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Essays on Access to Higher Education, Welfare Traps, and Welfare Migration

Martin Guzi

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Contents

Introduction

The research conducted for my dissertation covers topics from labor economics and consists of three empirical papers.

In the first chapter, co-authored with Michal Franta, we analyze the demand for tertiary education in the Czech Republic depending on university proximity. The study explores the difference in the probability of entering tertiary education for two secondary school graduates who differ only in that the first one resides within commuting distance to a university while the other one does not. We presume that the advantage of having access to a local university follows in two ways: first, attending a non-local university is associated with costs, either for monetary or non-monetary reasons. These include direct costs (travel costs, accommodation outside the parental home) and indirect costs (opportunity costs). If individuals are cost sensitive, these extra costs may affect their decision to attend a university and which particular university to attend. Second, informational advantages from a university environment are beneficial in the enrollment process to a university. The information advantage to a potential applicant transfers through face-to-face contacts with university students and easier access to preparatory courses organized by local faculty for applicants, etc. We distinguish two stages—the application stage and admission to a university—therefore, our research goes beyond existing studies that usually deal with university enrollees only. The results suggest that the presence of a university per se is not driving the student's decision to apply, but it constitutes a premium in the admission examinations. We further show that the influence of a local university is specific to the field of study. Therefore, living near a university that provides an applicant's preferred program increases the admission probability to that field even if the applicant applies to a different university. The premium is larger if the student applies to a highly oversubscribed program. As expected, both the decision to apply to a university and the probability of admission are also affected by the student's ability and socio-economic status. The study provides important information for making informed policy decisions because in most European countries the spatial distribution of higher education institutions, is a to large extent, determined by the national government. To equalize the chances in the admission examinations, policy makers should consider a geographical expansion of the system of universities accompanied by an expansion of university programs.

The second chapter demonstrates the existence of a welfare trap in the Czech Republic, created by the tax and social security systems. This result was documented by several studies by means of simulations for the selected types of households. The contribution of my analysis is that it explores the interactions of tax-benefit systems and the individual labor supply behavior directly. The methodology is adapted from Commander and Heitmueller (2007) and I significantly improved the computations of household income under working and non-working alternatives. Combining individual data from the Czech Labor Force Survey and the Czech Household Income Survey, the analysis exploits the difference between the available social benefits and the net household income when a person is employed. This information allows us to calculate the net replacement rate based on the parameters of the taxation system and rules for means-tested social benefits at the household level. Estimates imply the existence of a welfare trap, which means that individuals who receive relatively higher social benefits are also more likely to remain unemployed. It is shown that the most affected groups are those with low education and long unemployment spells. Furthermore, the paper documents the disadvantaged position of women in the Czech labor market. The estimates imply that women outflows to employment are particularly influenced by the high social benefits, and the existence of a welfare trap persists even when the job-search intensity is controlled. This finding contributes to the discussion on the persistent and large unemployment gender gap in the Czech Republic initiated by Lauerova and Terrell (2005). The results of the analysis support policy improvements towards low-income households. A better harmonization of tax and social security systems is necessary in order to ensure that the incentives to leave unemployment are not hampered by high social benefits. The suggested solution that would help the unemployed return to work is to allow individuals to receive full social benefits for some period while they are earning an income. To further strengthen the incentives, the measure should be accompanied by improvements in the monitoring and in the enforcement of job searching.

The third chapter presents the findings of the project I engaged in at the IZA. It studies welfare migration in European countries. The purpose of the study is to test the welfare magnet hypothesis for international migration, which suggests that migrants move across countries because of the differences in the welfare systems. As a result, countries with particularly generous unemployment benefits could attract a greater number of immigrants. The analysis is based on a panel of 19 European countries observed over the period 1993 to 2008. In order to address the endogeneity problem implied by reverse causality, the spending on unemployment benefits is instrumented with the number of political parties within each

winning parliamentary coalition. This choice is motivated by an empirical study done by Bawn and Rosenbluth (2006), which shows that the public sectors in European countries are larger when coalitions are formed by more political parties. The estimates obtained from the ordinary least squares regressions indicate the existence of a moderate welfare magnet effect for non-EU immigrants, while the instrumental variable approach reveals that the effect is substantially smaller and becomes essentially zero when the generalized method of moments technique is implemented. All estimates for EU immigrants are essentially zero, which suggests that immigration within the EU does not respond to unemployment benefit incentives. This finding supports the argument that EU immigrants are more skilled, and hence, less likely to be attracted by welfare states (Brücker, 2002), or they may rely on their home country unemployment benefit system. Our results lead to the rejection of the welfare magnet hypothesis. Although the effect of spending on unemployment benefits on immigration is zero on average, it is not possible to exclude it for immigrants from certain origins; unemployment benefits constitute a strong incentive to immigrate. Future availability of detailed data will allow us to explore this hypothesis further.

Introduction (in Czech)

V první kapitole disertační práce, spolu s Michalem Frantou, analyzujeme pravděpodobnost podání si přihlášky a pravděpodobnost přijetí na vysokou školu pro populaci českých středoškoláků, kteří maturovali v akademickém roce 1997/1998. Zaměřili jsme se na hlavní faktory ovlivňující středoškolákovo rozhodnutí o přihlášení se na vysokou školu a na faktory ovlivňující rozhodnutí příslušné vysoké školy o přijetí konkrétního uchazeče ke studiu. Pro analýzu jsme využili výsledků srovnávacích testů, ve kterých byli maturanti v roce 1998 testováni ze znalostí v základních předmětech vyučovaných na střední školách. Tyto údaje jsme zkombinovali s údaji o uchazečích o vysokoškolské studium v České republice v roce 1998. Údaje o uchazečích navíc obsahují informaci o všech vysokých školách, kam se uchazeč hlásil a na které byl přijat. Hlavním cílem článku je porovnat pravděpodobnost podání přihlášky na VŠ a šance na přijetí pro dva totožné maturanty, kteří se liší pouze místem bydliště. Jeden maturant bydlí blízko univerzity a druhý bydlí od nejbližší univerzity ve vzdálenosti, která neumožňuje každodenní dojíždění. Přítomnost (blízkost) univerzity může potenciálního uchazeče o vysokoškolské studium ovlivnit dvěma způsoby. Jednak mají uchazeči bydlící blízko univerzity možnost bydlet dál se svými rodiči, a tedy získat vysokoškolské vzdělání na místní univerzitě s nízkými náklady. Přítomnost univerzity ovšem může potenciálního uchazeče ovlivnit i jinak. Středoškoláci žijící u univerzity potkávají vysokoškolské studenty, mohou s nimi diskutovat aspekty vysokoškolského studia, mají konkrétní představu o pracovních možnostech souvisejících s vysokoškolským diplomem apod. Tito studenti tedy mohou být lépe informováni o výhodách spojených s terciárním vzděláním i o samotných přijímacích testech. Naším cílem je potvrdit nebo vyvrátit přítomnost těchto dvou možných vlivů místní univerzity na potenciální uchazeče o vysokoškolské studium. Výsledky naši analýzy ukazují, že individuální charakteristiky (socio-ekonomické postavení rodiny a výsledek studenta ve srovnávacim testu), stejně tak jako charakteristiky maturantovy třídy na střední škole (velikost třídy, průměrný výsledek testů ve třídě) a maturantova regionu (regionální nezaměstnanost a ekonomický růst) hrají významnou roli při rozhodování o přihlášení se na vysokou školu. Dále jsme zjistili, že vyšší náklady spojené se studiem pro maturanty, kteří nemají možnost studia na místní univerzitě, rozhodnutí potenciálního uchazeče neovlivňují. Zatímco nebyl nalezen žádný vliv místní univerzity na maturantovo rozhodnutí o podání přihlášky, na samotné přijetí již existence místní univerzity vliv mít může. Zjistili jsme, že pokud uchazeč bydlí blízko vysoké školy, která nabízí studium oboru, na který se uchazeč hlásí, přináší mu existence místní vysoké

školy v přijímací řízení výhodu. To platí i pro uchazeče hlásícího se na příslušný obor na nějakou jinou (vzdálenou) univerzitu. Navíc jsme zjistili, že pro uchazeče z gymnázií je tato výhoda v přijímacím procesu rostoucí se zmenšující se pravděpodobností přijetí na danou vysokou školu (tj. zvětšující se poptávkou po oboru na dané vysoké škole). Analýza poptávky po vysokém školství v České republice ukázala, že systém finanční podpory vysokoškolským studentům byl v roce 1998 dostatečný na to, aby vyšší náklady pro studenty, kteří se musí kvůli studiu stěhovat, nesnižovaly jejich šance na získání vysokoškolského vzdělání. Problémem je spíše informovanost o konkrétních oborech studia. Vyrovnávání šancí na získání terciárního vzdělání by tedy mělo být zaměřeno na geografické rozšíření systému institucí poskytujících terciární vzdělání nebo na informovanost středoškolských maturantů o vysokoškolském studiu a přijímacím řízení.

V druhé kapitole disertační práce se věnuji zkoumání vlivu systému státní sociální podpory a daňového systému na zvýšení pracovní aktivity u nezaměstnaných v České republice. Předchozí literatura, využívající metody simulací pro modelové typy domácností, poukazuje na negativní dopad společného působení daní a sociálních dávek. V této kapitole jsou analýzy rozhodování jednotlivců, jestli vstoupit nebo nevstoupit na trh práce v závislosti na příjmu domácností, provedeny na individuálních datech o nezaměstnaných, a to v kombinaci údajů získaných Výběrovým šetřením pracovních sil a údajů Microcensus. Analýza počítá výši příjmů ze sociálního systému v nezaměstnanosti a porovnává je s čistým příjmem domácnosti v případě, že se jednotlivec zaměstná. Výsledky potvrzují existenci pasti nezaměstnanosti, což znamená, že jedinci, kteří dostávají relativně vyšší sociální dávky, mají také vyšší pravděpodobnost, že zůstanou bez práce. Ukazuje se, že účinek dávek sociální pomoci je důležitý, protože negativně ovlivňuje motivaci najít si práci převážně u dlouhodobě nezaměstnaných a u lidí s nízkým vzděláním (a tedy u nízkopříjmových domácností). Výsledky rovněž poukazují na znevýhodněné postavení žen na českém trhu práce. Protože ohodnocení žen na trhu práce je nižší než u mužů, je riziko pasti nezaměstnanosti u žen vyšší. Výsledky studie poskytují evidenci o dlouhodobě přetrvávajících velkých rozdílech v nezaměstnanosti pozorovaných mezi ženami a muži v České republice. Navrhovaným řešením, které by posílilo motivaci nezaměstnaných vrátit se do práce, je možnost pobírání části sociálních dávek také po nástupu do zaměstnání.

Třetí kapitola disertace prezentuje výsledky projektu, na kterém jsem pracoval v Institutu pro výzkum práce (IZA) se sídlem v Bonnu. Studie zkoumá, jestli je nastavení sociálního systému důležité pro imigraci cizinců do evropských zemí (tzv. welfare magnet hypothesis). Analýza vychází z údajů o migračních tocích, HDP, nezaměstnanosti a podílu výdajů na

programy podpory v nezaměstnanosti na HDP pro 19 zemí Evropy na roky 1993 – 2008. Empirické výsledky naznačují, že migranti se rozhodují spíše podle míry nezaměstnanosti a výšky HDP. Významnou roli také mají kontakty na migranty, který již v dané krajině žijí. Hypotézu o tom, že štědré sociální systémy jsou magnetem pro imigranty, jsme nepotvrdili. Naše výsledky rovněž ukazují, že dávky v nezaměstnanosti pobírají migranti v přibližně stejné míře jako domácí obyvatelstvo. Závěry studie nasvědčují, že obavy z přílivu migrantů do zemí EU a zneužívání sociálního systému jsou neopodstatněné, protože migranti si vybírají cílové země hlavně podle příznivých ekonomických podmínek.

Chapter 1

Unequal Access to Higher Education in the Czech Republic: The Role of Spatial Distribution of Universities[1]

(Joint work with Michal Franta)

1 Introduction

In the paper, we analyze the demand for tertiary education depending on university proximity. We identify the most influential factors affecting both the probability of applying and the probability of admission to a university. This paper contributes to the literature on the determinants of human capital spatial distribution. Generally, the geographical distribution of a tertiary-educated population is influenced by i) the general migration of the tertiary-educated population (e.g. Giannetti, 2002, 2003); ii) the post-university migration of graduates (e.g. Bound, Groen, Kezdi, and Turner, 2004; Makovec, 2005); and iii) the demand for tertiary education (e.g Frenette, 2006). In this paper, we explore the determinants for the tertiary education demand caused by the absence/presence of a local university. We consider two ways of how the local university facilitates enrolment. First, costs are lower for students who enroll in a nearby university. In particular, students have the option to live with their parents, saving on rent and moving costs, as opposed to those residing away from a university.[2] Second, students residing close to a university can be better informed about the admission process, university study, job prospects related to a university degree, and the local university's scheduled open days. The advantage, based on *heterogeneous information*, is realized through various channels: information provided by secondary schools, face-to-face contacts with university students, the possibility of using university facilities during secondary school study, or an easy access to preparatory courses organized for applicants. In general, secondary school students living near a university can benefit from a nearby

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[2] Matějů (2007) presents the results of an income and expenditure survey of Czech university students from Eurostudent survey 2005. Expenditures for transportation and accommodation account for one-third of total student expenditures. Therefore, attending a local university represents a large savings. According to the survey, 40% of students live with their parents.

university environment and consequently have an advantage in the admission process. We aim to detect the presence of the two mentioned causes of unequal access to tertiary education and assess their relative importance. We distinguish two stages, the application and the admissions process, which allow our research to go beyond the existing studies that usually deal with university enrollees only.

In the first stage, we estimate the probability of applying to a university. The estimation results suggest that the presence of a university per se does not drive the student's decision to apply. We identify on the prospective applicant the positive effect of student ability, parental education, and district characteristics represented by the share of those tertiary educated in the district. In the second stage we discuss the admission to university. The econometric analysis reveals that applicants are, in terms of their admission probabilities, positively affected by the presence of a local university. We find that the influence of a local university is specific to the field of study. Therefore, living near a university that provides an applicant's preferred study field increases the admission probability to that field even if the applicant applies to a different university. The effect is stronger in the case of highly over-subscribed study fields. Therefore, the results confirm our hypothesis that secondary school graduates living far from a university are disadvantaged in the enrollment process to university.

The findings provide important information for making informed policy decisions about the spatial distribution in higher education institutions, which is to a large extent determined by the national government. We conduct an analysis for the Czech Republic, a country with a high geographical variation in its tertiary-educated population typical for post-transition countries (e.g. Jurajda and Terrell, 2009). The number of universities in the Czech Republic has remained unchanged since the 1960s when the university system was established. Jurajda (2011) shows that regions with a higher concentration of human capital experience a larger increase in their human capital endowment that further deepens regional differences. An awareness of the channels which affect the demand for tertiary education would therefore facilitate the decision-making that concerns the expansion of university education.

The structure of the paper is the following. In the next section, we discuss the research dealing with the effects of local universities and the post-secondary schooling decision. In Section 3, we describe the schooling system and the admission process to a university in the Czech Republic. Section 4 presents the theoretical framework. In Section 5, we introduce the data sets and carry out a descriptive analysis. The estimation results are reported in Section 6, Section 7 concludes.

2 Literature review

There is an extensive literature on the choice behavior of high-school leavers. We present an overview of studies concentrating on aspects of geographical distance to a university on post-secondary education. Attending a non-local university is associated with costs, either for monetary or non-monetary reasons. These include direct costs (travel costs, accommodation outside the parental home) and indirect cost (opportunity costs). For individuals rooted to their local environment the cost is attributed to giving up their social networks. If individuals are cost sensitive, these extra costs may affect their decision to attend university and which university to attend.

The effect of a local university on a prospective university applicant is considered in Frenette (2004, 2006, 2009), Sá, Florax, and Rietveld (2006) and Eliasson (2006). All of these authors recognize the effect of lower costs for the population living near a university and, in general, find that those living near a university participate in university study more often. Frenette (2006) finds a negative relationship between distance to university and the decision to attend a university in Canada. The author suggests that those particularly disadvantaged are from low-income families. Similarly Eliasson (2006) shows that the university enrollment decisions of Swedish students with a less privileged background are more sensitive to university accessibility. Frenette (2009) and Currie and Moretti (2003) study the effect of the establishment of new universities. The positive impact of a local university on student numbers in a given region is interpreted as a causal effect of university proximity.

Several studies document that the local university plays an important role in the choice of study program and in the quality of university where applicants enroll. Griffith and Rothstein (2009) show that the probability of applying for specialized programs declines with more distance to the university. Denzler and Wolter (2009) find that students in Switzerland are more likely to apply to universities for teachers if they live farther from the university providing a broad range of majors. This is because universities for teachers are more densely geographically distributed than other universities.

The role of a local university goes beyond the reduced costs of attending a university. Frenette (2006) explains that "students in outlying areas simply don't see the benefits from a university education since fewer people hold a degree".[3] The research approach he employs, however, cannot distinguish between these two determinants of behavior dependent on the distance to the nearest university. Do (2004) argues that the presence of a local university

[3] Page 23 in Frenette (2006).

generates a “knowledge spillover” that influences the choice of the quality of university where the student enrolls. He finds that the quality of the university in which the applicant enrolls is positively linked to the quality of the local university. Brooks (2002) focuses on determinants from the point of view of the information they convey, discussing possible inequalities among students. She points out, for example, the importance of the interactions with current university students in the prospective applicant’s decision process.

Literature provides significant evidence that the presence of a local university can foster the decision to attend university. In this paper, we further examine whether a local university helps students to succeed in the admission examination to a university.

3 The Czech system of tertiary education

The university education system in the Czech Republic is largely state funded. In 1998, there were 111 university departments in 23 universities. Public universities do not charge tuition but remain highly over-subscribed. The law to accredit private universities was passed in 1999; therefore, they do not enter our analysis. The enrollment to a university is a sequential process: First students formally apply to university programs, then the university decides on which students to admit, and then the student decides where to enroll. In 1998 about 50 percent of students who applied to a university were admitted to at least one program. The spatial distribution of universities is very uneven with 94% of university departments concentrated in 13% of districts, and around 70% of all university students enrolled in the academic year 1997-98 attended universities located in three districts only (Prague, Brno, and Ostrava).

In the Czech Republic a school-leaving examinations (*maturita* in Czech) after upper secondary-level education is a pre-requisite for tertiary education. These exams correspond to the U.K. General Certificate of Education or the German “Abitur” exam (Jurajda, 2011). The exam in the Czech Republic is comprised of the Czech language and an additional two or three subjects chosen by the student. However, the examinations are not standardized and therefore universities do not take into account student performance on the exam during the admission process.

A qualified school graduate (*maturant* in Czech) is free to choose any university and any program anywhere in the Czech Republic. In order to apply, the student must send applications to preferred university programs. There is a small fee attached to each application, which is not a limiting factor, but it makes students ration their decisions. The

number of applications per person is not limited and on average students send between two and three applications. All students are then invited to participate in the admission examination. Typically, these examinations test extensively the applicants' knowledge in the particular field of study. The decision on admission is solely on the side of the university and is based on admission test performance and/or on oral interviews (Jurajda and Münich, 2010). Given the high demand for tertiary education, we presume that the presence of a local university can be beneficial for the enrollment process.

4 Theoretical framework

4.1 Application to university

Regarding the post-secondary schooling decision, there are three main theoretical approaches established in the literature. First, human capital theory views the decision on taking another period of schooling as an investment decision (Becker, 1964; structural model in Willis and Rosen, 1978). An individual compares the present value of future benefits based on expected future earnings with the costs related to continuing education. Another approach assumes that education is also a consumption good, and the decision on post-secondary education is a current consumption choice (e.g. Gullason, 1989). Finally, the third approach views schooling as an indicator of an individual's capabilities that has nothing to do with the individual's productivity. Therefore, the decision on post-secondary education reflects the individual's willingness to provide the signal (Spence, 1973). We introduce the model that combines the standard models of the schooling decision that are based on human capital theory and on expected utility theory.

A secondary school graduate makes a decision whether to apply to a university or not by comparing the expected utility of those two decisions. We denote the individual's expected utility of applying as U^a and the expected utility of not applying as U^{na}. The student chooses to apply if $U^a > U^{na}$. Suppose there are $F > 0$ available university programs, and students select to which they formally apply. All applicants are invited to participate in the admission procedure that usually takes a whole day for a particular university. There are costs attributed to every application $AC_j > 0$ (such as application fee, courses for preparing the student for admission tests, travel costs concerning the admission procedure, and others.). Resources are subject to budget $M > 0$ and time $T > 0$ constraints. If a student applies to just one program, then the expected utility from applying to that program equals

$$U^a = p_1(B_1 - C_1) + \sigma(M - AC_1),$$

where p_1 is the probability of being admitted to the program conditional on application and B_1 and C_1 denote the present values of benefits and costs, respectively, of being admitted to the program. Finally, the coefficient σ represents a disutility related to admission costs with respect to the utility given by the expected benefits and costs of a university program. If a student applies to two programs, the expected utility is given by:

$$U^a = p_1(1-p_2)(B_1 - C_1) + p_2(1-p_1)(B_2 - C_2) + p_1 p_2 \max_{j\in\{1,2\}}\{B_j - C_j\} + \sigma(M - AC_1 - AC_2).$$

We basically divide the situation of the individual applying to two programs into three mutually exclusive events. An applicant is admitted either to the first program only (with probability $p_1(1-p_2)$), or to the second program only (with probability $p_2(1-p_1)$), or to both programs (with probability $p_1 p_2$).[4] However, we assume that an individual can enroll in only one program. Therefore, if a student is admitted to both programs, the program with the higher present value of the expected benefits net of costs is preferred.

In general, a secondary school graduate chooses to apply to such programs to maximize his expected utility taking into account time and budget constraints. So, an applicant decides whether to apply to a program j ($t_j = 1$) or not ($t_j = 0$). The optimization problem takes the following form:

$$U^a = \max_{\{t_1,\ldots,t_F\}} \left\{ \sum_{k=1}^{F} \left[\sum_{A\in C(N,k)} \left(\left(\prod_{j\in A} t_j p_j \right) \left(\prod_{j\in N\setminus A} (1 - t_j p_j) \right) \right) \max_{j\in A}\{B_j - C_j\} \right] + \sigma\left(M - \sum_{j=1}^{F} t_j AC_j \right) \right\} \qquad \text{(A1)}^5$$

$$\sum_{j=1}^{F} t_j \le T \qquad \text{(A2)}$$

$$\sum_{j=1}^{F} t_j AC_j \le M \qquad \text{(A3)}$$

$$t_j \in \{0,1\};\ j = 1,\ldots,F;\ N \equiv \{1,\ldots,F\}. \qquad \text{(A4)}$$

[4] The form of compounded probabilities implicitly involves a reasonable assumption that the probability of being admitted to the first program does not affect the probability of being admitted to the second program. The two events are statistically independent.

[5] $C(N,k)$ is a set of combinations of size *k* from the set N.

The maximized function (A1) is a generalization of the case for the one or two programs discussed above. The time constraint (A2) captures the fact that the length of the testing period is limited, and the admission procedure takes one day. The budget constraint (A3) captures the limitations given by admission costs and the individual's disposable income. The present values of benefits and costs related to university program j are denoted by B_j and C_j, respectively. The variable p_j denotes the graduate's subjective estimate of the probability of being admitted to program j conditional on application.[6] An individual can infer the probability in various ways, such as from the admission probabilities in previous years (published every year) and from her performance at secondary school in comparison with schoolmates.

In the case of the expected utility for not applying, U^{na} , a student compares the expected benefits and the costs of not applying. Non-appliers can enter the labor market or stay out of the labor market. We put these possibilities together into one outside option. The expected utility of not applying is related to regional labor market prospects, the individual, and to secondary school characteristics.

4.2 Admission to university

Universities decide about the admission of prospective students exclusively on the results of admission tests. There are no other criteria for admission other than test scores. The student's performance (measured as S*) in the admission procedure is an unobservable (latent) variable. A student is admitted to a program *j* if his performance in the test is above the threshold or $S^* \geq T_j$, where T_j is the threshold necessary for admission to a particular program *j*. We model the latent variable S^* in the following way:

$$S^* = \beta_0 + \alpha I + \beta C + \delta d + \varphi R + \varepsilon ,$$

where I denotes the set of individual characteristics, vector *C* includes the set of secondary school (class) characteristics, *d* stands for the dummy variable indicating the presence of a

[6] We assume that the probability of being admitted to program *j* conditional on application (p_j) is a primitive of the problem. If we assume that the primitive is the probability of being admitted to a program along with not being admitted to another university program conditional on application ($\tilde{p}_j$), then the maximized function would take the simple form:

$$\sum_{j=1}^{F} t_j \tilde{p}_j (B_j - C_j) + \sigma \left(M - \sum_{i=1}^{F} t_i AC_i \right).$$

local university in the applicant's place of residence, and vector R contains regional characteristics. An individual is admitted to a program *j* if

$$S^* - T_j = \beta_0 + \alpha I + \beta C + \delta d + \varphi R - T_j + \varepsilon \geq 0.$$

If we assume logistic distribution for the disturbance, then the individual's probability of being admitted to program *j* (conditional on application) is given as

$$P(Admit = 1 \mid I, C, d, R, F_j) = \Lambda\left(\beta_0 + \alpha I + \beta C + \delta d + \varphi R + \tau F_j\right),$$

where F_j is a vector of university characteristics that serves as a proxy for the admission test score threshold T_j.

5 Data and descriptive analysis

5.1 Data

Our empirical analysis is based on the following two anonymized data sets collected by the Czech Institute for Information on Education in 1998: (i) the data set *Uchazec* includes all applications sent to university programs together with the result of the admission process and (ii) the data set *Maturant* is a unique nation-wide project that provides achievement tests of graduates at every secondary school.[7] Examinations were held simultaneously (independently of the traditional maturita exam), and the results were processed centrally. In our analysis, the measure of a student's ability is calculated as the average score from four tests taken in Czech, one foreign language, mathematics and study aptitude. The test score is normalized so that a rank of 100 is the best graduate and the rank of 0 the worst. Most importantly, we are able to match two databases in order to obtain a set of information on the cohort of secondary graduates augmented with revealed preferences for post-secondary education. The same data sets were used in Jurajda and Münich (2010; 2011) to study the admission into Czech universities.

The information about university accessibility is determined based on travel time between the district capital of a graduate's secondary school and the nearest university. [8] Students are considered to have access to a local university when a university can be reached within 30

[7] The nation-wide testing of graduates was repeated after 11 years in 2009 but school participation was on a voluntary basis. As a result, less than 10% of schools participated.

[8] The information about traveling time is computed using the software *Kilometrovnik* taken from the webpage www.tranis.cz. We compute the time of a car driving from all 76 district capitals to each of the 11 university centers.

minutes from the district of their residence. The definition of access to a university within 30 minutes corresponds to the median of distance distribution. Figure 1 shows the map of the Czech Republic with marked districts within commuting distance to the nearest university. The travel time is computed for travel by car, and the same journey with public transportation takes a longer time. We consider the threshold of 30 minutes as reasonable given that additional time is needed for inner city travel, so the overall commuting time (door to door) can be higher.

Finally, we collect information at the district level. The data on the unemployment rate and the share of the tertiary-educated population in the district is taken from the Czech Statistical Office. Additionally, we construct a district-specific measure of the non-cognitive skills of secondary school students. Non-cognitive skills involve, for example, motivation, persistence, and self-discipline.[9] We presume that a higher level of non-cognitive skills helps in admission to post-secondary education. The measure is computed as the relative excess demand for gymnasium seats in a district.[10] Relative to gymnasiums, specialized secondary schools are often viewed as the second best option—those not admitted to gymnasiums enter specialized secondary schools. Thus, districts with high relative excess demand for gymnasiums are assumed to exhibit students with a high level of non-cognitive skill even for students in specialized secondary schools. In the same way a high district relative excess demand for gymnasiums implies that students entering gymnasiums exhibit on average a higher level of non-cognitive skills in comparison to districts with low relative excess demand.

5.2 Summary statistics

In this section, we inspect the application strategies of students with regard to the choice of university programs and the success in the admission tests. In the following, we call a student, who sends at least one application to a university program, an applicant. Students are further divided into two groups based on the residence type, depending on having access to a university within commuting distance. The upper part of Table 1 presents the sample characteristics of all gymnasium and specialized secondary school graduates while the bottom part presents the characteristics of applicants. On average more than 90% of

[9] The effect of non-cognitive skills on various outcomes is discussed in Heckman, Stixrud and Urzua (2006).

[10] The demand for gymnasium is estimated using the share of tertiary-educated population in a district, a university presence dummy, and the share of seats at gymnasiums taken by 6- and 8-year gymnasium programs subtracted by the supply of gymnasium seats (relative to all secondary school seats in a district). The procedure is thoroughly discussed in Drnakova (2006), and she kindly provided us with data for 2002/2003; earlier data are not available.

gymnasium graduates choose to apply to a university, and approximately two-thirds of them are admitted to at least one program. The corresponding figures for specialized secondary schools are 50% and 40%. The considerable difference between gymnasiums and specialized secondary schools in the shares of applicants and admission rates has two origins. First, gymnasiums intend to prepare students for university study; therefore, gymnasium graduates generally perform better in admission tests than graduates from specialized secondary schools. Second, students enter a gymnasium presuming they will continue their study at a university, and therefore, the population entering the secondary level of education is sorted according to interest in (and ability for) tertiary education. Table 1 indicates a decreasing pattern in the shares of applicants and admission rates when comparing students with and without a local university. For example, 53% of graduates from specialized secondary schools living near a local university apply in comparison to 46% of those living far away. The observed difference for gymnasium students is very low (2%) but significant at the 5% level. Restricting our attention to admission rates, we observe lower rates for applicants living far from a university relative to those living near a university (0.37 vs. 0.41 for specialized secondary schools and 0.64 vs. 0.66 for gymnasiums; differences are statistically different at the 10% significance level). The admission decision depends upon the student's performance in the test; therefore, the differences in admission rates also include the advantage of a local university. The reported differences in admission shares, however, need not prove the presence of heterogeneous information since the shares are not conditional on other characteristics. Differences can result also from differences in ability, socio-economic background, etc. for the two residence types. Note that a worse socio-economic background (parental education; information on family income cannot be obtained, so computer ownership is used as a proxy). Interestingly, the level of observable cognitive skills (measured by test scores) is higher for gymnasium students living far from a university, but the pattern is opposite for secondary school students. Ability is a strong predictor of the decision to apply to a university while no significant differences in test scores are observed for applicants by residence type. The effect of heterogeneous information and other observable characteristics is examined by the econometric analysis in Section 6.

5.3. Application strategies

The presence of a local university can determine the application to a university and also the choice of a university. Table 2 presents the shares of applicants with respect to the location of the university to which applicants choose to apply. We observe that students from specialized secondary school tend to apply to local universities more relative to gymnasium

graduates. In the following, we filter out the direct cost of attending a university and examine the effect of heterogeneous information. With this aim, we focus on students applying only to a non-local university, i.e. applicants with a local university applying to a non-local university and applicants without a local university. In the bottom panel in Table 2, we compare the admission rates of applicants. We observed that applicants with access to a local university who choose to apply to non-local university have a higher probability of admission by 3% in the case of specialized secondary schools while the difference is not significant for gymnasium. To investigate further the advantage in the admission process, we look at the application strategies of applicants who apply only to the non-local universities. All applicants in this subgroup face high potential costs of university study; therefore, heterogeneous information as a reason for the differences can be identified. In Table 3, we present rates by the field of study (of the university program) and the access to a local university. Study fields in Table 3 are sorted by the probability of admission (calculated as the ratio of the number of applications sent to the number of applications accepted). It is observed that some fields are demanded more by applicants living far from a university (e.g. Education, Economics) or by applicants living near a university (e.g. Engineering, Law, Medicine) while some are equally demanded (e.g Natural Sciences, Humanities, Arts, Agriculture). According to Table 3, the variation in admission rates does not depend on the access to a university. There are only two exceptions: Gymnasium graduates living near a university are more successful in applying to Economics, and specialized secondary school students not living near a university show a higher admission rate to Medicine. In Table 3 we look at applicants who only apply to non-local universities to reduce the motive of applying to a local university for the lower cost. The evidence that the admission rates of this group of applicants are affected by the presence of a university is not convincing. In the econometric analysis, we further explore whether the type of programs (study fields) provided by a local university are beneficial to the admission process.

6 Estimation results

Our empirical analysis proceeds in two steps. First, we explore whether individuals residing in close proximity to a university are more likely to apply to a university, and we discuss the main determinants that influence the application decision. In the second step, we estimate the probability of admission conditional on application.

6.1 Application to university

We estimate the model of applying to a university (1) separately for gymnasium and secondary school graduates in the following form

$$Apply_{icd} = \alpha_0 + \alpha I_{icd} + \beta C_c + \varphi R_d + \delta d_d + \sum_{j=1}^{8(7)} \mu_j SD_{icd}^j + \varepsilon_{icd}\,, \qquad (1)$$

where $Apply_{icd}$ is a dummy variable that indicates whether a student i from secondary school class c and district d applies to a university. Controls for individual characteristics (vector I_{icd}), class characteristics (vector C_c), and district characteristics (vector R_d) are included. The coefficient on the dummy variable d_d is of our interest. The dummy equals 1 if a graduate resides within commuting distance to the nearest university and 0 otherwise. Additionally, we include a set of variables SD_{icd} indicating the major subjects taken at the maturita exam (for gymnasium students) or the field of study (for specialized secondary school students). Equation (1) is estimated as a logit model clustering data by class.[11] Table 4 reports estimation results as marginal effects.[12] The local university dummy variable is essentially zero in both regressions. The same results are obtained when we vary the threshold around 30 minutes or include several distance dummies jointly. Estimates suggest that the decision to apply to a university is influenced neither by the direct costs of study nor by heterogeneous information. This conclusion assumes that the lower cost of study and heterogeneous information act in the same direction, i.e. both lower the probability of applying for graduates living far from a university. It seems likely that the system of financial support of university students (e.g. dormitories, meal tickets, ect.) together with the available information are sufficient to equalize the differences in the probability of applying caused by university accessibility. Estimates in Table 4 suggest that in addition to individual skills, gender and individual socio-economic background (parental education, computer ownership) are also significant determinants of the application decision. For example, the average female student from a specialized secondary school faces a 10% lower probability of applying to a university than the average male keeping other variables constant. The estimated impact of district characteristics suggests links between the local economic and living conditions and the graduates' behavior regarding application to university. Higher

[11] Moulton (1990) argues that individuals from the same socio-economic background (secondary school, class) could share the same unobservable characteristics. The disturbances of such groups of individuals are then correlated, and we take the possibility of clustering into account.

[12] Logistic regression diagnostics: We find that the model is correctly specified (specification error test— *linktest* in Stata), and it fits the data well in the case of specialized secondary schools (Hosmer and Lemeshow's test—*lfit* in Stata). The model's performance is worse for gymnasiums. Finally, we do not detect any multi-collinearity problems (command *collin* in Stata).

unemployment leads to a higher probability of applying, which is in line with the lower opportunity costs of university study in districts exhibiting high unemployment. The effect is stronger for graduates from specialized secondary schools. Our interpretation is that they have specific skills and thus are more sensitive to unemployment changes. Similarly, higher regional economic growth lowers the incentives to go on with university study. Again, higher growth increases opportunity costs and graduates (especially from specialized schools) tend to enter the labor market immediately after graduation from secondary school. The share of the tertiary-educated population in the district is positively related to the probability of application to a university. Each percentage point of the share of tertiary-educated population in a district[13] accounts for at least a 0.31 percentage point higher probability of applying for gymnasium graduates (1.14 percentage points for graduates from specialized secondary schools). This result suggests that the local environment created by the highly educated population can provide the heterogeneous information we attempt to detect.

6.2 Admission to university

The entry into tertiary education in the Czech education system is based upon the competitive selection process. The organization of admission examination is autonomously determined by universities (or even by university departments). We set the model to capture the following peculiarities. First, admission tests are different, and also the test score threshold necessary for admission differs across university programs. Second, there are differences in demand for a university. An applicant applying to an oversubscribed program has a lower probability of admission than an otherwise similar applicant applying to a program that is not oversubscribed. Third, we encounter the self-selection problem, i.e. students with different abilities for a tertiary education apply to different programs. A student applying to a university whose pool of applicants has an overall higher ability faces a lower probability of admission than an otherwise similar applicant applying to a university whose pool of applicants has an overall lower ability. We construct two variables which are program-specific in order to control for the distinct features of admission procedure and the selection of students into programs. We take advantage of the database that comprises all applications sent to universities together with the result of the admission examination. First, we determine the average quality of a marginal applicant who is admitted to the program *j*. In other words, we find the lowest test score that ensures an individual is admitted to the program *j*. Second, we compute the probability of admission to program *j* that measures the total demand for the program. Our baseline specification of the model of admission follows

[13] The standard deviation of the percentage share of the tertiary-educated population in a district is 2.1.

$$Admitted_{icd}^{j} = \beta_0 + \alpha I_{icd} + \beta C_{cd} + \varphi R_d + \delta_1 d_d + \delta_2 f_j + \rho F_j + \upsilon_{icd}^{j}, \quad (2)$$

where $Admitted_{icd}^{j}$ is a dummy variable that indicates whether application i has successfully passed through the admission procedure at program *j*. The set of individual and class characteristics is the same as in (1). The district variables (R_d) are limited to the inclusion of variables that can potentially influence the applicant's performance at the admission test — the share of the tertiary-education population and the measure of non-cognitive skills. Given the large autonomy in the organization of admission examinations, we test the sensitivity of estimates to the inclusion of university, university programs and, field of study fixed effects F_j. The dummy variable indicating the presence of a local university d_d in (1) captures two effects of a local university on the prospective applicant — the lower costs of study and the heterogeneous information — because in the application regression, we cannot distinguish these two effects. We resolve the problem in the admission regression, where the applicant's potential cost of attending a university does not play a role, and the coefficient on the local university dummy captures the effect of heterogeneous information only.[14] A non-zero coefficient on the local university dummy variable in the admission regression equation reveals whether students living near a university are advantaged in the admission process because of the information spread within the university neighborhood. To examine the nature of heterogeneous information in detail, we add an additional dummy variable f_j that identifies applicants according to whether they live close to a university offering the program in the field to which they apply. So, f_j equals one if an applicant applies to a field of study that is provided by a local university even if the applicant applies to that program at other universities.

We estimate equation (2) as a logit model clustering data by individuals. The estimated marginal effects are reported in Table 5 for gymnasiums and in Table 6 for specialized secondary schools. The specification allows us to recognize the effect of a local university based on the offered programs. We distinguish applicants living far from any university ($d_d = 0$, $f_j = 0$) from applicants living near a university that does not provide the

[14] Note that the information affecting the decision on application and the information providing an advantage in the admission test (and/or oral interview) need not necessarily be of the same nature. Therefore, by econometric analysis, we identify whether heterogenous information along with the costs of study play a role in the application decision, and whether heterogenous information affects admission to university. Then, based on an assumption about the common nature of heterogenous information, we can discuss the relative role of study costs and the heterogenous information in the application decision.

applicants' preferred field of study ($d_d = 1$, $f_j = 0$) and from applicants living near a university providing the applicants' preferred program ($d_d = 1$, $f_j = 1$). The estimated coefficients on the two dummy variables indicate that proximity to a university with a preferred program provides an advantage in the admission process.[15] Information that brings an advantage in the admission process is, therefore, "program specific". For example, face-to-face contacts with older students who passed the admission process successfully and preparatory courses for applicants organized by local universities or extra information provided by secondary school teachers or counselors who are experienced with programs provided by local universities can be beneficial for local students.

Universities which do not experience high excess demand[16] usually admit the vast majority of applicants, and thus, one cannot expect that some applicants are advantaged on the grounds of access to information. On the other hand, in the case of highly oversubscribed university programs,[17] additional information can provide an advantage to an applicant. To test the dependence of the impact of heterogeneous information on relative excess demand for a university, we interact a dummy variable indicating the presence of the desired program at a local university f_j with the probability of admission to that program. Estimates in Table 5 imply that living near a university with the preferred program increases the probability to be admitted for the average applicant from a gymnasium by about 7%. In Columns 4 and 5, we show that the premium can be higher for highly demanded programs with a lower probability of admission. Table 6 depicts that in the case of applicants from specialized secondary schools, the average premium is 4.5%. Other estimated marginal effects suggest the importance of individual characteristics (parental education, test score) for the probability of being admitted. It is shown that female applicants to university perform less well than similar male applicant (gender differences in the admission process are discussed in Jurajda and Münich, 2011). Estimates further suggest that computer ownership (our proxy for family income) is not related to the performance in the admission examinations. It seems counterintuitive that the negative coefficient on the share of the tertiary educated population is estimated. In the application equation, we show that the environment of tertiary educated people motivates students to apply for a university. The negative impact of the share of

[15] So we find, for example, that an applicant residing near a university providing medical programs is more informed and thus advantaged in the admission test to a medical program than an applicant living near a university that does not provide medical programs or another applicant living far from a university.
[16] 10 out of 42 programs admitted more than 70% of applicants from secondary schools in 1998.
[17] 4 out of 42 programs admitted less than 10% of applicants from secondary schools in 1998.

tertiary educated people is estimated on the probability of admission to a university. A possible explanation is that the lower admission rate is due to the larger pool of applicants which means that the environment of people with university education motivates students with low prospects of enrollment to apply.

In the econometric analysis, we find that heterogeneous information due to the presence/absence of a local university does not influence the application decision but does influence the admission decision. The information spread in a university neighborhood is relevant for the applicant's performance in the admission examinations. Students living in an environment that is characterized by a high share of the tertiary-educated population tend to apply more. So, it seems likely that information disseminated by a highly educated environment provides an advantage for secondary school graduates in their enrollment decision.

7 Concluding remarks

In this paper, we focus on the effect of the presence of a local university on a student's prospects regarding post-secondary education. The paper explores the difference in the probability of entering a tertiary program for two secondary school graduates who differ only in that the first one resides within commuting distance to university while the other one does not. We presume that the advantage of having access to a local university follows in two ways: first, cost savings from being able to live at home with their parents and not having to move. In this manner, the costs of acquiring a diploma at a local university are lower. Second, the informational advantages from a university milieu in the neighborhood are beneficial in the admission process. The information advantage to a potential applicant transfers through face-to-face contacts with university students, through the possibility to use university facilities during secondary school study or easier access to preparatory courses organized by local faculties. Employing logit model regressions, we show that individual characteristics (parents' education, computer ownership, student's test score) as well as class characteristics (class size, average class test score) and district characteristics (unemployment rate, regional GDP growth, the share of the tertiary-educated population, non-cognitive skills) are significant influential factors affecting a graduate's decision to apply for tertiary education. However, estimation results suggest that the presence of a university per se is not driving the student's decision to apply. In the second stage, we found that a local university can constitute an advantage in the admission examinations for

applicants living near a local university. We attribute the advantage to the heterogeneous information realized through various channels discussed in the paper. Further, we show that the advantageous information is specific to the field of study. Therefore, living near a university that provides an applicant's preferred study field increases the admission probability to that field even if the applicant applies to a different university. The effect is stronger in the case of highly oversubscribed study fields.

To equalize the chance of admission, policy makers should consider expanding the system of universities along the lines of private higher education institutions.[18] Moreover, we found that the advantage concerns the university programs that are offered by the local university. The expansion of universities should be, therefore, accompanied by the expansion of university programs. Alternatively, equal chances of entering tertiary education could be achieved also by the improvement of information spread since we detected that it is the information emitted by a local university that provides the advantage. In this paper, we do not examine the nature of such information in detail. So, future research is needed to elaborate the essence of such information and to answer the question whether information availability is an adequate alternative for expanding the system of institutions providing tertiary education.

[18] The Higher Education Act of 1998 made provision for the establishment of private higher education institutions of both. In 2009, there were 39 private higher education institutions and together they enroll 6 to 7% of the total student body.

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Appendix

Table 1. Descriptive characteristics of gymnasium (G) and specialized secondary school (S) graduates and applicants

	Gymnasiums			**Specialized secondary sch.**		
Residence type:	no local university	local university	diff.	no local university	local university	diff.
Graduates	n=8617	n=10208		n=18393	n=18894	
share of applicants	0.91	0.93	-0.02***	0.46	0.53	-0.07***
Individual characteristics						
share of women	0.60	0.58	0.02**	0.62	0.59	0.03***
computer at home	0.47	0.59	-0.12***	0.37	0.46	-0.09***
born before 1980	0.48	0.51	-0.03***	0.58	0.60	-0.02***
test score	77.24	78.08	-0.84**	42.8	44.5	-1.73***
Shares of parental highest education:						
basic&vocational	0.16	0.09	0.07***	0.36	0.25	0.10***
secondary	0.43	0.35	0.09***	0.48	0.49	-0.01
tertiary	0.40	0.56	-0.15***	0.16	0.26	-0.09***
Class characteristics						
class size (number of students)	28.00	28.45	-0.45***	26.77	26.14	0.63***
test score (class average)	77.13	78.00	-0.87***	42.73	44.48	-1.75***
private school	0.03	0.10	-0.07***	0.18	0.25	-0.06***
District characteristics						
unemployment rate (%)	7.87	6.69	1.18***	8	6.95	1.05***
GDP growth (1997=100)	97.37	99.05	-1.68***	97.33	98.8	-1.47***
share of the tertiary educated pop.	0.06	0.12	-0.05***	0.06	0.12	-0.05***
non-cognitive skills	0.02	0.01	0.01***	0.02	0.01	0.01***
Applicants	n=7784	n=9425		n=8599	n=9892	
share of admitted	0.64	0.66	-0.02*	0.37	0.41	-0.04***
Individual characteristics						
share of women	0.59	0.57	0.02*	0.54	0.51	0.03***
computer at home	0.49	0.60	-0.11***	0.47	0.54	-0.08***
born before 1980	0.47	0.50	-0.03***	0.54	0.57	-0.03***
test score	78.64	79.21	-0.57	52.27	52.29	-0.02
Shares of parental highest education:						
basic&vocational	0.15	0.09	0.06***	0.26	0.19	0.07***
secondary	0.43	0.34	0.09***	0.52	0.49	0.03***
tertiary	0.43	0.58	-0.15***	0.22	0.32	-0.10***
Class characteristics						
class size (number of students)	28.09	28.54	-0.45***	27.36	26.53	0.83***
test score (class average)	77.57	78.48	-0.91***	47.56	48.33	-0.77**
private school	0.02	0.09	-0.07***	0.17	0.20	-0.03***
District characteristics						
unemployment rate (%)	7.87	6.64	1.22***	7.96	6.87	1.09***
GDP growth (1997=100)	97.35	99.10	-1.75***	97.23	98.86	-1.63***
share of the tertiary educated pop.	0.06	0.12	-0.06***	0.06	0.12	-0.05***
non-cognitive skills	0.02	0.01	0.01***	0.02	0.01	0.01***

Source: *Maturant*, 1998; *Uchazec*, 1998.

Notes: Column diff. states whether the characteristics of students who live near a local university are statistically different from students living far from a university. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2. Application strategies with respect to the location of the university where applicants choose to apply

	Gymnasiums			Specialized secondary sch.		
Residence type:	local university	no local university	diff	local university	no local university	diff
Application						
to local university only	0.37	-	-	0.52	-	-
to non-local university(ies) only	0.18	1	-	0.22	1	-
to both local and non-local university	0.45	-	-	0.26	-	-
Admission rate (condition on application)						
to local university only	0.62	-	-	0.38	-	-
to non-local university(ies) only	0.65	0.64	0.012	0.39	0.36	0.03***
to both local and non-local university	0.69	-	-	0.47	-	-

Source: *Maturant*, 1998; *Uchazec*, 1998.

Notes: Column diff. states whether the admission rate of students who live near a local university but choose to apply to a non-local university are statistically different from students living far from a university. *** significant at 1%

Table 3. The applications sent by applicants who apply only to non-local universities Rates are stated by the field of study and access to the local university.

Study field	Probality of admission	Share of applications			Admission rate		
		no local university	local university	diff.	no local university	local university	diff.
Applicants from gymnasiums							
Engineering	0.69	0.15	0.20	-0.05***	0.76	0.79	-0.02
Natural Sciences	0.44	0.11	0.12	-0.01*	0.46	0.50	-0.04
Agriculture	0.36	0.05	0.05	0	0.46	0.50	-0.04
Medicine	0.37	0.09	0.13	-0.04***	0.43	0.41	0.02
Education	0.27	0.23	0.12	0.12***	0.31	0.32	0
Economics	0.22	0.15	0.14	0.01	0.34	0.40	-0.05*
Humanities	0.16	0.12	0.13	0	0.17	0.16	0.01
Law	0.13	0.09	0.10	-0.02***	0.16	0.17	-0.02
Arts	0.10	0.02	0.02	0	0.09	0.12	-0.03
Applicants from specialized secondary schools							
Engineering	0.69	0.19	0.32	-0.13***	0.63	0.61	0.02
Natural Sciences	0.44	0.04	0.05	-0.01	0.31	0.36	-0.04
Agriculture	0.36	0.09	0.08	0.01*	0.29	0.33	-0.04
Medicine	0.37	0.03	0.05	-0.02***	0.13	0.07	0.07*
Education	0.27	0.13	0.09	0.04***	0.15	0.15	0
Economics	0.22	0.38	0.26	0.12***	0.13	0.11	0.02
Humanities	0.16	0.07	0.07	0	0.05	0.06	-0.01
Law	0.13	0.04	0.05	-0.01*	0.05	0.03	0.01
Arts	0.10	0.03	0.04	-0.01***	0.10	0.08	0.01

Source: *Maturant*, 1998; *Uchazec*, 1998.

Notes: Study fields are sorted by the probability of admission (calculated as the ratio of the number of applications sent and the number of applications accepted). Column diff. states whether the rates of students who live near a local university but choose to apply to a non-local university are statistically different from students living far from a university. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. Application equation: Estimated marginal effects

(G - gymnasiums, S - specialized secondary schools)

	G	S
Local university dummy		
Living within a commuting distance to a university	0.000	0.003
	(0.03)	(0.19)
Individual characteristics		
Female	-0.009**	-0.101***
	(2.18)	(11.67)
Highest level of parental education: secondary	0.022***	0.109***
	(5.70)	(14.33)
Highest level of parental education: tertiary	0.046***	0.210***
	(10.02)	(21.66)
Computer at home	0.010***	0.096***
	(2.71)	(14.17)
Born before 1980	-0.015***	-0.081***
	(4.68)	(11.57)
Test score	0.001***	0.006***
	(14.60)	(36.16)
Class (school) characteristics		
Class size	0.001**	0.005***
	(2.37)	(4.14)
Test score (class average)	0.000**	0.002***
	(1.96)	(5.07)
Private secondary school	-0.007	0.025*
	(0.83)	(1.65)
Regional (district) characteristics		
District unemployment rate	0.002***	0.007***
	(2.67)	(3.51)
Regional GDP growth	-0.001*	-0.013***
	(1.77)	(6.26)
Share of the tertiary educated population in district	0.314***	1.135***
	(3.37)	(4.79)
Non-cognitive skills	0.187**	0.590**
	(2.14)	(2.57)
Constant	0.019	0.528**
	(0.23)	(2.57)
Observations	15809	31637

Source: *Maturant*, 1998; *Uchazec*, 1998.

Notes: The dependent variable is a dummy that equals 1 if the graduate applies to at least one university and 0 otherwise. The reference individual is male, born in 1980, parents education elementary or vocational, no computer at home, student attends a non-private secondary school and resides outside of commuting distance to a university. The equation includes dummies for subjects taken at Maturita (G) or field of secondary school (S). * significant at 10%; ** significant at 5%; *** significant at 1%, absolute values of z statistics in parentheses.

Table 5. Admission equation for gymnasiums: Estimated marginal effects

	1	2	3	4	5
Local university dummy					
Living within commuting distance to a university	-0.004	-0.018**	-0.015	-0.057***	-0.006
	(0.42)	(1.98)	(1.57)	(3.32)	(0.32)
Interaction with the probability of admission	-	-	-	0.141***	-0.013
				(3.68)	(0.33)
Presence of preferred program at local university	0.067***	0.077***	0.061***	0.111***	0.094***
	(7.47)	(8.40)	(6.57)	(6.20)	(5.16)
Interaction with the probability of admission	-	-	-	-0.108***	-0.091**
				(2.58)	(2.16)
Individual characteristics					
Female	-0.031***	-0.028***	-0.018**	-0.043***	-0.014*
	(4.49)	(3.83)	(2.44)	(6.23)	(1.93)
Highest level of parental education: secondary	0.017	0.026**	0.026**	0.015	0.030***
	(1.48)	(2.18)	(2.22)	(1.31)	(2.58)
Highest level of parental education: tertiary	0.080***	0.088***	0.092***	0.076***	0.092***
	(7.07)	(7.49)	(7.69)	(6.74)	(7.84)
Computer at home	0.007	0.006	0.003	0.012*	0.001
	(1.10)	(0.81)	(0.43)	(1.80)	(0.19)
Born before 1980	0.007	0.008	0.008	0.005	0.007
	(1.06)	(1.21)	(1.25)	(0.79)	(0.99)
Test score	0.008***	0.009***	0.009***	0.008***	0.009***
	(30.33)	(30.98)	(30.99)	(30.18)	(30.82)
Subjects at maturita exam (dummies)	-	-	-	-	Included
Class (school) characteristics					
Class size	0.003***	0.002**	0.002**	0.002**	0.001
	(2.64)	(2.21)	(2.00)	(2.42)	(1.44)
Test score (class average)	0.004***	0.004***	0.005***	0.004***	0.004***
	(9.74)	(9.87)	(10.64)	(9.93)	(10.24)
Private secondary school	-0.053***	-0.047***	-0.049***	-0.055***	-0.069***
	(3.19)	(2.67)	(2.76)	(3.29)	(3.94)
District characteristics					
Share of tertiary educated population	-0.599***	-0.372***	-0.299**	-0.687***	-0.282**
	(5.25)	(2.98)	(2.37)	(6.04)	(2.40)
Non-cognitive skills	-0.011	0.028	0.028	0.050	-0.043
	(0.08)	(0.18)	(0.18)	(0.34)	(0.28)
University characteristics					
Program specialization dummies	Included	-	-	Included	Included
University dummies	-	Included	-	-	-
University program dummies	-	-	Included	-	-
Marginal test score of admittance to program	-	-	-	-	-0.015***
					(27.62)
Constant	-1.556***	-1.277***	-1.323***	-1.290***	-0.213***
	(33.16)	(28.35)	(29.23)	(31.01)	(2.83)
Observations	43073	42897	42771	42833	43073

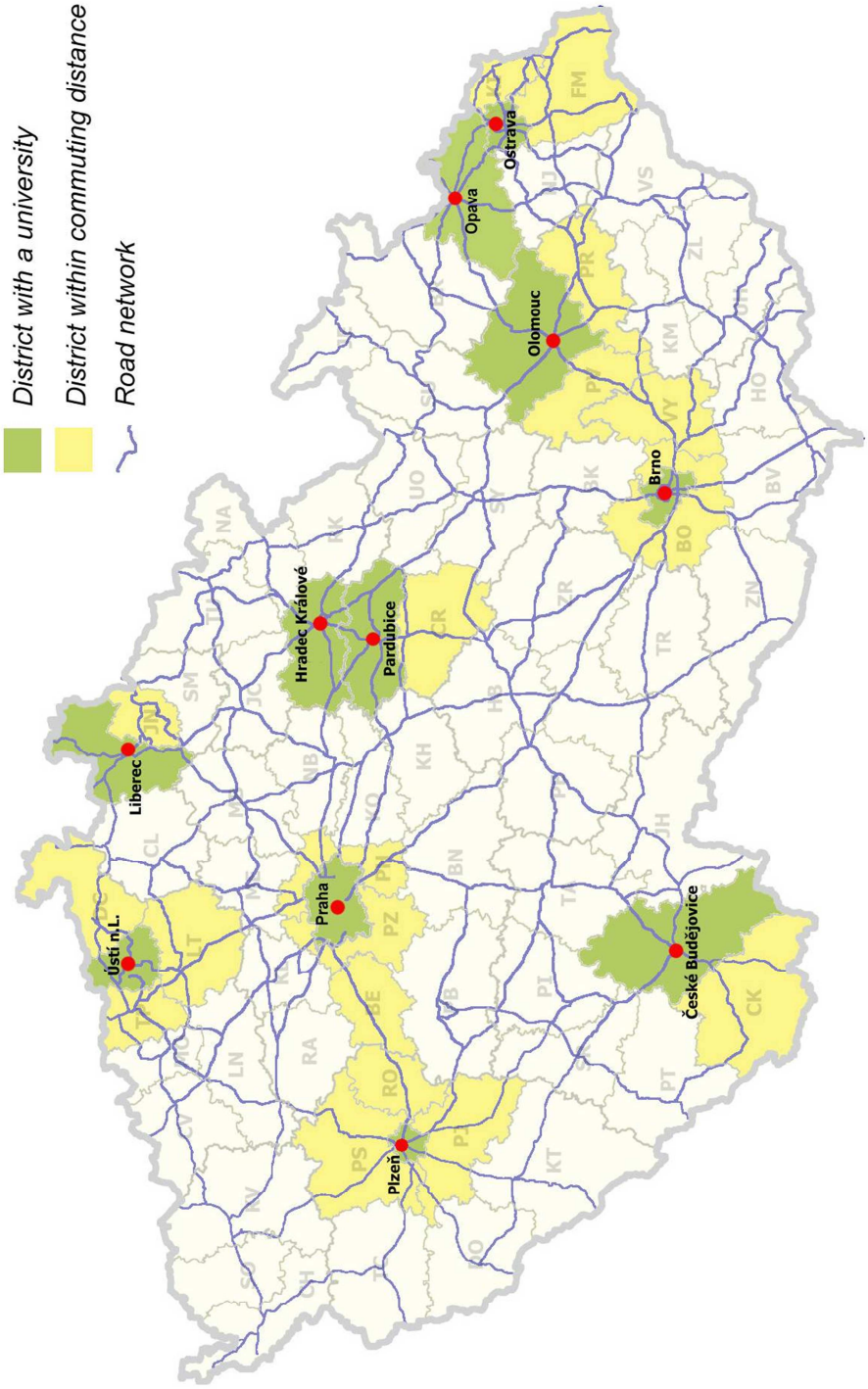
Notes: Unit of observation is an application to a university program. The dependent variable is a dummy that equals 1 if the applicant is admitted and 0 otherwise. Pseudo R2 of reported specifications are between 0.21-0.27. Included – indicates the group of dummies used in estimations but not reported here because of the number of dummies. For the reference individual see notes to Table 4. * significant at 10%; ** significant at 5%; *** significant at 1%, absolute values of z statistics in parentheses.

Table 6. Admission eq. for specialized secondary schools: Estimated marginal effects

	1	2	3	4	5
Local university dummy					
Living within commuting distance to a university	0.009	-0.003	-0.007	0.016	0.015
	(1.15)	(0.43)	(0.89)	(1.31)	(1.22)
Interaction with the probability of admission	-	-	-	-0.017	-0.057*
				(0.59)	(1.90)
Presence of preferred program at local university	0.041***	0.048***	0.049***	0.039***	0.045***
	(4.91)	(5.97)	(5.86)	(2.97)	(3.53)
Interaction with the probability of admission	-	-	-	0.007	0.008
				(0.25)	(0.26)
Individual characteristics					
Female	-0.040***	-0.029***	-0.019***	-0.046***	-0.024***
	(6.24)	(4.44)	(2.84)	(7.14)	(3.58)
Highest level of parental education: secondary	0.017**	0.016**	0.017**	0.016**	0.019**
	(2.23)	(2.16)	(2.31)	(2.14)	(2.45)
Highest level of parental education: tertiary	0.045***	0.047***	0.048***	0.044***	0.048***
	(5.48)	(5.74)	(5.70)	(5.31)	(5.70)
Computer at home	0.001	0.006	0.004	0.003	0.004
	(0.18)	(0.97)	(0.72)	(0.54)	(0.69)
Born before 1980	0.003	-0.003	-0.001	0.001	0.002
	(0.49)	(0.52)	(0.26)	(0.15)	(0.30)
Test score	0.003***	0.004***	0.004***	0.003***	0.004***
	(20.78)	(22.25)	(22.51)	(20.28)	(22.89)
Field of secondary school (dummies)	-	-	-	-	Included
Class (school) characteristics					
Class size	-0.001	-0.001	-0.000	-0.001	-0.001
	(1.17)	(1.27)	(0.54)	(1.30)	(0.74)
Test score (class average)	-0.000	0.001***	0.001***	0.000	0.001***
	(0.13)	(3.76)	(4.10)	(0.06)	(4.54)
Private secondary school	-0.101***	-0.083***	-0.080***	-0.104***	-0.074***
	(11.38)	(9.53)	(8.76)	(11.70)	(7.24)
District characteristics					
Share of the tertiary educated population	-0.536***	-0.165	-0.165	-0.579***	-0.332***
	(5.53)	(1.63)	(1.56)	(5.97)	(3.46)
Non-cognitive skills	-0.135	-0.149	-0.205	-0.127	-0.091
	(0.94)	(1.05)	(1.38)	(0.88)	(0.62)
University characteristics					
Program specialization dummies	Included	-	-	Included	Included
University dummies	-	Included	-	-	-
University program dummies	-	-	Included	-	-
Marginal test score of admittance to program	-	-	-	-	-0.008***
					(27.40)
Constant	-0.671***	-0.501***	-0.550***	-0.250***	-0.040
	(11.69)	(19.11)	(19.93)	(9.06)	(0.64)
Observations	31060	31048	30259	30850	31060

Notes: See notes to Table 6

Figure 1: Districts with universities and districts within commuting distance to the nearest university, the Czech Republic, 1998.



Source: Author's calculations

Chapter 2

An Empirical Analysis of Welfare Dependence in the Czech Republic[1]

1 Introduction

The combination of tax and social security systems affects labor market dynamics. The scope of this paper is to explore whether the potential disincentive effects created by the Czech tax and social security systems reduced the labor flows from unemployment to employment over the period 1995-2005. The employment and social policies are subject to incentive compatibility constraints given that they have to make work pay. The interaction of tax and social security systems defines the disposable income of individuals and, therefore, influences the decision of the unemployed to accept a job.

In the late 1990s, the amount of social benefits paid to the unemployed was relatively generous; indeed, the Czech social system was ranked the second most generous in the OECD in 1996 (OECD, 1998).[2] Moreover, the incremental benefit attributed to families with children was proportionally larger in the Czech Republic than in any other OECD country (OECD, 1998). OECD studies pointed out that the combination of benefit withdrawal and the tax system in the Czech Republic could lead to a distorted labor supply (OECD, 1998; OECD, 2004). In 1998, OECD representatives issued the recommendation for the Czech Republic to *"re-examine the basis upon which benefits in the social assistance and state social support system are determined. To preserve work incentives, additional benefits awarded to larger families need to be reduced in line with international practice".*[3] At the same time, the economic transformation in the late 1990s prompted a steep increase in the unemployment rate. The unemployment rate doubled following the recession in 1997, while

[1] I thank Daniel Münich, Kamil Galuščák, Jozef Zubický, Ricarda Schmidl, Jan Kmenta and Randall Filer for their valuable comments. I would like to thank anonymous reviewer of INFER conference. All errors remaining in this text are the responsibility of the author.

[2] The benefit generosity is compared relative to the average economy wage rather than in absolute terms.

[3] Page 87 in OECD (1998)

the long-term unemployment rates more than tripled between 1996 and 2000 (see Figure 1). After 2000, the economy was growing yet the unemployment rate remained high.

The tax and social security systems in the Czech Republic were assessed by several studies as generating a welfare trap for a wide range of households (e.g. Jahoda, 2004; Schneider, 2004; Jurajda and Zubricky, 2005; Galuscak and Pavel, 2007). Results from studies suggest that high net replacement rates are likely to attenuate work incentives for individuals with children, as well as those who have lower chances of getting a better-paid job. For these individuals, the potential income from employment may not be significantly higher relative to the available income from social benefits. Galuscak and Pavel (2007) estimate that around one-third of all employed individuals in the Czech Republic in 2006 had low incentives to avoid short spells of unemployment given that it did not significantly reduce their earnings. These findings are typically based on the theoretical considerations for selected types of households, with the potential income of the unemployed usually approximated with the income of the average production worker in the economy and compared to the amount of available benefits.

Several studies (e.g. Sorm and Terrell, 2000; Lauerova and Terrell, 2005) have examined the behavior of the unemployed in the Czech labor market directly using micro data yet have not considered the role of social benefits. One exception is the study of Commander and Heitmueller (2007), who use micro data and empirically test the impact of social benefits on the labor supply behavior of the unemployed in the Czech Republic, Hungary and Poland. However, the measure of social benefits generosity is simplistic in their analysis with the authors assuming the average level of benefits relative to the national average wage for several household types. The high approximation of social benefits at the household level reflects the main drawback of the paper, and consequently, the authors find only weak evidence for the role of social benefits in the Czech labor market.

This paper adapts the methodology from Commander and Heitmueller (2007) yet significantly improves the computations of household income under working and non-working alternatives. Given that the Czech Labor Force Survey does not include any income information, the Czech Household Income Survey is used to estimate potential income in the local labor market for the unemployed. This information allows us to calculate the Net Replacement Rate (NRR) based on the parameters of the taxation system and rules for means-tested social benefits at the household level. The analysis subsequently proceeds to examine the link between the social benefits generosity and individual labor supply behavior. The purpose of the paper is to test the hypothesis that high social benefits constitute a

welfare trap for the unemployed and to identify the existence of a welfare trap among different groups.

The remainder of the paper is organized as follows. The next section discusses the empirical findings of labor market policies on individual labor supply behavior. Section 3 describes the Czech social security system. Section 4 proposes a simple job search model to derive the behavior of the unemployed with available social benefits. Section 5 provides a description of the data set used and presents summary statistics. The calculation of NRR for each household is described in Section 6, while Section 7 presents findings and Section 8 concludes.

2 Literature review

Both active and passive labor market policies were introduced in the transition economies during the 1990s to relieve tensions in the labor market and provide income support for jobless workers. Government interventions through an active labor market policy (ALMP) provide training and guidance to the unemployed. Indeed, it is documented that the increased expenditure on ALMP has a positive impact on employment prospects in EU-15 countries, and it has also been shown that youth measures and public employment services reflect the most efficient allocation of ALMP resources (European Commission, 2004). The level of expenditure on ALMP is substantially lower in Central and Eastern Europe (CEE) countries, and thus it is not surprising that unemployment development does not seem to be affected by ALMP in these countries (Lehmann and Muravyev, 2009). The weak efficiency of ALMP programmes in the Czech Republic was previously confirmed in Münich, Svejnar and Terrell (1999). Flek and Vecernik (2005) mention that expenditure on ALMP appeared to be insufficient to reverse the rising unemployment rate in the Czech Republic in the late 1990s.

Passive labor market policies ensure that individuals can subsist during periods of unemployment with more resources allocated to these programmes.[4] On the one hand, the availability of income support for the unemployed renders joblessness less painful, thus allowing for a longer job search that leads to a better job match in the labor market. Wulfgramm and Fervers (2013) find that workers in European countries with more generous income support for the unemployed achieve higher employment stability upon re-

[4] The Ministry of Labor and Social Affairs reports that the share of ALMP in GDP was 0.07% during the period 1995-2000. The average spending on passive programmes amounted to 0.23% of GDP.

employment. The authors suggest that this outcome is possibly driven by the intensity of ALMP programmes via skill level increases and information deficit reductions.

On the other hand, generous social benefits can negatively affect the job search intensity of unemployed workers, and conditional on the wage offered, the higher benefits reduce the economic incentives to accept a job offer. Mulligan (2012) explains that recently expanded welfare programs in the USA provide strong disincentives to work. His evidence is compelling as he shows that the labor supply behavior was not affected among groups least affected by the specific safety-net increases (e.g. among the elderly, married, high-income, and among workers residing in regions with more stable housing prices). Literature provides many examples that most of the unemployed want to work and the evidence of negative aspects of welfare participation on transition to work is documented. In Germany, Schneider and Uhlendorff (2006) confirm that exits to work during 1992-2000 were more likely to be observed for unemployed individuals with higher potential wage relative to the level of social benefits. Portugal and Addison (2008) identify disincentive effects of unemployment benefits on the exit rate from unemployment using Portuguese employment surveys between 1992 and 1997. Petrongolo (2009) evaluates the UK reform in 1996 that introduced tighter search requirements for social benefits claimants. She concludes that reform was successful in moving unemployed individuals to the labor market through raising the costs of remaining on social benefits. Van Ours and Vodopivec (2006) find that the job finding rate of the unemployed in Slovenia largely increased after 1998 when the benefit entitlement period was substantially shortened. The exit rate remained unchanged for the unemployed whose entitlement period did not change; therefore; the authors interpret the effect as causal. Boeri (2000) finds a positive relationship between the level of social benefits and the (self-reported) reservation wages of individuals in the transition countries with the generous social benefits increasing the opportunity costs of employment and leading to high reservation wages. Boeri explains that the distribution of reservation wages does not increase uniformly but rather rises predominantly at its lower end. Consequently, high social benefits increase the chances of low-productive workers remaining out of employment.

Both the tax and social security systems contain measures targeted at poorer households and families with children. Prusa (2001) discusses the redistribution and tax policies in the Czech Republic prior to 2000 and Jahoda (2004) in 2003. Both studies conclude that there is a little interaction between these two systems with the welfare trap likely to arise for low-income individuals who transit from unemployment to employment. Similarly higher benefits targeted to families with children may lock individuals in unemployment due to the welfare

trap. Schneider (2004) shows that the tax and social security systems in the Czech Republic heavily redistribute income towards low-income groups. Working with aggregate figures from 2001, Schneider finds that taxes rise and social benefits are withdrawn when household income moves up from the bottom decile, creating strong disincentives for labor market participation. Jurajda and Zubricky (2005) discuss the parameters of tax and social security systems, showing that the level of social benefits for individuals from low income and large families remains relatively high in long-term unemployment. Therefore, the guaranteed household income from social benefits suggests very little motivation for individuals to exit unemployment.

Several studies have empirically examined the behavior of the unemployed in the Czech labor market using micro data. The study by Sorm and Terrell (2000) analyses worker mobility across different labor market states during 1994-1998. It considered individual characteristics as determinants of labor mobility and concluded that labor market flows during the studied period were efficient with a low incidence and duration of unemployment. Lauerova and Terrell (2005) explore female-male differences in labor market flows over the period 1993-1996 finding that women have significantly lower probabilities of exiting unemployment than men. Such chances are particularly low for married women. Commander and Heitmueller (2007) study flows in the labor market with respect to the role of social benefits during 1993-2003 finding weak evidence that individual decisions to leave unemployment to employment relate to the amount of social benefits. However, this result can be partly attributed to the fact that the authors use a simple approximation of benefit generosity at the household level.

The findings from literature evaluating the dynamics in the Czech labor market are very inconclusive. The findings based on the income simulation for selected households suggest that the combination of tax and social security systems in the Czech Republic creates a welfare trap, i.e. social benefits are accepted as an alternative to low and insecure earnings. Empirical studies find that the less educated tend to have a higher incidence of unemployment and longer spells although the association between social benefits and high unemployment was not directly confirmed. This paper confirms the existence of a welfare trap finding a negative influence of the high net replacement rate on the probability of transition from unemployment to employment.

3 The Czech social security system

The Czech government implemented extensive reforms to its tax and social security systems in the early 1990s. The social security system described in this paper was introduced in 1995 and had only undergone minor changes until 2005.[5] Workers who become unemployed are eligible to receive unemployment benefits for a period of 6 months with the amount calculated from previous net income. The unemployed who are jobless for more than 6 months are entitled to social benefits of an unlimited duration. Social benefits are not taxable and are subject to means-testing. In practice, they are paid to keep household income above the minimum subsistence level (MSL), which is defined by the Ministry of Labor and Social Affairs and represents the minimum amount of money that a household of a given composition would require for its subsistence. The MSL scheme defines a personal benefit for individuals by age and a household supplement to cover necessary household expenses. The MSL is shown in Table 1 and expressed in percentages relative to the net income of an average productive worker. The MSL for a given household is defined as the sum of personal benefits of all family members and the household supplement. Table 2 demonstrates the MSL computed for several typical households. It is observed that the MSL was initially set at relatively high levels before falling over time. Galuscak and Pavel (2007) calculate that while the average wage in the Czech economy between 1996 and 2006 increased by 106%, the amount of social benefits rose by 66% for single individuals, 57% for a couple without children, and 51% for a couple with two children. The authors explain that this decreasing trend in benefit generosity mainly occurred due to relatively high (wage) inflation and a lack of indexation of social benefits. However, social benefits remained relatively high for some groups throughout this period. It should be noted that it is standard to express social benefits relative to the national average wage despite the income of the majority of workers being lower. Therefore, the presented values are taken as a lower bound, and the relative value of social benefits can be higher for the majority of workers.

Previous studies emphasised that higher social benefits targeting families with children may constitute a potential welfare trap. As an example, Table 2 illustrates that the guaranteed income from social support for a couple (if both spouses are unemployed) with two children in 2000 was at 102 per cent of the national net monthly wage of an average production worker. The amount of benefits at that level may constitute a sufficient income for a family

[5] For a detailed description of the Czech tax and benefit systems, see Galuščák and Pavel (2007). An update to the tax-benefit policy is published annually at www.oecd.org/els/social/workincentives.

residing in a depressed region, whilst rendering an employment alternative as a less attractive option.

4 Theoretical framework

A simple job search model represents a useful framework to illustrate the likely impact of social benefits and job search intensity on the transition from unemployment to employment. This model is familiar within the existing literature on job search theory formalized by Mortensen (1986). In the model, individuals can be either employed or unemployed and maximize the lifetime utility in continuous time. Unemployed individuals receive benefits b and invest search time (or intensity) $s = [0,1]$ to find a job. Search effort cost $c(s)$ generates job offers at rate $\lambda(s)$ from a known wage distribution F(w). The standard assumption follows that search costs are convex in effort while returns are concave; thus, $c'(s) > 0, c''(s) > 0, \lambda'(s) > 0, \lambda''(s) < 0$. Employed individuals are paid a wage w and face an exogenous risk of job loss δ. An individual who has a job does not search to find another one. The unemployed choose an optimal level of job search effort s and determine the optimal reservation wage w_R. The flow value of unemployment and employment can be written as follows, respectively:

$$rU = \max_{s,w_R} \left\{ b - c(s) + \lambda(s) \int_{w_R} [W(w) - U] dF(w) \right\}, \tag{1}$$

and

$$rW(w) = w + \delta [U - W(w)], \tag{2}$$

where r represents the intertemporal discount rate. In theory, the reservation wage is defined at the level that makes a job-seeker indifferent between accepting a job and remaining unemployed. From $rW(w_R) = rU$ it follows that the flow value of unemployment is equal to the reservation wage $rU = w_R$, which is derived from (1) as a function of the parameters of the model:

$$w_R = rU = \max_s \left\{ b - c(s) + \frac{\lambda(s)}{r + \delta} \int_{w_R} [1 - F(w)] dw \right\}. \tag{3}$$

The optimal reservation wage is an implicit function of benefits and search intensity. The optimal search effort s^* is set at the level that maximizes the intertemporal utility of a job-

seeker. The first order condition for the choice of search intensity is obtained by differentiating formula (3):

$$c'(s^*) = \frac{\lambda'(s^*)}{r+\delta}\int_{w_R}[1-F(w)]dw. \tag{4}$$

Equations (3) and (4) form a system that implicitly determines the reservation wage and search effort. From equation (3), it follows that a higher b increases the reservation wage while rendering unemployment more attractive relative to employment. Formally:

$$\frac{dw_R}{db} = 1 - \frac{\lambda(s)}{r+\delta}[1-F(w_R)]\frac{dw_R}{db} = \frac{r+\delta}{r+\delta+\lambda(s)[1-F(w_R)]} > 0. \tag{5}$$

The dependence of the reservation wage on search effort is ambiguous in sign given that differentiation leads to:

$$\frac{dw_R}{ds} = \frac{r+\delta}{r+\delta+\lambda(s)[1-F(w_R)]}\left\{\frac{\lambda'(s)}{r+\delta}\int_{w_R}[1-F(w)]dw - c'(s)\right\}. \tag{6}$$

A search effort below the optimal level implies a positive effect, while a search effort above the optimal search level implies a negative effect on utility. In the basic model, a rise in benefit increases the reservation wage, but it is assumed that search effort is unconditional on a benefit that is unsatisfactory. The next step is to define the search effort as an implicit function of benefit. Differentiating equation (4) with respect to b implies:

$$c''(s^*)\frac{ds^*}{db} - \frac{\lambda''(s^*)}{r+\delta}\int_{w_R}[1-F(w)]dw\frac{ds^*}{db} + \frac{\lambda'(s^*)}{r+\delta}[1-F(w_R)]\frac{dw}{db} = 0. \tag{7}$$

With the help of (5), the result is:

$$\frac{ds^*}{db} = \frac{\lambda'(s^*)[1-F(w_R)]}{r+\delta+\lambda(s^*)[1-F(w_R)]}\left[\frac{\lambda''(s^*)}{r+\delta}\int_{w_R}[1-F(w)]dw - c''(s^*)\right]^{-1} < 0. \tag{8}$$

An unemployed person finds a job at rate $\lambda(s^*)[1-F(w_R)]$; therefore, higher benefits effectively decrease the job finding rate via both a decrease in the job search effort and an increase in the reservation wage. This result implies that the higher benefits increase the spell of unemployment.

5 Data

5.1 Data and sample selection

The empirical analysis relies on the quarterly Labor Force Survey (LFS) data from 1995 to 2005.[6] It is a rotating sample, and each quarter 20 per cent of individuals in the sample are replaced. The survey design allows the tracing of individuals over two consecutive periods (quarters) in order to identify the change of individual labor market status in the second period. The LFS follows the ILO definition of unemployment, i.e. an unemployed person has no employment, actively searches for a job, and is able to accept a job offer. In the Czech Republic, registration with the labor office is necessary to collect social benefits although labor offices have limited tools to screen the willingness of the unemployed to work (Galuscak and Münich, 2007). The final sample includes individuals who are jobless for longer than six months; therefore, they can collect social benefits, and their income never falls below MSL. The final sample includes the unemployed who are the heads of households or spouses. Other persons living in the household, such as the parents of spouses or other relatives, do not enter the analysis (around 2% of the sample). Due to different retirement schemes, the sample is limited to individuals of the working age 18-54 years.[7] Individuals who report full health disability are dropped from the sample. LFS contains information about personal characteristics such as age, gender, the highest level of education, unemployment duration and the type of activity prior to unemployment. Family composition and information about the age and number of children in the household are used to determine the MSL. Unfortunately, the LFS survey contains no income information, which is thus obtained from the Czech Household Income Survey collected by the Czech Statistical Office in 2002.[8] The standard Heckman (1979) model is applied to estimate the wage equation on the sample of workers taking into account the selection to employment.[9] The income is

[6] Labor Force Survey data for the Czech Republic are collected quarterly since 1993 by the Czech Statistical Office (CSU). Sample sizes cover more than 250,000 individuals per year. The number of respondents is proportional to the size of the district. Households are chosen randomly, and all members of the household are surveyed.

[7] In 1995, the statutory retirement age was 60 for men and 57 for women with no children, 56 for women who raised one child, 55 for women who raised two children, and 54 for women with three or four children.

[8] The Czech household income surveys were collected in 1996 and 2002. The choice of 2002 data hinges on the assumption that important wage determinants are stable throughout the study period. The stability of returns to education between 1996 and 2002 is confirmed by Münich, Svejnar and Terrell (2005) who estimate wage regressions using both 1996 and 2002 surveys.

[9] Similarly, Arellano and Meghir (1992) use the British Family Expenditure Survey to estimate the income for individuals in the British LFS. Schneider and Uhlendorff (2006) use the Heckman selection model to estimate a potential gross market wage of the unemployed receiving social assistance in Germany.

estimated for the sample of individuals 18-54 years old who are full-time employees, excluding the self-employed, students, and persons working less than 30 hours per week. The family characteristics such as the presence of children, other household income and the presence of employed persons other than the spouse are used to estimate participation in the labor market. The estimated parameters of the log-wage equation are used to calculate a potential monthly full-time gross wage of every individual in the LFS sample, while an estimation is performed separately by gender (see Appendix 2 for details).

5.2 Summary statistics

The final sample includes 28,338 unemployed individuals, of whom around two-thirds are comprised of women. Table 3 presents the descriptive statistics of the variables used in the analysis, reported separately for men and women. On average, the transition from unemployment to employment is observed for 9 per cent of individuals and does not differ between genders. The individuals who transit from unemployment to inactivity are treated as unemployed and their inclusion does not have an effect on the final results (around 2.6% of flows from unemployment). In terms of educational attainment, women are more educated relative to men in the sample. Overall, the majority of unemployed (77%) attained lower secondary or primary education. Men in the sample are slightly older than women, while the share of married women is higher than the share of married men. In terms of the activity prior to unemployment, a quarter of unemployed women worked in the household or provided childcare. By contrast, most unemployed men were employed prior to becoming unemployed, and about 12% engaged in other activities (such as military service or education). Longer detachment from the labor market can negatively affect future prospects in the labor market. Interestingly, the share of unemployed by the length of spell is almost identical by gender. Since 2002, the Czech LFS has included information on job-search channels used by the unemployed to seek work in the last period.[10] The job-search intensity is constructed as the number of search channels used. On average, unemployed individuals report using three channels to seek employment, with higher search intensity likely to speed up the transition to employment. Given that the gender differences in personal characteristics and incentives to exit unemployment are expected to lead to different results, an analysis is also performed separately by gender.

[10] The following seven search channels are considered: looking for a job through a public employment office, through a private employment agency, through friends or relatives, contacting employers directly, inserting or answering advertisements in newspapers or journals, studying advertisements in newspapers and journals, or through other methods.

5.3 The labor participation of women

Bicakova (2010) observes that a high percentage of women with young children in the Czech Republic withdraw from the labor force for a considerable period of time to raise their children. Consequently, these women experience a lower ability to find appropriate employment and to keep a job after the end of their parental leave. The amount of social benefits increases with the household size; therefore, individuals from large families tend to be more prone to welfare dependency. This finding emerges in Table 4 when the distribution of households by the number of children in the census data is compared to the distribution of households with unemployed individuals in the LFS sample. The information taken from the census data reveals that 65 per cent of households in the Czech Republic are childless (Column 1 in Table 4). Based on the LFS sample, 38 per cent of the unemployed live in households without children, with this figure significantly differing by gender. Almost half of unemployed men live in childless households, whereas only a third of unemployed women live in a household without children. A tentative pattern observed in Table 4 demonstrates that the incidence of unemployment increases with the number of children in the household, and the risk is higher for women.

5.4 Regional patterns

One of the key sources of variation for the analysis lies in the spatial heterogeneity in the economic conditions and in the nationally determined policy because differences in employment opportunities between districts are not reflected in the social security system, i.e. MSL is based solely on household composition. However, wages are set in the local labor market, and thus the actual generosity of social benefits varies geographically. Tables 5 documents the wage differentials and the widening unemployment rate between districts over time. In every year, 77 districts are divided into quintiles by the level of average wage in the district relative to the national wage and by the district unemployment rate. Average values for districts in the first and fifth quintiles are reported in Table 5. In particular, the districts in the first wage quintile record between 79-86 per cent of the national gross wage, while districts in the fifth wage quintile record between 102-107 per cent of the national gross wage. The variation in the unemployment rate between districts is even more pronounced, increasing from 6% to 15% in districts in the fifth quintile, while remaining below 5% in districts in the first quintile over the period 1995-2005. This result implies that territorial differences in earnings opportunities determine the working prospects of the unemployed. In this paper, regional variation in earnings opportunities is accounted for in the net replacement rate calculations. The district unemployment rate is included in the main

analysis to control for labor demand in the labor market (the same result is obtained if the vacancy-unemployment ratio is used rather than the unemployment rate).

6 Household welfare participation

6.1 Income estimation

The household net income is obtained under two alternatives in order to test the impact of welfare participation on an individual's labor supply decision. First, the individual potential gross income under the working alternative is obtained from the complementary data set for every person and their spouses in the sample (see Appendix 2 for details). Subsequently, the household net income is computed based on parameters of the tax and social security systems and accounts for family composition. Calculations account for personal income tax, with social contributions and rules for means-tested social benefits applied.[11] In contrast to previous studies, the estimation of household income is significantly improved in this paper. Commander and Heitmueller (2007) assume NRR computed for ten household types relative to the national average wage, while Galuscak and Pavel (2007) undertake the estimation assuming that the potential entry wage for the unemployed equals 50 or 67 per cent of the national average wage.

Second, personal income under the non-working alternative is approximated by the MSL of the household, under the assumption that the household collects the available social benefits. Mares (2001) is the only study to estimate the non-take-up of social security benefits in the Czech Republic, roughly estimating non-take-up rates to vary between 10 and 30 per cent depending on the type of social benefit. If an unemployed person lives with a working spouse, the household income is equal to the sum of the net income of the working spouse and means-tested social benefits.

6.2 Net replacement rates

Having the household income under both working and non-working alternatives enables us to calculate the NRR for every individual, which is expressed as the ratio of net household income when a person is unemployed to the net household income under the alternative situation when the individual is employed. NRR represents a useful measure to assess the link between generous social benefits and unemployment persistence (e.g. Commander and

[11] I thank Stepan Jurajda and Jozef Zubricky who collected the parameters of tax and social benefit systems in the Czech Republic for the period 1995-2005. I adapted their calculations of net income and social benefits from excel tables to STATA (do-files are available upon request).

Heitmueller, 2007; Jurajda and Zubricky, 2005). The ratio takes values from 0 to 1, with higher NRR increasing the reservation wage of the unemployed, thereby reducing incentives to enter employment. For example, NRR close to 1 means there are no monetary incentives to look for a job given that the household receives the same level of income regardless of the employment status. However, if accounting for other costs associated with the job search and the costs of participation in the labor market (i.e. transportation costs), even an NRR lower than 1 provides little incentive to search for a job. Table 6 details the average NRR computed for the total LFS sample, as well as separately for men, women, and groups of different characteristics. The decreasing trend of NRR reflects the declining generosity of the social security system. Rates are significantly higher for women relative to men, which is attributed to their lower earnings opportunities in the labor market. The lowest rates are recorded for men and high-educated individuals who have better prospects in the labor market in terms of high potential earnings. Conversely, the highest rates are observed for individuals with children and those who are low-educated. A clear pattern emerges that NRR increases with the length of unemployment spell, which points to the negative selection of individuals with a low ability for long-term unemployment. The share of individuals with an NRR above 0.8 is calculated at the bottom of Table 6. The pattern shows that the incidence of high social benefits is prevalent among the unemployed with children, the low-educated, and the long-term unemployed. Therefore, the existence of a welfare trap is likely to be present among these groups.

7 Results

In this section, we test for the effect of NRR on the transition probabilities of the unemployed to employment, controlling for the individual socio-demographic characteristics, local labor market attributes, and regional and time-fixed effects.

7.1 Estimation strategy

The model is estimated as the reduced form equation defined as the probability of transition from unemployment to employment. The indicator function E is defined. The individual makes the decision to remain unemployed $(E_i = 0)$ rather than enter employment for which they are qualified $(E_i = 1)$ because earnings or other working conditions are less attractive than the option of not working. In the estimation, constraints on the demand side are approximated by local labor market characteristics (i.e. the district unemployment rate and regional fixed effects). The key variable in the model is the incentive to enter employment in

the presence of social benefits. The probability of transition from unemployment to employment is expressed as:

$$P(E_i=1|X_i)=\Phi(\alpha NRR_i + X_i\beta), \quad (9)$$

where NRR is the ratio of household income under the non-working and working alternative, X_i includes individual characteristics. $\Phi(.)$ is the logistic cumulative distribution function, and equation (9) is estimated by the standard Logit model. The estimated coefficient on NRR tests for the existence of the welfare trap. In order to explore the hypothesis, the sensitivity of the estimated parameter is explored among different groups of unemployed but also to the inclusion of job-search intensity.

7.2 The effect of social benefits on the transition from unemployment to employment

Equation (9) is estimated for different groups with the results reported in Table 7. Column 1 shows the baseline model estimates from total sample. The coefficient on NRR is significant and negative, in line with the hypothesis, which means that individuals who receive relatively higher social benefits are also more likely to remain unemployed. Estimates imply that, *ceteris paribus*, if NRR were to decrease from a value of 0.8 to 0.68 (a decrease by one standard deviation to the mean value), there would subsequently be an associated change in the transition probability from 8.7% to 9.2%. The existence of the welfare trap and its prevalence among different groups is discussed further below. The estimated effects of demographic characteristics on transition probabilities are consistent with the previous literature. Labor supply is often a joint decision within couples, as observed by Galuscak and Pavel (2007). Moreover, married persons are more likely to leave unemployment for a job, as empirically confirmed by Sorm and Terrell (2000). Estimates further imply that unemployed persons who live with an employed spouse exhibit a higher propensity to enter employment. Coefficients on a female dummy in Table 7 are negative; thus, suggesting that women are disadvantaged in the transition to employment with at least two reasons discussed within the existing literature. Women are placed in a disadvantaged position, first, by the responsibility for childcare (Bicakova, 2010) and second, the lower earnings opportunities in the labor market (Jurajda, 2003). The presence of young children in the family implies a negative impact although variables are not significant at the conventional levels.[12] In general,

[12] Low significance possibly arises because the presence of children delivers the reverse impact on labor supply behaviour by gender. When the equation is estimated separately by gender, the presence of a 3-5 year old child in the family translates to the lower probability of transitioning to work for women by 1.2 percentage points, and the coefficient is significant at the 5 per cent level. For men, the

people with less education have a lower propensity to enter employment relative to those with more education. Furthermore, workers who were not employed prior to unemployment display a lower ability to exit unemployment. This predominantly concerns women who worked in the household or provided childcare. The longer duration of unemployment has a rather strong negative effect on the outflow from unemployment. All individuals in the sample have been unemployed for at least 6 months. Estimates imply that the chances of exiting unemployment decrease by around 3 percentage points for those unemployed with a spell longer than 12 months and by 7 percentage points if the spell lasts for more than 2 years. Individuals with partial health disability have a lower propensity to leave unemployment for a job by 3 percentage points. A higher unemployment rate in the local labor market indicates fewer employment opportunities and consequently lower chances of finding a job. Estimates from the baseline model in Column1 imply that, *ceteris paribus*, an increase in one standard deviation in the unemployment rate is associated with a decline by 0.25 percentage points in the propensity to leave unemployment for employment.

Finally to confirm that results are not driven by the number of children, the equation is estimated including the interactions of NRR with the number of children in the household.[13] The estimates confirm the robustness of the benchmark regression, while the effect of NRR is negative and significant (the size of the coefficient is larger in magnitude -4.2 and significant at the 5% level), and the interaction terms are not significant.

7.3 Which groups are affected?

The transition from unemployment to employment varies with economic incentives. Previous studies indicate that motivation may be particularly low for those unemployed with children as well as individuals who have lower chances of getting a better paid job. To test this hypothesis, equation (9) is estimated separately for the unemployed living in families with and without children (see Table 7 in Columns 2 and 3). The effect of social benefits (represented by NRR) is negative and significant at the 5 per cent level for childless individuals, while it is not significant for those with children. This result points to the existence of a welfare trap within the former group yet not within the latter group. An alternative explanation consistent with the estimates is that social benefits attached to families with children are high (as shown in Table 6) although the variation in NRR is insufficient to explain the outflow from unemployment. Accordingly, this means that the

estimate implies a significant positive effect of 1.4 percentage points. The presence of older children in the family has no association with the dependent variable.

[13] I thank Mikolaj Herbst who suggested the robustness check. Results are available on request.

transition probability for this group is determined by factors other than the level of social benefits. Estimates suggest that it is rather the childless unemployed with low-earnings opportunities who are vulnerable to the welfare trap. To further support this argument, equation (9) is estimated separately for individuals with low (primary or lower secondary) and high (upper secondary or tertiary) educational attainment. Given that education is a strong predictor of labor income, the withdrawal of means-tested benefits associated with entering low-paid work can lead to a no significant increase in total income in the case of low-educated individuals. Results in Columns 4 and 5 reveal that the effect appears to be concentrated in the groups with low education; indeed, for the group with high education, the effect is close to zero and statistically insignificant. Overall, the results reveal that relatively high social benefits constitute a welfare trap for potentially low-income workers, and the existence of a welfare trap was not confirmed for those unemployed with children.

7.4 Unemployment duration dependence

The last three columns of Table 7 present results from the specification containing individuals by the length of unemployment spell. The negative duration dependence was confirmed by Sorm and Terrell (2000), implying that the longer an individual is unemployed, the less likely they are to leave that state. Negative dependency arises due to the unobserved heterogeneity that those who are unemployed for longer spells are less motivated or have other characteristics that render them less favourable to employers. According to that hypothesis, the welfare trap is more likely to be present among long-term unemployed who have the lowest chances of improving their economic conditions in the labor market. The estimate on NRR is negative and significant for those unemployed for a spell longer than two years, while coefficients are not significant for those unemployed for shorter spells. Estimates indicate that the negative dependency observed in the Czech labor market is accompanied by the existence of a welfare trap.

7.5 Gender differences

As discussed above, women are disadvantaged in the transition from unemployment to employment. Relative to men, women face lower earnings possibilities, and consequently, the relative level of social benefits is higher for women. For this reason, the amount of social benefits can have an impact that varies on the economic incentives of men and women to find a job. Equation (9) is estimated separately for men and women and for groups along different dimensions in Table 8 in order to examine whether there is a heterogeneous effect of social benefits on the labor supply behavior of men and women. The dimensions

considered are the presence of children, education, and unemployment duration. In general, the results reveal that women are more vulnerable to the welfare trap than men. The existence of a welfare trap is confirmed for women without children, the low-educated and the long-term unemployed, while the estimate on NRR for women living in families with children is proven not to be significant. This also means that the transition probability for this group is determined by other factors (such as education, the economic status of spouse, the age of children, etc.) rather than the level of social benefits. For men, the average estimated coefficient on NRR is negative and significant yet is imprecisely estimated for the sub-groups of the male sample. Finally, the estimates of models that include observations before and after 2000 are presented.[14] These estimates are consistent with the findings of Sorm and Terrell (2000), who document that the labor market was characterized by a high mobility of workers with short unemployment spells prior to 2000. The existence of a welfare trap is confirmed in the period after 2000. The estimate on NRR is significant for women at the 1 per cent level, while it is not significant at the conventional level for men.

7.6 Job-search intensity

The theoretical framework derived in section 4 demonstrates that higher job-search intensity increases transitions to employment. The relationship is tested empirically for the sub-sample in the period 2002-2005, given that the information on search channels is not provided for the whole period. Table 9 shows the estimates of the baseline model for the sub-sample together with the estimates separately by gender. Next to it, the equations are estimated with the additional control of job-search intensity. Estimates on search intensity provide evidence that those unemployed who use multiple channels of job searching are more successful in finding a job and exiting unemployment. Importantly, the inclusion of the search intensity variable only slightly affects the estimates on NRR. The existence of a welfare trap is documented for women; however, it is not significant for the total sub-sample (t statistics are 1.54) and men (t statistics are 0.86).

8 Conclusions

The social security system in the Czech Republic has been assessed by several studies as generating potential disincentive effects (welfare trap) for some unemployed individuals. This paper combines the information from Czech Labor Force Surveys and the Czech Household Income Survey to demonstrate the effect of the tax and social security systems on

[14] The results are robust to the choice of split around 2000.

individual flows from unemployment to employment. The analysis presents empirical evidence that relatively high social benefits reduce the incentives to exit unemployment for individuals with low-earnings opportunities in the labor market. The analysis documents the disadvantaged position of women in the Czech labor market. Due to lower earnings in employment, women face high replacement rates relative to men. The estimates imply that women outflows to employment are particularly influenced by the high social benefits, and the existence of a welfare trap persists even when the job-search intensity is controlled. This finding contributes to the discussion on the persistent and large unemployment gender gap in the Czech Republic initiated by Lauerova and Terrell (2005).

Finally, the analytical results advocate for policy improvements towards low-income households. A better harmonization of the tax and social security systems is necessary in order to ensure that the incentives to leave unemployment are not hampered by high social benefits. The suggested solution that would help the unemployed return to work is to allow individuals to receive full social benefits for some period while they are earning an income. To further strengthen the incentives, the measure should be accompanied by improvements to monitoring and to the enforcement of job search.

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Appendix 1

Table 1: Minimum subsistence level (% average of monthly net income)

Year	Personal benefit depends on age				Household supplement depends on household size				
	0-5	6-9	10-15	above 16	1	2	3	4	5
1995	27	20	22	26	12	16	20	20	22
1996	24	18	20	23	13	17	21	21	24
1997	24	18	20	23	12	16	20	20	22
1998	23	17	19	22	14	19	23	23	26
1999	22	16	18	21	16	21	26	26	29
2000	21	15	17	20	15	20	25	25	28
2001	20	15	17	20	16	20	25	25	28
2002	19	14	15	19	15	19	24	24	26
2003	18	13	15	18	14	18	22	22	25
2004	17	12	14	17	13	17	21	21	24
2005	16	12	13	16	13	18	22	22	24

Source: Ministry of Labor and Social Affairs of the Czech Republic

Note: Amounts are computed relative to the nominal monthly net income of an average production worker living in a single household (see Column 2 in Table 5).

Table 2: Minimum subsistence income computed for typical households (% average of monthly net income)

Year	Single	Single+children	Couple	Couple+children
1995	38	92	67	117
1996	36	86	63	109
1997	35	85	62	108
1998	37	86	64	108
1999	37	86	64	107
2000	36	81	60	102
2001	36	81	61	101
2002	33	75	57	94
2003	32	71	54	89
2004	30	67	50	84
2005	29	66	49	82

Source: Ministry of Labor and Social Affairs of the Czech Republic

Note: Subsistence is computed from Table 1 as the sum of personal benefits for all family members based on their age and the household supplement based on the family size. A family with two children aged 3 and 8 is assumed.

Table 3: Summary statistics – individual characteristics

	Total		Men		Women	
	mean	s.dev	mean	s.dev	mean	s.dev
N	28338		9384		18954	
Transition to employment	0.09	0.29	0.09	0.29	0.09	0.29
Female	0.67	0.47				
Married	0.61	0.49	0.56	0.50	0.63	0.48
Spouse is employed	0.48	0.50	0.31	0.46	0.57	0.50
No children	0.38	0.49	0.48	0.50	0.33	0.47
Child 0-2y	0.04	0.20	0.11	0.32	0.01	0.08
Child 3-5y	0.15	0.36	0.13	0.33	0.17	0.37
Child 6-9y	0.25	0.43	0.18	0.38	0.28	0.45
Child 10-15y	0.30	0.46	0.23	0.42	0.33	0.47
Edu: primary	0.33	0.47	0.35	0.48	0.32	0.47
Edu: lower sec	0.45	0.50	0.50	0.50	0.42	0.49
Edu: upper sec	0.20	0.40	0.12	0.33	0.24	0.43
Edu: tertiary	0.03	0.16	0.03	0.18	0.02	0.14
Age	39.81	9.10	40.91	9.25	39.26	8.98
Spell 0.5-1 years	0.32	0.47	0.31	0.46	0.32	0.47
Spell 1-2 years	0.28	0.45	0.27	0.44	0.28	0.45
Spell >2 years	0.41	0.49	0.42	0.49	0.40	0.49
Before: employment	0.76	0.43	0.88	0.33	0.70	0.46
Before: household	0.08	0.27	0.01	0.08	0.11	0.32
Before: childcare	0.09	0.28	0.00	0.04	0.13	0.33
Before: other	0.08	0.27	0.12	0.32	0.06	0.24
Partial disability	0.13	0.34	0.15	0.36	0.12	0.33
Search intensity	3.74	1.24	3.71	1.24	3.75	1.23
Unemployment rate	10.84	4.91	11.16	4.95	10.68	4.88

Source: Labor Force Survey 1995-2005, the Czech Republic

Note: Information on search intensity is only available for the 2002-2005 period.

Table 4: Household typology (in %)

Household type	Census 2001	Estimation sample		
		Men	Women	Total
without children	65	48	33	38
one child	17	20	28	26
two children	15	19	28	25
three or more children	3	13	11	12
unknown	1	0	0	0

Source: Census information is taken from Jahoda (2004), Labor Force Survey 1995-2005

Table 5: Wage level and unemployment rate statistics at national and district level

Year	National avg gross wage (CZK) (1)	National avg net wage (CZK) (2)	Avg wage in districts as % of (1) lower quintile (3)	upper quintile (4)	Unemployment rate in districts lower quintile (5)	upper quintile (6)
1995	8170	6291	86	107	1.15	5.83
1996	9684	7457	86	106	1.47	6.73
1997	10698	8344	85	106	2.53	9.50
1998	11709	9133	84	107	4.06	12.53
1999	12651	9868	84	107	5.20	15.48
2000	13484	10383	83	106	4.35	15.60
2001	14793	11391	80	103	4.49	15.42
2002	15857	12210	79	102	5.14	16.62
2003	16917	12857	80	102	5.61	17.38
2004	18035	13707	80	102	5.83	17.08
2005	18937	14392	80	102	4.88	15.24

Source: Czech Statistical Office

Note: The average nominal gross monthly wage (in CZK) and registered unemployment rate were collected in 77 districts. Average nominal net wage (in CZK) assumes the effective tax rate of a single person without children. In every year, districts are divided into quintiles by the level of average gross wage and unemployment rate. Average values for districts in lower and upper quintiles are reported.

Table 6: Net Replacement Rate of different groups in the sample

Year	**Total**	**Men**	**Women**	**Childless**	**Has children**	**Low edu**	**High edu**	**Spell 0.5-1y**	**Spell 1-2y**	**Spell >2y**
1995	0.74	0.67	0.77	0.61	0.79	0.76	0.63	0.72	0.73	0.80
1996	0.72	0.63	0.76	0.59	0.78	0.74	0.62	0.71	0.72	0.77
1997	0.70	0.63	0.74	0.59	0.77	0.73	0.62	0.70	0.68	0.76
1998	0.71	0.64	0.74	0.60	0.77	0.74	0.62	0.68	0.71	0.76
1999	0.71	0.65	0.75	0.61	0.77	0.75	0.61	0.68	0.71	0.76
2000	0.70	0.62	0.73	0.58	0.76	0.73	0.59	0.68	0.69	0.73
2001	0.69	0.61	0.73	0.59	0.75	0.71	0.61	0.66	0.69	0.71
2002	0.68	0.60	0.73	0.57	0.76	0.71	0.59	0.66	0.67	0.70
2003	0.67	0.58	0.71	0.55	0.74	0.69	0.57	0.64	0.66	0.69
2004	0.65	0.56	0.70	0.55	0.73	0.68	0.54	0.61	0.64	0.68
2005	0.64	0.54	0.69	0.54	0.71	0.67	0.54	0.63	0.62	0.66
average NRR	0.69	0.60	0.73	0.57	0.75	0.71	0.59	0.67	0.68	0.71
% NNR>0.8	0.21	0.17	0.23	0.10	0.28	0.26	0.03	0.15	0.19	0.28

Source: Author's computations.

Note: Individuals with a low level of education are defined as those who have primary and lower secondary. Individuals with upper secondary and tertiary education are defined as a high level of education.

Table 7: Transition probability from unemployment to employment and NRR

	Total		Childless		Has children		Low edu		High edu		Spell 0.5-1y		Spell 1-2y		Spell >2y	
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
NRR	-0.034	**	-0.053	**	-0.03		-0.035	**	0.016		-0.049		-0.02		-0.043	**
	(0.017)		(0.023)		(0.035)		(0.018)		(0.051)		(0.044)		(0.035)		(0.019)	
Married	0.019	***	0.02	***	0.018	***	0.022	***	0.002		0.043	***	0.027	***	0.004	
	(0.004)		(0.006)		(0.006)		(0.004)		(0.013)		(0.011)		(0.009)		(0.005)	
Spouse is employed	0.012	***	0.004		0.016	**	0.01	**	0.017		0.012		0.015	*	0.009	*
	(0.004)		(0.006)		(0.007)		(0.005)		(0.012)		(0.011)		(0.009)		(0.005)	
Child dummy 0-2y	0.005				0.005		0.004		0.017		-0.004		0.003		0.013	
	(0.007)				(0.009)		(0.008)		(0.023)		(0.019)		(0.016)		(0.009)	
Child dummy 3-5y	-0.004				-0.003		-0.002		-0.009		-0.005		-0.011		0.006	
	(0.004)				(0.005)		(0.005)		(0.012)		(0.011)		(0.010)		(0.006)	
Child dummy 6-9y	-0.004				-0.004		-0.004		-0.003		-0.011		-0.005		-0.001	
	(0.004)				(0.004)		(0.004)		(0.010)		(0.010)		(0.008)		(0.004)	
Child dummy 10-15y	0.003				0.002		-0.001		0.018	*	0.004		-0.01		0.01	**
	(0.004)				(0.005)		(0.004)		(0.010)		(0.010)		(0.008)		(0.004)	
Female	-0.009	**	0.003		-0.017	***	-0.004		-0.037	***	-0.021	**	-0.019	**	0.008	
	(0.004)		(0.006)		(0.006)		(0.004)		(0.011)		(0.010)		(0.009)		(0.005)	
Edu: lower sec	0.029	***	0.011	**	0.043	***	0.025	***			0.064	***	0.035	***	0.008	**
	(0.004)		(0.005)		(0.006)		(0.003)				(0.011)		(0.008)		(0.004)	
Edu: upper sec	0.04	***	0.016	**	0.056	***					0.089	***	0.038	***	0.016	***
	(0.005)		(0.007)		(0.007)						(0.012)		(0.010)		(0.005)	
Edu: tertiary	0.027	***	-0.001		0.043	***			-0.016		0.066	***	0.029		-0.001	
	(0.009)		(0.013)		(0.013)				(0.013)		(0.022)		(0.019)		(0.013)	
Age /100	0.384	**	0.25		0.416		0.361	**	0.521		0.647	*	0.423		0.21	
	(0.156)		(0.184)		(0.256)		(0.163)		(0.441)		(0.386)		(0.329)		(0.199)	
Age sq /10000	-0.706	***	-0.517	**	-0.731	**	-0.64	***	-1.016	*	-1.153	**	-0.82	*	-0.4	
	(0.204)		(0.239)		(0.339)		(0.213)		(0.577)		(0.508)		(0.430)		(0.253)	
Spell 1-2 years	-0.032	***	-0.03	***	-0.033	***	-0.025	***	-0.062	***						
	(0.003)		(0.005)		(0.005)		(0.004)		(0.009)							
Spell >2 years	-0.072	***	-0.074	***	-0.069	***	-0.063	***	-0.108	***						
	(0.004)		(0.005)		(0.005)		(0.004)		(0.011)							
Before: household	-0.023	***	-0.028		-0.024	***	-0.024	***	-0.022		-0.052	***	-0.028	**	-0.005	
	(0.006)		(0.019)		(0.007)		(0.007)		(0.015)		(0.016)		(0.013)		(0.006)	
Before: childcare	-0.018	***			-0.019	***	-0.017	**	-0.021		-0.056	***	-0.005		-0.008	
	(0.006)				(0.007)		(0.007)		(0.015)		(0.017)		(0.012)		(0.006)	
Before: other	-0.012	*	-0.002		-0.025	**	-0.016	**	0		-0.017		-0.012		-0.008	
	(0.006)		(0.007)		(0.010)		(0.007)		(0.017)		(0.018)		(0.013)		(0.006)	
Partial disability	-0.03	***	-0.026	***	-0.029	***	-0.026	***	-0.047	**	-0.053	***	-0.038	***	-0.009	*
	(0.006)		(0.007)		(0.008)		(0.006)		(0.020)		(0.016)		(0.012)		(0.005)	
Unemployment rate	-0.005	***	-0.003	***	-0.007	***	-0.004	***	-0.011	***	-0.011	***	-0.005	***	-0.002	***
	(0.001)		(0.001)		(0.001)		(0.001)		(0.002)		(0.002)		(0.001)		(0.001)	
Constant	-0.152	***	-0.077	*	-0.189	***	-0.148	***	-0.143	*	-0.299	***	-0.191	***	-0.105	**
	(0.031)		(0.040)		(0.053)		(0.034)		(0.085)		(0.077)		(0.066)		(0.041)	
N	28338		10726		17612		22001		6337		8990		7798		11550	

Source: Labor Force Survey 1995-2005, the Czech Republic

Note: Logit model estimates and marginal effects are reported. Year dummies and 14 region fixed effects are included. The following are base groups: male, primary education, single, no children, unemployment spell 0.5-1 year, employed before unemployment, no disability and Prague region. Standard errors in parenthesis, *** significance level 1%, ** significance level 5%, * significance level 10%.

Table 8: Estimates of NRR for different groups by gender

	Total		Men		Women	
All	-0.034	**	-0.043	*	-0.059	**
	(0.017)		(0.026)		(0.023)	
Childless	-0.053	**	-0.040		-0.077	**
	(0.023)		(0.036)		(0.030)	
Has children	-0.030		-0.073		-0.015	
	(0.035)		(0.070)		(0.043)	
Low edu	-0.035	**	-0.028		-0.078	***
	(0.018)		(0.026)		(0.027)	
High edu	0.016		-0.174		0.039	
	(0.051)		(0.112)		(0.062)	
Spell 0.5-1 years	-0.049		-0.116		-0.047	
	(0.044)		(0.074)		(0.062)	
Spell 1-2 years	-0.020		0.032		-0.106	**
	(0.035)		(0.057)		(0.049)	
Spell >2 years	-0.043	**	-0.040		-0.057	**
	(0.019)		(0.025)		(0.027)	
Year 1995-2000	-0.018		-0.031		-0.023	
	(0.027)		(0.041)		(0.039)	
Year 2001-2005	-0.044	**	-0.043		-0.088	***
	(0.022)		(0.034)		(0.031)	

Source: Labor Force Survey 1995-2005, the Czech Republic

Note: Figures in the table are the estimates of NRR from separate regressions. All models have the same specification as in Table 7. Standard errors in parenthesis, *** significance level 1%, ** significance level 5%, * significance level 10%.

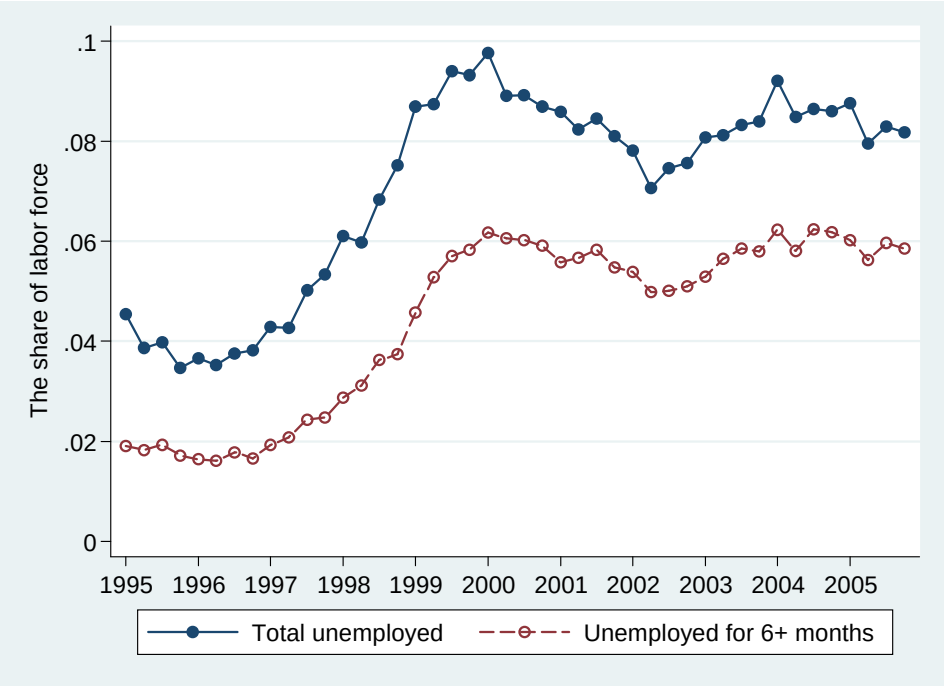
Table 9: Estimates of NRR and search intensity

	Total	Men	Women		Total		Men		Women	
	(1)	(2)	(3)		(4)		(5)		(6)	
NRR	-0.038	-0.033	-0.067	**	-0.037		-0.033		-0.064	*
	(0.024)	(0.039)	(0.034)		(0.024)		(0.039)		(0.034)	
Search intensity					0.005	***	0.006	**	0.004	**
					(0.002)		(0.003)		(0.002)	
N	12699	4242	8457		12699		4242		8457	

Source: Labor Force Survey 2002-2005, the Czech Republic

Note: All models have the same specification as in Table 7. Standard errors in parenthesis, *** significance level 1%, ** significance level 5%, * significance level 10%.

Figure 1: The unemployment rate



Source: Labor Force Survey 1995-2005, the Czech Republic

Appendix 2

The Heckman's sample selection model is applied to estimate a wage equation controlling for the selection into employment. In the first step, the probit selection equation describing the propensity to work is formulated. The predicted values from the probit regression are used to calculate the Inverse Mills Ratio (IMR) for each observation in the sample. In the second step, the wage regression is estimated with IMR as an additional regressor that will account for the bias due to the non-random nature of the sample of wage earners. The first equation is specified as follows:

$$P(E_i=1|Z_i)=\Phi(Z_i\gamma),$$

where Z includes different explanatory variables that affect the likelihood of participation of individuals in waged work $(E_i=1)$. The IMR is calculated by the following relation:

$$IMR_i=\frac{\phi(Z_i\gamma)}{1-\Phi(Z_i\gamma)},$$

where $\phi(.)$ and $\Phi(.)$ are the density function and distribution function of the standard normal distribution, respectively. In the second step, IMR is added as an additional explanatory variable in the Mincerian wage model:

$$W_i^* = X_i\beta + \beta_{IMR} IMR_i + \varepsilon_i,$$

where W_i^* is the wage, and vector X_i includes observed variables relating to the i'th person's productivity, and ε_i is an error term. β_{IMR} is the covariance between the error terms from the wage and selection equations. Error terms in both equations are assumed to be jointly normally distributed. The system is estimated separately for men and women. The participation equation contains potential working experience and its square, education, family characteristics such as the presence of children of different ages, marital status, the presence of an economic active person in the household other than a spouse, the logarithm of other household income, the district unemployment rate, city size, and region fixed effects. The results are presented in Table 10. As expected, the presence of young children in the household is associated with the lower participation rate of women and less so of men. Higher education has a strong positive effect on participation for both genders. As expected, the availability of other household income has negative associations with employment participation. Similarly, the presence of an other employed person in the household implies the lower participation of women. In the second step, the Mincerian log-wage regression is estimated with controls including the worker's experience, education, a indicator of partial disability, and region fixed effects. The significant estimate on IMR in the wage regression points to the negative selection into employment.[15] Estimating the potential entry income of unemployed workers in the local labor market, the choice of variables in the wage regression is limited due to the fact that the prediction of income for the sample of unemployed workers does not allow us to consider work characteristics (the same approach is used in Schneider and Uhlendorff, 2006). The wage regression explains about 35% of the variation in wages. The estimated parameters of the log-wage equation are used to calculate a potential monthly full-time gross wage of every individual in the LFS. The wages for years other than 2002 are subsequently adjusted for the regional wage growth. Predicted gross monthly earnings that fell below the Czech statutory minimum gross wage (180 cases) were set to the respective level of the minimum wage.

[15] Based on the findings, the interpretation is that a woman with sample average characteristics who selects into waged employment receives around 3.2% lower wages than a woman drawn at random from the population with the average set of characteristics. The respective figure for men is 5%. These effects are computed at the average IMR values of 0.446 and 0.198 for women and men, respectively.

Table 10: Wage estimation (Heckman‘s sample selection model)

Equation 1: selection to employment					**Equation 2: logarithm of gross monthly wage**				
	Women		Men			Women		Men	
Work experience	-0.001		0.057	***	Work experience	0.008	***	0.02	***
	(0.013)		(0.016)			(0.003)		(0.003)	
Work experience sq. /100	0.018		-0.132	***	Work experience sq. /100	-0.011	*	-0.043	***
	(0.032)		(0.039)			(0.006)		(0.007)	
Edu: lower sec	0.606	***	0.95	***	Edu: lower sec	0.109	***	0.064	*
	(0.092)		(0.110)			(0.026)		(0.038)	
Edu: upper sec	0.789	***	1.264	***	Edu: upper sec	0.424	***	0.293	***
	(0.095)		(0.127)			(0.027)		(0.042)	
Edu: tertiary	1	***	1.405	***	Edu: tertiary	0.714	***	0.6	***
	(0.132)		(0.181)			(0.032)		(0.045)	
Partial disability	-1.73	***	-1.417	***	Partial disability	-0.363	***	-0.389	***
	(0.167)		(0.171)			(0.078)		(0.072)	
Married	0.043		0.683	***	The inverse Mills ratio	-0.076	***	-0.265	***
	(0.065)		(0.094)			(0.026)		(0.074)	
Child dummy 0-2y	-1.984	***	-0.077		Constant	9.163	***	9.446	***
	(0.086)		(0.133)			(0.038)		(0.058)	
Child dummy 3-5y	-1.347	***	-0.271	**	N	3121		3202	
	(0.082)		(0.137)		R2	0.354		0.328	
Child dummy 6-9y	-0.391	***	-0.05						
	(0.075)		(0.124)						
Child dummy 10-15y	-0.083		-0.11						
	(0.070)		(0.098)						
Other household income	-0.04	*	-0.156	***					
	(0.024)		(0.030)						
Other econ. active person	-0.41	***	-0.045						
	(0.038)		(0.050)						
City size 5,000-50,000	0.132	*	0.156	*					
	(0.069)		(0.090)						
City size 50,000-100,000	0.188	*	0.309	**					
	(0.109)		(0.144)						
City size above 100,000	-0.124		-0.15						
	(0.113)		(0.141)						
Unemployment rate	-0.036	***	-0.041	**					
	(0.012)		(0.016)						
Constant	1.495	***	0.779	***					
	(0.204)		(0.266)						
N	4019		3473						
Pseudo R2	0.378		0.2448						

Source: Czech Household Income Survey, 2002

Note: Estimation method: probit model for the selection equation and OLS regression for the wage equation

The sample includes individuals aged 18-54 years old who are unemployed or full-time employees (excluding self-employed, students and persons working less than 30 hours per week). Work experience equals age minus 6 minus imputed years of schooling. Fourteen region fixed effects are included in both equations. Standard errors in parenthesis, significance level: *** 1%, ** 5%, * 10%.

Chapter 3

Unemployment Benefits and Immigration: Evidence from the EU[1]

(Joint work with Corrado Giulietti, Martin Kahanec and Klaus F. Zimmermann)

1 Introduction

In recent years, the topic of "welfare migration" has raised controversial discussions and generated a substantial body of literature. There is concern that excessive participation in welfare or social security systems might be a more common phenomenon for immigrants than for natives (Cohen, Razin and Sadka, 2009; Nannestad, 2006) or constitute a fiscal burden for host countries (De Giorgi and Pellizzari, 2009).

The scope of this paper is to explore whether and how changes in countries' welfare generosity affect immigration. Instead of using an aggregate measure of welfare, such as total social public spending (which would include social assistance), this work focuses on unemployment benefits. These benefits result from a public insurance program in which participation is conditioned on compulsory contributions during periods of insured work. The contributory nature of the program makes immigrants' benefit recipiency directly linked to their employment experience. As described by Heitmueller (2005), expected income may be an important factor driving people's decision to migrate. Together with earnings during phases of employment, this also includes unemployment benefits that might be accessed during spells of unemployment. Hence, the presence of unemployment benefits may increase immigrants' expected income as well as help reduce its volatility. As a result, countries with particularly generous unemployment benefits could attract a greater number of (risk averse) immigrants.

[1] An earlier version of this work was published as Giulietti, Corrado, Guzi Martin, Kahanec Martin and Zimmermann F. Klaus. (2013). *International Journal of Manpower*, 34 (1): 24-38. We are grateful for useful comments to Bob Gregory, Jan Fidrmuc, Gábor Kézdi, Jan Kmenta, Thomas Liebig, László Mátyás, Mariola Pytlikova, Asaf Razin and anonymous referees. All errors remaining in this text are the responsibility of the authors.

This hypothesis is tested by estimating the relationship between immigration inflows and unemployment benefit spending (UBS) as a fraction of the gross domestic product for a sample of European countries. Flows from EU and non-EU origins are analysed separately because immigrants from these two broad origins are likely to respond in different ways to UBS. This could be due to, for example, their diverse socio-economic characteristics or the different treatment in terms of immigration legislation (Anastassova and Paligorova, 2005), or even different eligibility criteria for unemployment program participation. In addition, while immigrants from EU origins are free to migrate within the EU, migrants from non-EU origins do not have the same freedom.

Building upon recent studies which have found no (Pedersen, Pytlikova and Smith, 2008) or moderate (De Giorgi and Pellizzari, 2009) evidence of the welfare magnet hypothesis, the article's main contribution is that it systematically studies the endogenous nature of UBS in the context of the welfare magnet hypothesis. Specifically, two potential channels of reverse causality between immigration and UBS are explored. The first is a case of simultaneity, whereby immigrants impact UBS through benefit take-up or by affecting the GDP of a country. This hypothesis is investigated by estimating the probability of unemployment benefits recipiency, conditional on unemployment, for both immigrants and natives. By doing so, it is possible to distinguish whether reverse causality arises due to the composition of the immigrant population or due to the immigrants' higher propensity to be on welfare. The second source of reverse causality relates to how policy reacts to immigration by cutting (or expanding) UBS. This conjecture is investigated by analysing whether changes in eligibility criteria and durations of unemployment benefits are associated with the evolution of immigration patterns.

In order to address the potential endogeneity implied by reverse causality, UBS is instrumented with the number of political parties within each winning parliamentary coalition. The rationale is that social expenditure is likely to be higher (lower) in countries where coalitions are comprised of more (fewer) political parties (Bawn and Rosenbluth, 2006). While the ordinary least squares (OLS) estimates indicate the existence of a moderate within-country welfare magnet effect for non-EU immigrants, the implementation of the instrumental variable (IV) and the generalised method of moments (GMM) approaches reveals that the impact becomes smaller and statistically insignificant. This result is taken as evidence that reverse causality produces an upward bias in the correlation between immigration and UBS. Therefore, failing to account for such a mechanism implies an overstating of the effect that an exogenous change in UBS would produce on immigration.

The analysis for EU immigrants indicates that they do not react to the UBS in host countries. This result might also reflect the different nature of within-EU migration.

The article is organised as follows. Section 2 reviews studies about the welfare magnet hypothesis. Section 3 outlines the empirical strategy, and section 4 provides a description of the data and related summary statistics. Section 5 presents results of the OLS and IV regressions, while the concluding remarks are to be found in Section 6.

2 Literature review

The focus of the immigration literature on the relationship between welfare and immigration is rather recent. In the context of immigration into the USA, Borjas (1999) proposes that since immigrants in the country have already incurred large costs, they tend to cluster in states offering the highest welfare benefits. Moreover, the generosity of the welfare state will also affect the skill composition of immigration. In their simulations, Brücker et al. (2002) find that welfare-generous countries attract relatively more low-skilled workers, whilst high-skilled workers prefer to settle in countries where social spending is lower due to the lower tax burden needed to finance it. Hence, welfare generosity may induce a negative sorting of immigrants. In the context of EU enlargement, Boeri and Brücker (2005) argue that when the risk of being unemployed is greater for immigrants than natives, the incentive to migrate increases with the replacement rate, and mainly for low-skilled individuals.

Several empirical studies have explored the welfare magnet hypothesis. Using the European Community Household Panel for the period 1994–2001, De Giorgi and Pellizzari (2009) estimate the correlation between immigration and the net replacement rate (NRR) used as a proxy for welfare generosity. The NRR is defined as the ratio between unemployment benefits and average wages. They find that welfare generosity acts as a magnet for immigrants, but its impact is relatively weak. On the other hand, labor market conditions in the destination countries (such as unemployment rates and wages) and networks play a vital role on the decision to move. A similar analysis was carried out by Pedersen, Pytlikova and Smith (2008). Their study, based on detailed immigration flows to OECD countries for the period 1990–2000, mainly focuses on exploring the impact of social networks on immigration. However, their regression analysis also controls for total social expenditure used as proxy for welfare generosity. Results from their preferred specification do not support the existence of a positive correlation between immigration and social expenditure.

To summarise, while theory suggests that immigrants — in particular, low-skilled — are more likely to move to generous countries, there is no strong empirical evidence that this is actually the case. This paper contributes to the recent empirical evidence in two ways: first it focuses on unemployment benefits as proxy for welfare generosity. Changes in public insurance programs affect the total income that working immigrants could obtain in the potential country of destination and hence influence their decision to move. Second, issues of the endogeneity of welfare generosity are directly addressed by exploring reverse causality between UBS and immigration.

3 Empirical framework

The hypothesis that immigration flows are correlated with UBS is tested with the following econometric model:

$$m_{it} = \alpha + \beta x_{it-1} + \mathbf{z}'_{it-1}\boldsymbol{\gamma} + \theta_i + \theta_t + \varepsilon_{it}, \qquad (1)$$

where m_{it} indicates immigration inflows expressed as a percentage of the total population in country i at time t, and x_{it-1} represents UBS. The parameter of interest (β) is the test of the welfare migration hypothesis and represents the marginal coefficient between immigration inflows and UBS estimated through within-country changes. The equation is estimated for both EU and non-EU immigration inflows. The matrix $\mathbf{z}_{it-1}$ includes, among other covariates, the social network variable. This corresponds to the stock of immigrants from the same origin of the flows (i.e. either EU or non-EU) as a percentage of the total population. Per-capita GDP and the unemployment rate of the destination country are also included in order to control for macroeconomic fundamentals correlated with immigration inflows. The model is estimated using country and year fixed effects to control for time-varying shocks common to all countries. In addition, an indicator for the years after the 2004 EU enlargement is introduced to capture changes in immigration patterns common to all receiving countries.[2] Due to the inhomogeneous size of countries, observations are weighted by population size.[3] To adjust for the fact that immigrants do not immediately respond to incentives in the host countries, all explanatory variables are used in their lagged values. Lags might also address problems of endogeneity, but only partially, especially if persistent

[2] While the inclusion of this variable does not substantially change the estimates, it does generally improve the fit of the model.

[3] Since weights must be constant when fixed effects are used, population size in the year 2000 is chosen. Sensitivity tests are carried out to assess the impact of observation weighting.

unobservable shocks contained in the error term are correlated with both the response variable and the covariates in the left hand side of equation (1). Issues of endogeneity are explored in section 5, where the IV and GMM approaches are discussed.

The welfare magnet hypothesis for international migration states that migrants move across countries because of differences in the welfare systems. The inclusion of fixed effects captures all the cultural and institutional factors that do not vary within a given country. The disadvantage of using fixed effects is that the information contained in cross-country variation is not incorporated into the estimated coefficients. We also estimated the corresponding models without country fixed effects. This invariably resulted in a insignificant correlation between migration inflows and UBS that supports our findings to reject the welfare magnet hypothesis. Cross-country variation could, however, mask statistically significant within-country effects. Such within-country effects may also be more relevant for the decisions of a country about reforming its welfare system. To strengthen the analysis we therefore proceed with the fixed-effect models, removing any time-invariant cross-country variation.

4 Data

The sample covers 19 European countries (the EU-15, excluding Greece, for which immigration inflows were not available, plus the Czech Republic, Hungary, the Slovak Republic, Norway and Switzerland) from 1993–2008.[4] Data were accessed from several sources. Gross immigration inflows come from the OECD Système d'observation permanente des migrations (SOPEMI) database, which provides consistent and harmonised data over time. These are used to calculate immigration inflows expressed as a percentage of total population in a country. Missing information on flows from some countries was complemented with the data used in Pedersen, Pytlikova and Smith (2008).[5] From SOPEMI, information on the stock of foreign-born population was obtained as well and was used to construct the social network variable (see Pedersen, Pytlikova and Smith, 2008). Data on UBS were collected from the OECD Social Expenditure Database (SOCX), which provides

[4] EU-15 member states are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom. The year 1993 coincides with the abolition of restrictions on internal labor mobility within the then European Community. Starting the analysis from this period facilitates the distinction between EU and non-EU flows. The panel is unbalanced because of the unavailability of data for some years. Details are presented in the Appendix.

[5] We are grateful to Peder Pedersen, Mariola Pytlikova, and Nina Smith for kindly providing us part of the data used in their paper.

detailed information on the social welfare spending in OECD countries.[6] Complementary information on the characteristics of UBS (such as eligibility criteria and duration) and on the expenditure on family, health and pension programmes were collected as well.[7] Finally, statistics on the unemployment rate and per-capita GDP were obtained from the World Development Indicators (WDI) online database.[8] Data on the number of parties in government coalitions were collected from the European Election Database.[9] Summary statistics are reported in Table 5 in the Appendix.

5 Results

5.1 OLS results

Table 1 reports the results of the estimation of the (fixed-effects) OLS regression of equation (1). The dependent variable in the model is the gross immigration inflow expressed as the percentage of population. For the sake of comparison, column (a) reports the results of the model without UBS. In such a model one would expect all components of $\mathbf{z}_{it-1}$ to be correlated with immigration flows. For example, immigrants are more likely to choose locations where individuals from the same origin have already settled. Similarly, a higher per-capita GDP and better employment conditions are expected to attract, all things being equal, more immigrants. The estimates of networks, GDP and the unemployment rate seem to confirm this hypothesis; however, the correlation is economically and statistically stronger for non-EU individuals.[10] For non-EU immigrants, the GDP is positively correlated with immigration (the point estimates vary between 0.017 and 0.019 across models), while for immigrants coming from EU countries, this correlation is essentially zero.[11] While for neither groups of immigrants is it possible to reject the null-hypothesis that unemployment is

[6] Source: http://www.sourceoecd.org/database/OECDStat.
[7] Source: OECD (2002, 2007).
[8] Source: http://data.worldbank.org/data-catalog/. Per-capita GDP is PPP adjusted and expressed in 2005 US dollars.
[9] http://www.nsd.uib.no/european_election_database/.
[10] For example, a change in the stock of EU immigrants of 0.1% (e.g., from the mean value of 4.5 to 4.6%) is associated with an increase of immigration flows which varies between 0.012 and 0.014% across specifications (at the mean value, this corresponds to an increase from 0.44 to around 0.45%). On the contrary, the increase of EU immigration flows associated with a 0.1% change in the network (e.g., from the mean value of 2.0 to 2.1%) is around 0.01% (at the mean value this corresponds to an increase from 0.12 to less than 0.13%).
[11] Since the logarithm of GDP is used in the regression, the estimate for non-EU immigration flows means that a 1% change on GDP is associated with a change of immigration flows from 0.44%, the mean value, to around 0.45%.

correlated with immigration, the size of the estimate would have been, in any case, negligible.[12]

In column (b), UBS is added to the specification. The estimated coefficient is positive for non-EU immigrants, but negative for EU immigrants, although imprecisely estimated. Taken at its face value, the estimate of 0.058 for non-EU immigrants means that a 1% change in UBS is associated with a change in immigration flows of less than 0.01%. A practical example is useful: If the UK were to experience a substantial increase in UBS from, say, 1.13% (the mean value) to 3.15% (the mean value in Germany), then there would be an associated change in immigration flows from 0.45% to 0.57%. In this particular case, a growth of UBS by a factor of nearly three correlates with a growth of about 1/4 in immigration flows. In contrast, the estimated coefficient for EU immigrants is essentially zero in terms of economic impact.

In column (c), a model is estimated, which includes other major social expenditure components (health, pensions, and family). The rationale is to control for potential omitted variables that might confound the correlation between UBS and immigration flows. After including these additional components, the estimate of UBS for non-EU immigrants increases only slightly (0.061 vs 0.058); however, this difference, besides being statistically insignificant at the 10% level, is also very small in terms of size. Similarly for EU immigrants, the addition of other expenditure components does not affect the essentially zero estimate.[13] Finally, in column (d), a model is estimated without weights. The UBS point estimates are, in absolute terms, slightly larger although the general pattern remains unchanged. The weighted estimates are generally preferred, especially for non-EU immigrants as they are closer to the predictions of migration theory both in terms of signs and magnitude.

In summary, estimates from OLS regressions demonstrate that there is a moderate within-country association between UBS and non-EU immigration inflow; however, the same cannot be said of EU immigrants. It should be noted that these results are mere correlation estimates. Hence, a more causal interpretation would require assessing how unobservable

[12] Since the inclusion of fixed effects absorbs cross-country, time-unvarying differences, a potential explanation for this weak relationship is that unemployment within each country does not vary substantially over time. An inspection of the unemployment rates confirms this conjecture: only Ireland, the Slovak Republic, and Spain exhibit important changes during the period under analysis, while unemployment rates are rather constant for the remaining countries.

[13] The estimates of the other components for non-EU immigration flows are 0.066 (s.e. 0.035) for family expenditure, -0.028 (s.e. 0.014) for health expenditure, and -0.039 (s.e. 0.025) for pension expenditure. For EU flows, the corresponding estimates are -0.001 (s.e. 0.010); 0.004 (s.e. 0.006); and -0.011 (s.e. 0.008).

factors attract immigrants. The following sub-section examines the potential threat to the internal validity of these results due to reverse causality.

5.2 Is unemployment benefit spending endogenous?

Two potential channels of endogeneity that might threaten the causal interpretation of the OLS estimates are now discussed. Both are cases of reverse causality, whereby social expenditure is a function of immigration. The presence of a simultaneity bias is best explained by the means of the following system of equations:

$$\begin{cases} m = \beta s + \varepsilon & \text{(2a)} \\ s = \gamma m + \eta. & \text{(2b)} \end{cases}$$

Equation (2a) is a simplified version of (1), and equation (2b) states that social welfare spending is a function of immigration. The estimation of (2a) by OLS will lead to simultaneity bias since:

$$p\lim \hat{\beta} = \beta + Cov\left(\frac{\gamma\varepsilon + \eta}{1 - \beta\gamma}, \varepsilon\right) \times \frac{1}{Var(m)} = \beta + \frac{\gamma\sigma_{\varepsilon}^2 + \eta}{1 - \beta\gamma} \times \frac{1}{Var(m)}. \quad (3)$$

Equation (3) shows that the size and magnitude of the bias depend (among other things) on the size and magnitude of γ, which captures the impact of immigration on spending. For example, the estimates obtained from OLS regressions might conclude that there is a positive (negative) welfare magnet effect. However, the true, exogenous impact of UBS on immigration could be much smaller (larger) in the presence of a positive (negative) bias. The following two channels of simultaneity bias are explored: a) the co-determination of immigration and UBS and b) the responsiveness of welfare policies to immigration.

The first possible channel is a consequence of the simultaneous determination of immigration and UBS. This occurs because immigrants access welfare, and hence, they affect s, the level of spending in equation (2b). Moreover, since UBS is expressed as a percentage of GDP, immigration simultaneously affects both the numerator (the amount of spending) and the denominator (how immigrants participate in GDP through consumption, taxes, and welfare spending). While it is difficult to provide a precise assessment of the effect of immigration on welfare spending, an indirect account can be given by comparing the welfare use of immigrants to natives. This is done in Table 2, where data for unemployment benefit recipiency are reported for natives, EU immigrants, and non-EU immigrants for the years 2005–2008. In particular, the first three columns report the unconditional take-up rates (percentage of individuals in each group who receive

unemployment benefits). With few exceptions, non-EU and EU immigrants show substantially higher unconditional probabilities of taking-up unemployment benefits than natives, determining a "disproportional" spending attributable to immigrants. However, these raw statistics do not take into account the diverse composition of immigrant groups. To this aim, the remaining columns of Table 2 report the probability of receiving unemployment benefits conditional on unemployment status and on socio-demographic characteristics (see Brücker et al, 2002).[14] After controlling for these characteristics, there is no longer evidence that immigrants take-up benefits more than natives; if anything, immigrants (particularly those from non-EU origins) exhibit lower rates of unemployment benefit recipiency. This evidence is in line with Barrett and Maître (2013), who find that after conditioning for unemployment status, immigrants are less likely than natives to receive unemployment benefits.[15] On the one hand, the disproportional benefit spending attributable to immigrants suggests that it is indeed important to take into account reverse causality as immigration might then lead to increased welfare spending. However, the figures in Table 2 also suggest that the relatively higher spending attributable to immigrants is the result of the composition of immigrant population rather than a consequence of their residual propensity to take-up welfare (holding characteristics constant).

The second possible cause of simultaneity bias explored is related to the responsiveness of unemployment benefit policies to immigration, given that institutions in the host country could intervene on expenditure legislation in response to high immigration. For example, if there is the perception of excessive expenditure caused by immigrant welfare dependency (i.e., immigrants take-up benefits more than they supply to the system through social contributions), then governments are more prone to reform aspects of the public insurance system that might discourage immigration (or favour return migration) such as eligibility criteria (contributions) and durations. Changes in these characteristics will, in turn, influence the level of UBS.[16] If this is the case, one would expect high-immigration countries to implement austere changes in the unemployment benefit system. To explore this hypothesis,

[14] A probit model is estimated for each of the three groups, pooling EU-SILC data for the years 2005–2008. The dependent variable is the probability of accessing unemployment benefits conditional on being unemployed. The explanatory variables contain gender, age, education and dummies for the country of residence. Observations are weighted by population size. Full estimates are available upon request.

[15] See Kahanec, Kim and Zimmermann (2013) for a discussion about the barriers immigrants face when accessing social benefits.

[16] For example, Razin, Sadka and Swagel (2002) argue that migration (in particular low-skilled migration) may lead to a lower tax burden in the long-run. They reason that there would be income redistribution as a consequence of immigration with native-born individuals moving towards the higher (and anti-tax) part of the income distribution.

Table 3 reports the levels of and the changes in the eligibility criteria (expressed by the months of employment contributions necessary to qualify for the unemployment benefit) and in the duration of unemployment benefits, for the period 1999–2007 (for which these data are available). Countries have been ranked in terms of non-EU immigration impact, represented by the change in the stock of immigrants as percentage of the population. There is no evidence that high immigration countries adopted more restrictive measures in terms of eligibility criteria. On the contrary, unemployment benefit duration has been reduced more in countries with relatively lower changes in immigration. This suggests the existence of a positive, although weak, impact of immigration on UBS, and further justifies the efforts to explore the reverse causality in the welfare magnet hypothesis.

5.3 IV estimates

The potential endogeneity issues just discussed can be addressed by means of an IV approach. In other words, in order to provide a causal interpretation to the welfare magnet hypothesis, a variable which is correlated with the exogenous part of expenditure but not with immigration shocks is required. The number of parties in a government coalition is chosen as the IV for UBS. This choice is motivated by an empirical study done by Bawn and Rosenbluth (2006) which shows that public sectors are larger when coalitions are formed by more political parties. Bawn and Rosenbluth use yearly, time-series, cross-sectional data from 1970 to 1998 in 17 European countries to show that government spending, as a fraction of GDP, increases with the number of parties in government and the effect is robust. The rationale is that in larger coalitions each party is liable only for a fraction of the government's political choices, resulting in greater public spending.[17]

The relevance of the instrument is explored by examining the first stage of the regression. This is done in Figure 1, where values of UBS (conditioning for all covariates in equation (1)) are plotted against the number of parties in the government coalition. The figure shows a strong correlation between the two variables — in particular, the estimate of the number of parties is 0.0019 (s.e. 0.0006).[18]

Instrument exogeneity requires that the number of parties is not correlated with the error term in the immigration equation. Although it is possible that election results are affected by

[17] A similar argument is used by Milesi-Ferretti, Perotti and Rostagno (2002), who document that proportional systems favor social welfare spending, while majoritarian systems are more likely to redistribute resources through public goods.

[18] Shea's R^2 is 0.11, and the Cragg-Donald Wald F-statistic is 26.78. In only three countries (Austria, Luxembourg, and the United Kingdom) did the number of parties in the governing coalition exhibit no variation over time.

immigration rates or that new parties arise as a consequence of high immigration, this is unlikely to alter the composition of the winning coalition in terms of the number of parties of which it is composed. In order to provide further evidence to the results above, a dynamic model is considered, whereby the lagged immigration inflows is included as an explanatory variable. The Arellano-Bond's system GMM technique is employed as the estimating technique.[19]

Table 4 presents the results related to IV and GMM estimations. After taking endogeneity into account, the coefficient for non-EU immigrants is essentially zero and statistically insignificant. On the one hand, these estimates suggest that, in the context of unemployment benefits, the welfare magnet hypothesis seems not at work; on the other hand, they reveal the presence of an upward bias in the OLS regressions. Likewise, for EU immigrants, IV and GMM estimates confirm the absence of any effect as found in Table 1.[20]

The presence of endogeneity indicates the existence of effects from immigration on UBS. It remains a topic for further research whether this is because immigrants access unemployment benefits with different intensity than natives, or whether their contribution to GDP is relatively different to their program participation, or, finally, whether policy makers' welfare generosity responds to immigration. Evidence was provided that these channels may be operative.

6 Conclusions

This paper has explored the role of UBS on immigration using a sample of EU countries during the period 1993–2008. While the estimates obtained from OLS regressions reveal the presence of a moderate within-country correlation between social welfare spending and immigration from non-EU origins, the IV and GMM estimates indicate that the causal effect is smaller and statistically insignificant, thereby rejecting the welfare magnet hypothesis. All estimates for EU immigrants are essentially zero, which suggests that immigration within the EU does not respond to unemployment benefit incentives.

Although the results are robust across specifications, it is important to point out potential limitations of the analysis. On the one hand, the absence of information detailing the country

[19] System GMM is an augmented version of GMM that uses the system of two equations, one differenced and one in levels. Variables in levels are instrumented with their first differences to increase efficiency. The second lag of the endogenous variables is used as the instrument because it is not correlated with the error term.

[20] In the GMM estimates, essentially all regressors are insignificant since most of their explanatory power is absorbed by the lagged dependent variable.

of origin, especially for immigration from outside the EU, might be confounding the existence of welfare magnet effects. Although the effect of UBS on immigration is zero on average, it is not possible to exclude it for immigrants from certain origins, unemployment benefits constitute a strong incentive to immigrate. Future availability of detailed data will allow the exploration of this hypothesis. As for EU immigrants, the finding that the estimated effect is essentially zero could be determined by either the fact that they are more skilled and hence, less likely to be attracted by welfare states (Brücker, 2002) or simply by their freedom of movement within the EU, which leads them to rely on (or refer to) their home country unemployment benefit system.

Finally, some descriptive evidence was provided showing a positive correlation between welfare and immigration due to two channels. First, inappropriate immigration policies in Europe may lead to an adverse composition of immigrants, which in turn results in a higher unemployment benefit take-up rate on the part of immigrants. Second, welfare policies may become more generous in the wake of immigration. These are fruitful areas for future research.

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Appendix

Description of SOPEMI database:

Information on stocks and inflows of foreign population in European countries is taken from the SOPEMI database. Data on foreign population and nationals are generally collected either from population registers or a residence permit database and covers the following periods: Austria, 1996–2008; Belgium, 1993–2007; the Czech Republic, 1995–2008; Denmark 1993–2007; Finland, 1993–2008; France, 1994–2008; Germany, 1993–2008; Hungary, 1995–2008; Ireland, 1994–2004; Italy, 1993–2007; Luxembourg, 1993–2006; the Netherlands, 1993–2008; Norway, 1993–2008; Portugal, 1993–2007; the Slovak Republic, 1993–2008; Spain, 1998–2007; Sweden, 1993–2003; Switzerland, 1993–2008; and the United Kingdom, 1997–2008.

Table 1. OLS estimates of immigration inflow rates

	(a)		(b)		(c)		(d)	
	Non-EU immigrants							
UBS			0.058	**	0.061	*	0.066	***
			(0.028)		(0.031)		(0.021)	
Stock of non-EU immigrants	0.141	***	0.129	***	0.123	***	0.079	*
	(0.028)		(0.026)		(0.028)		(0.039)	
Per-capita GDP	0.017	**	0.019	**	0.018	**	0.007	
	(0.007)		(0.007)		(0.007)		(0.004)	
Unemployment rate	-0.007		-0.015		-0.005		-0.026	
	(0.018)		(0.017)		(0.016)		(0.015)	
Constant	-0.056	**	-0.063	**	-0.053	**	-0.02	
	(0.023)		(0.024)		(0.021)		(0.014)	
R2	0.64		0.65		0.68		0.52	
	EU immigrants							
UBS			-0.009		-0.003		-0.012	
			(0.012)		(0.013)		(0.013)	
Stock of EU immigrants	0.072	***	0.075	***	0.068	**	0.094	***
	(0.021)		(0.025)		(0.027)		(0.021)	
Per-capita GDP	0		0		0		-0.003	
	(0.002)		(0.003)		(0.003)		(0.003)	
Unemployment rate	0.001		0.002		0.004		0.006	
	(0.005)		(0.006)		(0.006)		(0.005)	
Constant	0		0.001		0.002		0.008	
	(0.006)		(0.007)		(0.007)		(0.010)	
R2	0.28		0.29		0.29		0.37	
Weights	Y		Y		Y		N	
Other welfare components	N		N		Y		N	
N	248		248		248		248	

Notes: robust standard errors in parentheses. */**/*** indicate significance at the 10/5/1% levels. All models are estimated by fixed effects and contain year dummies. Weights are population counts of each country in the year 2000. Other welfare components are expenditure on health, family, and pensions.

Table 2. Unemployment benefit recipiency, 2005–2008

	Unconditional take-up rates			Conditional take-up rates		
Country	Natives	Non-EU	EU	Natives	Non-EU	EU
Austria	0.105	0.195	0.106	0.631	0.676	0.567
Belgium	0.152	0.193	0.162	0.810	0.752	0.799
the Czech Republic	0.049	0.035	0.049	0.330	0.234	0.257
Denmark	0.207	0.335	0.242	0.640	0.730	0.710
Finland	0.194	0.464	0.233	0.847	0.840	0.842
France	0.101	0.148	0.091	0.544	0.534	0.588
Germany	0.118	0.153[a]		0.721	0.710[a]	
Hungary	0.071	0.028	0.040	0.543	0.319	0.654
Ireland	0.108	0.093	0.092	0.621	0.496	0.559
Italy	0.127	0.204	0.184	0.230	0.286	0.281
Luxembourg	0.025	0.059	0.049	0.256	0.309	0.424
the Netherlands	0.052	0.065	0.060	0.448	0.208	0.494
Norway	0.047	0.102	0.054	0.350	0.370	0.356
Portugal	0.047	0.050	0.056	0.314	0.255	0.263
the Slovak Republic	0.030	0.013[a]		0.175	0.128[a]	
Spain	0.065	0.061	0.066	0.323	0.219	0.265
Sweden	0.107	0.160	0.098	0.377	0.316	0.462
the United Kingdom	0.018	0.025	0.017	0.368	0.345	0.304

Source:EU-SILC 2005 to 2008.

Notes: [a] Breakdown by EU/non-EU immigrants not available, figures refer to the average rate for the two groups.

Table 3. Employment contributions and durations of unemployment benefits

Country	Stock non-EU	Stock EU	Employment contributions		Durations	
	Δ 2007-1999	Δ 2007-1999	Value 1999	Δ 2007-1999	Value 1999	Δ 2007-1999
Spain	7.85	1.58	12	0	24	0
Luxembourg	4.72	1.15	7	0	12	0
Italy	3.45	-0.02	12	0	6	1
the United Kingdom	2.4	0.1	24	-12	6	0
Ireland	1.61	0.06	10	0	15	0
Portugal	1.59	0.32	18	-9	30	-6
the Czech Republic	1.41	0.16	12	0	6	0
Norway	1.3	0.34	12	0	36	-12
Finland	0.72	0.1	11	0	25	-2
Austria	0.62	0.74	12	0	10	-1
Switzerland	0.52	1.12	6	6	7	11
Denmark	0.34	0.25	12	0	60	-12
Sweden	0.26	-0.03	6	0	15	-1
the Slovak Republic	0.21	0.21	24	12	9	-3
Hungary	0.16	0.08	12	0	12	-3
France	0.07	0.12	4	2	60	-37
the Netherlands	0.01	0.07	7	0	60	-22
Belgium	-0.01	0.38	21	6	60	0
Germany	-1.24	0.5	12	0	12	0

Source: OECD (2002, 2007).

Note: The change in the stock of immigrants is expressed in percentage of total population. Employment contribution is given by the number of months of insured work needed for unemployment benefit entitlement. The duration of unemployment benefits is expressed in months.

Table 4. IV and Arellano-Bond estimates of immigration inflow rates

	EU immigrants				Non-EU immigrants			
	IV		GMM		IV		GMM	
UBS	-0.004		-0.001		0.040		-0.012	
	(0.022)		(0.006)		(0.065)		(0.033)	
Immigrants inflow			0.916	***			0.793	***
			(0.084)				(0.073)	
Stock of immigrants	0.073	***			0.133	***		
	(0.014)				(0.018)			
Per-capita GDP	0.000		0.000		0.019	***	0.004	
	(0.001)		(0.001)		(0.003)		(0.003)	
Unemployment rate	0.002		0.002		-0.012		-0.001	
	(0.003)		(0.001)		(0.011)		(0.007)	
Constant	0.002		0.000		-0.068	***	-0.013	
	(0.005)		(0.002)		(0.012)		(0.009)	
N	248		244		248		244	

Notes: robust standard errors in parentheses. */**/*** indicate significance at the 10/5/1% levels. All models are estimated by fixed effects and contain year dummies. All regressions are weighted by the counts of individuals in each country in the year 2000. The instrument is the number of parties in the winning parliamentary coalition. IV estimates are computed using the Stata command xtivreg2 developed by M.E. Schaffer. GMM estimates are obtained using the Stata command xtabond2 developed by D. Roodman.

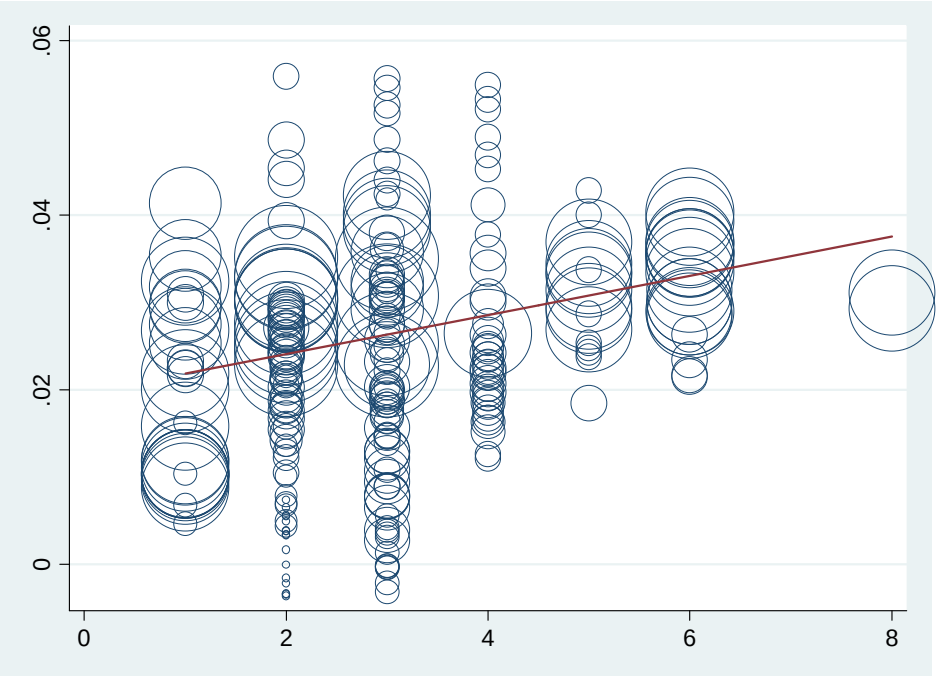
Table 5. Descriptive statistics

Country	Immigration inflow		Stock of immigrants		GDP	Unempl.	UBS	Number of parties
	non-EU	EU	non-EU	EU		rate	% GDP	in the ruling coalition
Austria	0.0077	0.0021	0.0770	0.0153	32059	0.048	0.022	2
Belgium	0.0033	0.0030	0.0322	0.0546	29819	0.082	0.063	4.6
the Czech Rep.	0.0033	0.0003	0.0231	0.0018	18431	0.066	0.012	2.6
Denmark	0.0032	0.0009	0.0375	0.0100	30877	0.054	0.068	2.6
Finland	0.0017	0.0003	0.0156	0.0034	27568	0.103	0.052	4.3
France	0.0014	0.0003	0.0650	0.0293	28311	0.099	0.032	5.2
Germany	0.0063	0.0015	0.0624	0.0240	30344	0.091	0.032	2.3
Hungary	0.0021	0.0002	0.0125	0.0018	16106	0.066	0.012	2.2
Ireland	0.0042	0.0040	0.0144	0.0505	30869	0.066	0.022	2.2
Italy	0.0034	0.0002	0.0268	0.0024	27165	0.098	0.010	5.8
Luxembourg	0.0063	0.0192	0.0638	0.3098	58634	0.032	0.012	2
the Netherlands	0.0036	0.0013	0.0308	0.0126	33119	0.045	0.036	3
Norway	0.0044	0.0022	0.0263	0.0177	43751	0.039	0.013	2.6
Portugal	0.0013	0.0003	0.0155	0.0056	19410	0.061	0.018	1.8
the Slovak Rep.	0.0012	0.0003	0.0057	0.0057	14720	0.150	0.009	3.3
Spain	0.0096	0.0016	0.0473	0.0191	26138	0.118	0.043	1.8
Sweden	0.0037	0.0011	0.0417	0.0144	27193	0.076	0.034	3
Switzerland	0.0063	0.0071	0.0810	0.1159	34516	0.036	0.018	4
the UK	0.0045	0.0010	0.0321	0.0154	31012	0.054	0.011	1
Weighted (mean)	0.0044	0.0012	0.0448	0.0202	28631	0.084	0.026	3.2
Weighted (sd)	0.0030	0.0014	0.0215	0.0205	4767	0.029	0.015	1.8

Source: Authors' computations from SOPEMI, WDI and SOCX databases;

Notes: Migration rates are expressed in the percentage of the total population in the country, and immigrants are distinguished by their origin — EU-15 or outside EU-15; GDP is measured in PPP 2005 dollars; and the number of parties in the winning coalition is taken from the European election database http://www.nsd.uib.no/european_election_database/. Data refer to averages over the years 1993–2008. Statistics at the bottom are weighted using population size in year 2000.

Figure 1: Predicted UBS (y-axis) and the number of parties in a governing coalition (x-axis)



Notes: The size of the circles is proportional to the population size of countries.