higher than that among Danes, which is between 4 and 6

[4] Further, we do have information on whether immigrants stay or re-emigrate until 1st of January 2011.
[5] Western countries are: EU-countries, USA, Canada, Australia, New Zealand, Andorra, Liechtenstein, Monaco, San Marino, Switzerland and the Vatican State. Non-western countries: all other countries.
[6] Of those who are singles in 2009, there are only very few who did not arrive as singles.

percent.[7] However, it is interesting to note that the share of unskilled is also higher among immigrants than among Danes – especially among immigrants from non-western countries. In contrast, the share of immigrants with an intermediate level of education is much lower than what is the case among Danes.

Table 2: Gender and age of high skilled immigrants, percent

	Single			With partners		
	Western countries	Non-western countries	Danish	Western countries	Non-western countries	Danish
Gender, Pct.						
Men	52	65	51	73	76	69
Women	49	35	49	27	25	31
Age, Pct						
20-29 years	41	50	10	14	18	3
30-39 years	36	39	29	49	55	30
40-49 years	15	8	25	29	23	28
50-59 years	7	3	23	6	4	24
60-65 years	1	-	13	1	0	14
Total	100 (1,198)	100 (533)	100 (30,860)	100 (552)	100 (359)	100 (70,742)
Note: The total number of immigrants is given in parenthesis						

From Table 2, we see that there are more males among high skilled immigrants than among high skilled Danes, especially among immigrants from non-western countries. We also see that high skilled immigrants are much younger than high skilled Danes, especially among singles.

Table 3 shows the differences with respect to the age and number of children in the families. Immigrants who are singles do basically not bring children to Denmark, and immigrant couples also have fewer children than Danish couples. With respect to the age distribution of children, the main difference between immigrants and natives is that a smaller share of children in Danish families is very young (below 2 years).

Table 3: Age and number of children for high skilled immigrants, percent

	Single			With partners		
	Western countries	Non-western countries	Danish	Western countries	Non-western countries	Danish
Number of children						
0	96	98	83	47	46	40
1 child	3	2	10	23	35	19
2 children	1	-	6	22	16	30
3 children	-	-	1	7	3	10
4 or more children	-	-	0	1	-	1
Total	100 (1,193)	100 (533)	100 (30,860)	100 (552)	100 (359)	100 (70,742)
Childrens' age						
0-2 years	14	-	6	23	27	19
3-6 years	20	35	17	30	28	25
7-16 years	54	65	58	41	37	45
16-18 years	13	-	19	6	8	12
Total	100(80)	100(17)	100 (7,387)	100(515)	100(294)	100 (75,199)
Note: The total number of children is given in parenthesis. A "-" indicates that there are fewer than 5 observations in which case confidentiality rules prevent publication						

Our sample includes all cohorts of high skilled immigrants arriving to Denmark between 2002 and 2008 who were still in Denmark in 2009. By restricting attention to some of the early cohorts, it is possible to get information on for how long high skilled immigrants stay in Denmark. In Table 4 we report the duration of stays for the immigrants arriving to Denmark in 2002 and 2003. It is e.g. seen that, in our sample, 10 percent of western immigrants leave before they have stayed a full year.[8] It is also seen that non-western immigrants tend to stay longer than western immigrants. The median stay of non-western couples is 63.5

[7] The share of Danes in the population having a long further education is approximately 10 percent. Hence, many Danes with a long further education are employed in jobs, where the majority does not have a long further education.
[8] It should be emphasized that this number is highly downward biased in our sample, because immigrants are only included in our sample, if they are employed in a high skilled occupation in the calendar year after their arrival to Denmark.

months, while it is 42 months for western couples, and there is a similar difference between singles from non-western and western countries.

Table 4: Duration of stay of high skilled immigrants arriving In 2002 or 2003, percent

	Single		With partners	
	Western countries	Non-western countries	Western countries	Non-western countries
1-12 months	15	7	11	7
13-24 months	14	14	18	18
25-36 months	15	14	16	13
37-48 months	9	10	12	7
49+ months	48	56	43	55
Total	100(447)	100(175)	100(147)	100(84)
median duration of stay	45	57	42	63.5

Note: The total number of immigrants is given in parenthesis

5. The fiscal impact of high skilled immigration

In this section, we calculate the fiscal impact of different types of immigrants, and we compare this impact to the one of similar Danes. We include all expenses and revenues to the public sector that can be individualized, like daycare, schooling, health services and criminal offences. However, this choice also implies that there are expenses and revenues that are excluded from the analysis. On the expense side, it is public goods like infrastructure, defense and administration, and on the revenue side, it is taxes on firms, excise duties and VAT. It is an open question how the public goods and taxes should be included in a comprehensive analysis of all costs and benefits of immigration, because they do not necessarily increase proportionally with the size of the population (see also Rowthorn, 2008). The left out expenses amount to approximately 20 percent of all public expenditures in 2009, whereas the left out taxes amount to approximately 40 percent of all taxes. Hence, it seems likely that we underestimate the net contribution of high skilled immigration to the public budget. However, the same will be the case for the comparison group of high skilled Danes.

The fiscal impact of family *i* in year *t* is given by

$$fi_{it} = tax_{it} - sb_{it} - cs_{it} - p_{it}^{dc}n_{it}^{dc} - p_{it}^{ps}n_{it}^{ps} - p_{it}^{hs}n_{it}^{hs} - p_{it}^{os}n_{it}^{os} - p_{it}^{d}n_{it}^{d} - p_{it}^{h}n_{it}^{h} - p_{it}^{c}n_{it}^{c}, \quad (7)$$

where tax_{it} is the payment of taxes of family *i* in year *t*; sb_{it} is social benefits (unemployment benefits, pensions, rent support); cs_{it} is child support; n_{it}^{dc} is the number of children in daycare, and $p_{it}^{dc}$is the cost for the public sector of supplying daycare per child (i.e. net of any payment of the parents). The other variables are defined similarly, where *ps* indexes primary schooling, *hs* high schooling, *os* other secondary schooling, *d* treatment at a doctor, *h* bed days at hospital (i.e. n_{it}^{h} is the number of days in hospital), and *c* criminal offences.

From the registers behind our dataset, we know the exact values of taxes, social benefits and child support. We also know the number of kids in daycare and the different types of schools (primary, high school and other secondary) they attend, the number of visits at a doctor, the number of days stayed in hospital and the number of criminal offences, but we do not know the exact unit costs of these for each family (i.e. the p_{it}^{j}, where *j = dc, ps, ss, d, h and c*). We assume that the unit costs are the same for all families (i.e. p_{it}^{j}=p_{t}^{j}). Further, from the public budgets we know the total cost on daycare, schooling etc., and we know the total

number of children in daycare, in schools etc. Therefore, we are able to calculate a unit cost for each of these services.[9] For further details, see Jacobsen et al. (2011).

In the descriptive statistics presented in the previous section, we distinguished between immigrants from western and non-western countries. The most noteworthy difference was that single immigrants from non-western countries are mainly men (65 percent), while there is a more equal gender distribution of single immigrants from western countries. However, in general, the differences between western and non-western high skilled immigrants are small, and in the following analyses we choose to pool the data on these immigrants. The main reason for doing this is that there are relatively few immigrants from non-western countries, and by pooling the data we get better and less variable estimates of the use of different types of public services.

We want to answer two questions. First, what is the fiscal impact of high skilled immigrants? Second, how does their impact compare to the impact of similar high skilled natives? Since we have data on the full population of Danes, we are able to answer the last question by using a simple matching method, where we match with a randomly chosen Dane with the exact same characteristics as the immigrant. Due to the definition of a high skilled, an important characteristic of an immigrant is the year of arrival. As explained above, it is, for example, per definition the case that a high skilled immigrant arriving in 2008 is employed in a high skilled occupation in 2009, whereas this is not necessarily the case for a high skilled immigrant arriving before 2008. Most of the Danes formally "arrive" in our dataset in 2002, but they have in reality been present in the economy many years before 2002. This is similar to immigrants being present in other economies before 2002. Therefore, to obtain a comparison group of high skilled Danes, we, for each year in our dataset, select Danes who are present that year, have a job in a high skilled occupation in the following year, and who are still present in the economy in 2009. Besides matching high skilled immigrants with high skilled Danes, it is an open question whether we should match on more variables. The gender, age, education, and composition of family may differ between immigrants and Danes, and these differences affect their fiscal impact. But, if we simply want to evaluate the net fiscal impact of immigrants compared to Danes, we should not control for these differences. On the other hand, if we want to analyze why immigrants may have a different fiscal impact than Danes, we should match on some of these variables in order to control for some of the possible explanations of the different fiscal impacts. Therefore, in the following, we vary the number of variables on which the matching analysis takes place.

In Table 5, we consider the payment of taxes and the reception of social benefits in 2009. Since the size of both taxes and social benefits are closely related to labour market performance, we also report the average size of income, and the average employment rate.[10] In the left-hand panel of the table we report results on immigrants who are singles, and in the right-hand panel on immigrants with partners. In the first column of the two panels, we report the mean of the chosen variables for the high skilled immigrants. It is, for example, seen that among immigrants with partners, the average employment rate of the head person is 92 percent, and for the spouse it is 47 percent. The head person earns on average 650,000 DKK, while the spouse earns 220,000 DKK. There are 9 percent of the head persons who have received social benefits,

[9] It turns out that in Danish Kronor: p_{it}^{dc} = 73,700 per year, p_{it}^{ps} = 68,500 per year, p_{it}^{hs} = 74,200 per year, p_{it}^{os} = 52,600 per year, p_{it}^{d} = 184 per used service, p_{it}^{h} = 15,000 per day, and p_{it}^{c} = 49,500 per offence.

[10] The employment rate is the share of people in the particular group being employed, measured as full time employment.

while this is the case for 17 percent of the spouses. In the second column, we report the average differences between immigrants and Danes where the only matching criterion is that both Danes and immigrants are high skilled. In the third column, we further match on gender and age, and in the fourth we add the Disco-classification as a matching criterion. By matching on DISCO-classification, we indirectly match on type of education. In the table it is also indicated whether the differences between immigrants and Danes are statistically significant. The numbers in the second, third and fourth column of each panel are calculated such that a positive number means that Danes have a higher value than Danes, i.e. the reported difference of 0.04 in employment rate between single immigrants and the Dane Match 1-group means that Danes have a 4 percentage points higher employment rate than immigrants.

Table 5. Employment, income, tax and social benefits- A matching analysis

	Single					With partners			
	Immigrant	Dane Match 1	Dane Match 2	Dane Match 3		Immigrant	Dane Match 1	Dane Match 2	Dane Match 3
Headperson									
Employment rate	0.77	0.04***	0.02	0.01		0.92	-0.04***	-0.03**	-0.04***
		(0.012)	(0.012)	(0.012)			(0.012)	(0.012)	(0.012)
Income	395,057	83,960***	16,378*	12,755		649,462	-78,764***	-90,542***	-69,595***
		(11,425)	(9,329)	(9,407)			(19,585)	(19,218)	(20,089)
Tax	134,480	49,563***	16,748***	15,064***		232,132	660	-20,223**	2,440
		(4,126)	(3,895)	(3,874)			(9,993)	(8,811)	(9,520)
Social Benefit rate	0.09	0.03**	0.09***	0.08***		0.08	0.03**	0.06***	0.06***
		(0.011)	(0.012)	(0.012)			(0.014)	(0.015)	(0.015)
Partner									
Employment rate	-	-	-	-		0.47	0.27***	0.28***	0.29***
							(0.020)	(0.019)	(0.019)
Income	-	-	-	-		220,182	147,448***	129,618***	138,713***
							(12,071)	(11,391)	(11,628)
Tax	-	-	-	-		78,537	61,383***	48,065***	52,473***
							(5,776)	(4,675)	(5,147)
Social benefit rate	-	-	-	-		0.17	0.01	0.10***	0.12***
							(0.019)	(0.021)	(0.021)
Total	1,673	1,673	1,673	1,673		897	897	897	897

Note: Standard errors are in parentheses , ***, *** and * indicate whether the difference between immigrants and matched Danes are significant at a 1 percent, 5 percent or 10 percent level, respectively. There were some matchingroups wherein there were no Danes, and some wherein the number of immigrants were higher than the corresponding number of Danes. These groups were dropped resulting in excluding 77 immigrants

When considering the headperson, there are big differences between immigrants who are singles and immigrants with partners, also when comparing to similar Danes. The single immigrants work a bit less than Danes, they earn less and they pay less in taxes. However, they also receive less in social benefits than similar Danes. The immigrants with partners tend to work more than similar Danes, they earn more, and receive less in social benefits. Whether or not they pay higher taxes than similar Danes depends on the matching criteria. A possible explanation on why immigrants with partners pay less in taxes, even though they receive higher income than similar Danes, is that some of these immigrants are eligible for reduced taxation under the Danish "Tax scheme for foreign researchers and key employees".[11]

With respect to both singles and immigrants with partners, we see that their income and taxes increase relative to Danes when comparing "Match 1" to "Match 2". The main reason for this is that immigrants are younger than Danes, and younger people tend to earn less than older. When comparing "Match 3 to

[11] This tax scheme was introduced in 1992 and applies a flat tax rate of 32 percent, which is much lower than the normal tax rates in the Danish tax system (the highest marginal tax rate was around 63 percent in the period under consideration).

"Match 2", we see that for single immigrants there is a further increase in income (and taxes) relative to Danes, which illustrates that single immigrants tend to be employed in types of jobs where the income is relatively low. For immigrants with partners, this is not the case.

Turning to the partners, we see that immigrant partners work much less than partners for Danes. This is also reflected in income and taxes, as native partners pay nearly the double in taxes than immigrant partners. However, with respect to social benefits, immigrant partners do not receive as much as Danish partners when controlling for differences in age and gender.

Next, we turn to public services, and in Table 6, we report the results. In the first column of the two panels, we show the numbers for immigrants who are singles and immigrants with partners, respectively. It is for example seen that immigrants who are singles on average stay 0.12 days at a hospital, visit doctors 3.3 times, and commit 0.0024 criminal offences. The second part of the table shows the numbers for partners, and the third part for children. The numbers for children concern the average per family and not the average per child. It is for example seen that in immigrant families with only one adult, there are in average 0.17 visits to a doctor which concerns children, while there are 3.3 visits in families with a head person and a partner. This difference reflects that only very few immigrants who are single bring children to Denmark. It is also seen that immigrant couples on average have 0.41 children in schools and 0.46 in daycare.

Table 6. Public Services- A matching analysis

	Single					Married			
	Immigrant	Dane Match 1	Dane Match 2	Dane Match 3		Immigrant	Dane Match 1	Dane Match 2	Dane Match 3
Headperson									
Bed days	0.12	0.28**	0.13**	0.06*		0.16	0.36***	0.06	0.09
		(0.108)	(0.058)	(0.035)			(0.121)	(0.055)	(0.081)
Visits to Doctor	3.30	1.96***	1.49***	1.09***		2.98	2.11***	1.24***	0.83***
		(0.184)	(0.173)	(0.171)			(0.263)	(0.225)	(0.224)
Criminal Offenses	0.0024	0.0056**	0.0043*	0.0013		0.004	-0.003	0.001	-0.002
		(0.003)	(0.002)	(0.002)			(0.002)	(0.004)	(0.002)
Partner									
Bed days	-	-	-	-		0.62	-0.13	-0.21	-0.02
							(0.170)	(0.155)	(0.163)
Visits to Doctor	-	-	-	-		4.65	1.22***	2.08***	1.86***
							(0.304)	(0.328)	(0.332)
Criminal Offenses	-	-	-	-		0.00	0.004	0.003	0.0028*
							(0.003)	(0.002)	(0.0015)
Children									
Bed days	0.01	0.03***	0.02**	0.005		0.15	1.18	0.11*	1.17
		(0.009)	(0.009)	(0.006)			(1.140)	(0.063)	(1.139)
Visits to Doctor	0.17	0.66***	0.44***	0.24***		3.30	1.39***	2.32***	1.92***
		(0.089)	(0.087)	(0.056)			(0.305)	(0.301)	(0.305)
Criminal Offenses	0.0000	0.0007**	0.0006	0.0001		0.00	0.0006	0.0022*	0.0014**
		(0.0003)	(0.0006)	(0.0001)			(0.0004)	(0.0013)	(0.0006)
Education	0.04	0.13***	0.05***	0.05***		0.41	0.22***	0.16***	0.20***
		(0.013)	(0.011)	(0.011)			(0.039)	(0.039)	(0.040)
Daycare	0.03	0.07***	0.05***	0.05***		0.46	0.20***	0.44***	0.44***
		(0.010)	(0.010)	(0.010)			(0.039)	(0.039)	(0.040)
Child support	1,158	2,685***	1,325***	1,656***		11,984	1,503**	5,265***	5,458***
		(293)	(258)	(287)			(607)	(597)	(616)
Total	1,673	1,673	1,673	1,673		897	897	897	897

Note: Standard errors are in parentheses , ***, *** and * indicate whether the difference between immigrants and matched Danes are significant at a 10 percent, 5 percent or 1 percent level, respectively

As in Table 5, the differences between immigrants and Danes are shown in the second column in the case where the only matching criterion is that immigrants and Danes are high skilled. In the third column, we further match on gender and age, and in the fourth also on the Disco-classification. We see that high skilled immigrants tend to use public services much less than similar Danes. This is the case when considering the use of the health sector, and it is also the case when considering child support, daycare and education of children. This suggests that, seen from the perspective of the welfare state, high skilled immigrants are a positively selected group with respect to the use of public services – even in a country like Denmark, where the welfare state is very generous.

The results reported in Table 5 and 6 constitute the main input to a cost-benefit analysis for the welfare state of high skilled immigration. The payment of taxes is the "benefit" of immigration, and the cost on social benefits and social services is the "cost" of immigration. To find the cost, it is necessary to multiply the use of public services in Table 6 by the unit cost of the different types of public services (see footnote 8). The results of the cost-benefit analysis are shown in Table 7.

Table 7. Benefits and costs- A matching analysis

	Single				With partners			
	Immigrant	Dane Match 1	Dane Match 2	Dane Match 3	Immigrant	Dane Match 1	Dane Match 2	Dane Match 3
Benefit in DKK	134,480	49,563***	16,748***	15,064***	310,669	62,042***	27,841***	54,913***
		(4,126)	(3,896)	(3,874)		(11,901)	(10,670)	(11,468)
Cost in DKK	11,506	20,529***	13,422***	12,107***	67,875	49,565***	41,772***	59,854***
		(2,389)	(1,826)	(1,656)		(18,057)	(4,086)	(17,962)
Net Benefit	122,953	29,055***	3,346	2,978	242,794	12,477	-13,930	-4,941
		(4,751)	(4,292)	(4,132)		(21,312)	(10,582)	(20,824)
Total	1,673	1,673	1,673	1,673	897	897	897	897

Note: Benefit is total taxes in DKK paid by the family, cost is the value in DKK of what the family receives in social benefits, child support, health services, schooling, childcare and criminal justice. Net benefit is benefit minus cost. Standard errors are in parentheses , ***, *** and * indicate whether the difference between immigrants and matched Danes are significant at a 1 percent, 5 percent or 10 percent level, respectively

It is seen that the average benefit of high skilled immigrants who are singles is approximately 135,000 DKK, while the average cost is only approximately 12,000 DKK. Hence, the average net benefit for the welfare state of a high skilled immigrant who is single is 123,000 DKK. Similarly, the average net benefit of an immigrant with a partner is approximately 243,000 DKK. When comparing the net benefit of high skilled immigrants to that of high skilled Danes, we see that, when considering singles, Danes contribute with more than immigrants. But, in the case of couples, with matching on gender and age (i.e. Match 2) or on education as well (Match 3), the net benefit of Danes is lower than that of immigrants. However, the difference is not significant. The importance of matching on gender and age reflects that immigrants are younger than Danes, and younger people earn less income and pay less in taxes than older people at the labour market.

When distinguishing between benefits and costs, the differences between immigrants and natives are more unambiguous and larger than when considering the net benefits. For immigrants, the benefits (taxes) are lower than for Danes, but the costs are lower, too. When controlling for differences in age and gender (i.e. Match 2), the benefit of Danes is 12 percent higher for singles and 9 percent higher for couples than for

immigrants. Even more pronounced, the cost of Danes is 117 percent higher for singles and 62 percent higher for couples than that of immigrants.

In order to calculate the total net present value of the fiscal impact of an immigrant, we need information on payment of taxes and the use of public services for each year the immigrant is present in Denmark. As an approximation, we may use the average net fiscal impact of the stock of immigrants in 2009 multiplied by the number of years an immigrant is present in Denmark.[12] The median length of stay of high skilled immigrants bringing their family is 4 years, and during that period, their net fiscal contribution is approximately 1 million DKK. The median length of stay of singles is also 4 years, and during that period they contribute with approximately 500,000 DKK.

From the theoretical section in section 3, it was argued that, if the destination country is sufficiently generous with respect to the provision of public services, it may become a welfare magnet, even among high skilled migrants. Hence, as far as there are differences in the demand for freely provided public services among high skilled migrants, those with the highest demand would migrate to countries where the generosity is high. However, our empirical results show that this does not happen in the case of Denmark, or if it happens, it is not a very strong effect, as high skilled immigrants use much less public services than high skilled Danes. Moreover, since Denmark is one of the most generous welfare states in Europe, it seems likely that a similar result would hold for other countries. This result also indicates that, in general, the generosity of the welfare state cannot be a very important criterion for the choice of location of high skilled migrants.

6. The fiscal impact of high skilled re-emigrants

The calculation of costs and benefits of high skilled immigration in the previous section were based on the payment of taxes and the use of public services in 2009. Further, it was based on immigrants who came to Denmark during the years 2002 to 2008, and who were still present in Denmark in 2009. Hence, the stock of high skilled immigrants in our sample consists of immigrants arriving more recently to Denmark than what is the case in the entire stock of high skilled immigrants of the total population in Denmark. If there is a tendency that those re-emigrating are different from those staying longer, this may give rise to a bias in our calculations of public costs and benefits of high skilled immigration. To find out whether this is the case, we chose to follow the cohorts of high skilled immigrants arriving in 2002 and 2003, and analyze to which extend there is a selection among re-emigrants with respect to their use of public services and payment of taxes. More specifically, we analyze whether those re-emigrating (early) tend to use public services more or less intensively, or pay more or less in taxes, than those staying longer.

To analyze the selection among re-emigrants, we use a duration model. Our staring point is the population of high-skilled immigrants into Denmark in 2002 and 2003. Thus our dataset is not left-censored. We follow the re-emigration until December 31, 2009, at which time 60 percent of the original population had re-emigrated. For each year we observe the immigrants' use of public services and payment of taxes, until the

[12] We do not make any discounting, and we do not take into account that taxes, social benefits and the cost of public services typically increase over time. In practice taxes, benefits and prices of public services are all more or less mechanically adjusted to the development in real wages. Hence, we implicitly assume that the real discount rate is equal to the growth rate of real wages.

time they re-emigrate thus creating an unbalanced panel. As the data consists of yearly observations, we employ the grouped duration model by Kiefer (1990), and we estimate the interval specific hazard rate of leaving Denmark in period *k*, given that the individual has stayed in Denmark until period *k*.
We estimate the proportional hazard model using the cloglog-specification as recommended by Jenkins (1995).

The panel at the left-hand side of Table 8 shows the estimations for singles, and the right-hand panel shows the estimations for couples. In columns 1 and 2 of each panel we use the fiscal benefit and cost of the current year corrected for the length of presence in the country for that year as explanatory variables (and we have excluded individuals who re-emigrate in January).The estimates of d1-d7 indicate the interval specific baseline hazard for year 1-7.

Table 8. Cloglog estimation, Costs and Benefits

	Single				Married			
	Model		Lagged model		Model		Lagged model	
Fiscal costs	-0.015***		-0.007**		-0.009***		-0.002***	
	(0.004)		(0.003)		(0.002)		(0.001)	
Fiscal benefits	-0.008***		-0.001		-0.006***		-0.002**	
	(0.001)		(0.001)		(0.001)		(0.001)	
Net benefits		-0.003***		-0.000		-0.000		0.000
		(0.000)		(0.000)		(0.000)		(0.000)
d2	-0.942***	-1.391***	-1.426***	-1.548***	-0.278	-1.438***	-0.928***	-1.445***
	(0.109)	(0.105)	(0.118)	(0.111)	(0.177)	(0.165)	(0.197)	(0.166)
d3	-0.909***	-1.477***	-1.618***	-1.759***	-0.017	-1.605***	-1.013***	-1.634***
	(0.134)	(0.129)	(0.141)	(0.134)	(0.220)	(0.201)	(0.238)	(0.202)
d4	-1.176***	-1.838***	-1.980***	-2.163***	-0.045	-1.935***	-1.126***	-1.988***
	(0.175)	(0.170)	(0.187)	(0.179)	(0.279)	(0.259)	(0.313)	(0.261)
d5	-1.346***	-2.168***	-2.189***	-2.400***	-0.720	-2.950***	-1.973***	-2.980***
	(0.205)	(0.200)	(0.221)	(0.211)	(0.457)	(0.447)	(0.492)	(0.449)
d6	-1.870***	-2.725***	-2.735***	-2.983***	-2.022**	-4.529***	-3.361***	-4.541***
	(0.281)	(0.277)	(0.295)	(0.285)	(1.004)	(1.000)	(1.025)	(1.000)
d7	-1.696***	-2.574***	-2.611***	-2.896***	-	-	-	-
	(0.411)	(0.408)	(0.424)	(0.415)	-	-	-	-
Observations	2440	2440	1855	1855	838	838	621	621

Note: Standard errors are in parentheses , ***, *** and * significance at a 10 percent, 5 percent or 1 percent level, respectively. The variable d7 has been dropped for married due to lack of variation.

We see that there is a tendency that those re-emigrating use public services less intensively than those staying longer. But, it is also the case that those re-emigrating pay less in taxes than those staying longer. The net result is that, for singles, there is a tendency for those re-emigrating to give rise to a lower net benefit than those staying longer, while, for couples, there is no difference between re-emigrants and those staying longer.

For many individuals the cost and benefit varies from one year to the other, and it is possible that, if the payment of taxes, or the use of public services, are particularly high in a specific year, this affects the

decision to re-emigrate in that specific year. It may for example be the case that, if immigrants temporarily need a lot of treatments by doctors or hospitals, they tend to stay, while this treatment takes place. It may also be the case that a particularly high payment of taxes in a year reflects an unusually high activity at a job for that year, which may also diminish the incentive to re-migrate in that particular year. To check whether there is also a relationship between re-emigration and a more long run tendency to use public services or to pay taxes, we also estimate whether the use of public services or the payment of taxes in the previous year affect the decision to re-emigrate. The results of this analysis are reported in columns 3 and 4 of the two panels in Table 8. We see that it is still the case that those re-emigrating tend to pay less in taxes than those staying longer. However, when considering the net benefits, there is no difference between those re-emigrating and those staying longer.

It should also be noted that the negative coefficients to the year-dummies d2-d7 demonstrates that the re-emigration probability is decreasing over time, except from year 2 to year 3, where the re-emigration hazard is slightly increasing in some of the estimations. This somewhat unexpected result may be due to the Danish tax rebate for scientists and other highly qualified personnel, which expire after three years.

7. Conclusion

In this paper we have considered the fiscal impact of high skilled immigration. In a simple theoretical model we found that in general it is ambiguous whether high skilled immigrants are selected among individuals having a high demand of public services, or are selected among those having a low demand. On the one hand, it is likely that the mobility cost of immigrants having a high demand of public services is relatively high. As far as this is the case, high skilled immigrants tend to be selected among those having a relatively low demand of public services. On the other hand, if a welfare state is sufficiently generous, it may become a welfare magnet, even among high skilled immigrants.

In the empirical analysis we apply data from Denmark which is one of the most generous welfare states in the world, and it turns out that high skilled immigration gives rise to a big net fiscal surplus. The median stay of high skilled immigrants who are singles is 4 years, and during these years the net contribution to the public budget is 500,000 DKK. The median stay of married immigrants who bring their families to Denmark is also 4 years, and during that period the net contribution to the public budget is approximately 1million DKK.

When matching immigrants with similar Danes it turns out that the net contribution to the public budget of immigrants is very similar to that of Danes. However, when distinguishing between costs to public services of the welfare state and the payment of taxes, there are major differences between high skilled immigrants and high skilled Danes. Danes pay more in taxes than immigrants, but immigrants use public services much less than Danes. Actually, the cost of public services to Danes who are singles is 117 percent higher than the cost of public services to immigrants who are singles, while the cost of public services to Danish couples is 62 percent higher than that to immigrant couples. These results suggest that high skilled immigrants are selected among those having a relatively low demand of public services – even the immigrants into a generous welfare state like the Danish.

By applying a duration model, we have also estimated the self-selection among re-emigrants with respect to the use of public services and the payment of taxes. It turns out that, in the year of re-emigration, re-

emigrants have a lower use of public services, but also a lower payment of taxes, than immigrants staying longer. The net result is that, for singles, re-emigrants tend to contribute less to the public budget than immigrants staying longer, whereas, for couples, there is no difference between re-emigrants and those staying longer. These results indicate that any biases in our estimates of the fiscal impact of high skilled immigration due to sample selections are small, and they also support the conclusion that the level of public services is not very important for the migration decision of high skilled workers. However, if we further take into account that our analysis only includes taxes and public expenditures that can be individualized, it seems likely that we underestimate the net fiscal impact of high skilled immigrants as well as of high skilled Danes.

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