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Healthy Immigrant Effect or Over-Medicalization of Pregnancy? Evidence from Birth Certificates *

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Abstract

We investigate the consumption of health care by immigrants by using newborn- and mother-level data from birth certificates. We use a predictive algorithm based on machine learning to identify the observables affecting birth health outcomes and the use of prenatal care. Using these observables, our empirical analysis pinpoints an advantage of immigrants over natives regarding newborns' birth weight and a lower use of prenatal care and of c-sections by immigrant mothers. To disentangle the healthy immigrant effect explanation for our results from an over-medicalization of pregnancy explanation, we use an IV approach. Our results support the over-medicalization of pregnancy hypothesis.

JEL Classification: I12, I14, J15
Keywords: Healthy Immigrant Effect, Deliveries, Prenatal Care, Consumption of Health care

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1 Introduction

It is often assumed that immigrants consume less than the *optimal* level of health care in their host country. In studying optimal health care consumption, one can discern at least two nuances. First, it might be that the optimal level for immigrants is structurally different from that of natives, with the former being lower than the latter. This narrative belongs to the healthy immigrant effect (HIE) literature. However, it could also be that, conditional on specific treatments and health care services—the use of which in developed countries is known to be driven by factors beyond the medical needs of patients—the health care consumption of immigrants is optimal compared with overconsumption by natives.

We contribute to the literature on immigrants and health care consumption using unique administrative patient data from the Czech Republic.[1] We focus on childbirths and how differences in health outcomes at birth between natives and immigrants might be linked to the actual use of prenatal care. This is relevant for several reasons. The importance of birth outcomes, especially birth weight, in determining individuals' future health and economic performance is widely assessed by the economic literature (Corman et al., 1987; Behrman and Rosenzweig, 2004; Almond et al., 2005; Currie, 2009; Almond and Mazumder, 2011). The existing empirical work on this topic has shown some advantages of immigrant newborns compared to those of natives (Farré, 2016). Nonetheless, these studies do not take into account the actual use of prenatal care. Furthermore, pregnancy is a medical condition that in developed countries, is claimed to be over-medicalized, from the prescription of unnecessary tests up to an overuse of cesarean sections (*e.g.*, Johanson et al. (2002)). Drivers of the over-medicalization of pregnancy span from fears of medical malpractice to the reimbursement system. For instance, among the most common allegations in malpractice claims against obstetricians are the failure to perform timely c-sections (Sachs, 1989), and the lack of diagnosis of certain fetal pathologies. Therefore, c-sections, as well as additional screenings and medical checks during pregnancy, are seen as a form of defensive medicine to respond to intense medical malpractice pressure (*e.g.*, Localio et al. (1993), Dranove and Watanabe (2009), Shurtz (2013)).[2]

The literature on immigrants and health care consumption concentrates on two main issues. The first concerns the better health performance of immigrants, which in our case is reflected by three types of health outcomes (vitality, weight, and gestational length) at birth. The second regards

[1] Previous assessments are almost entirely, to the best of our knowledge, based on survey data with the only exception being (Farré, 2016).

[2] Malpractice pressure is the combined result of the probability of being sued and all the material and immaterial costs entailed by involvement in litigation. It encompasses not only the fear of litigation but also high liability insurance premiums and the unpredictability of victims' compensation.

the actual consumption of health care services in the host country, which we identify through the consumption of prenatal care: the beginning of prenatal care in the first trimester (*i.e.*, before the 13th gestational week), the number of controls in pregnancy (*i.e.*, more than 11), and whether the mother had only one ultrasound during pregnancy (see Section 2 for prenatal guidelines). We add to the prenatal measures also the likelihood of receiving a planned c-section. According to a HIE framework, we should expect immigrants to exhibit better health outcomes at birth and lower consumption of prenatal care and c-sections. We would also expect something similar in the case of over-medicalization of pregnancies, but the underlying assumptions would clearly differ.

The HIE identifies the health advantage that immigrants have over natives based on a set of possible drivers (Cervantes et al., 1999; Guendelman et al., 1999; McDonald and Kennedy, 2004; Wingate and Alexander, 2006; Rubalcava et al., 2008; Margioula-Siarkou et al., 2013; Farré, 2016), such as self-selection (Chiswick, 1999), higher marginal returns from the availability of more food and means (Stillman et al., 2012; Giuntella, 2016), or on the contrary, a better lifestyle in the country of origin (Abraido-Lanza et al., 1999). As a result, immigrants consume less health care services but end up with better health outcomes. By the same token, immigrants would not need any *ad hoc* policy to facilitate their consumption of health care in the host country. However, there is a dark side of the HIE, and assimilation might alter the situation as noted by Giuntella and Mazzonna (2015). As the original health advantage fades due to assimilation, the unequal use of health care could backfire for immigrants, who might ultimately face worse health outcomes due to a lack of appropriate prevention or limited use of basic services. This is why some scholars contend that it is necessary to design *ad hoc* policies to facilitate immigrant access to health care.

Those arguing for the over-medicalization of pregnancy, while accepting that natives and immigrants might require different levels of health care, remain skeptical that the *observed* differences in health care consumption are triggered by actual differences in medical needs. In other words, one potential explanation for the aforementioned difference is that the additional consumption of health care has zero marginal effects on the health outcomes of both immigrants and natives. While there is considerable empirical evidence on how changes in the incidence of cesarean sections would not affect health outcomes at birth because c-sections are overused (*e.g.*, Currie and McLeod 2008), it is more complex to prove the role of prenatal consumption.

The conventional wisdom associates early and more prenatal care with better outcomes at birth: one of the objectives of *Healthy People 2020* on *Maternal, Infant, and Child Health* is to "increase the proportion of pregnant women who receive early and adequate prenatal care". However, both the economic and medical literatures present mixed findings on the effect of prenatal care on the general population of mothers/newborns for both natives and immigrants. A branch of the eco-

nomic literature finds an impact only on subgroups of disadvantaged mothers (Sonchak, 2015), and an anemic impact—or no impact at all—of prenatal care on infant health (Grossman and Joyce, 1990; Kaestner, 1999; Currie and Grogger, 2002; Evans and Lien, 2005), while other papers justify these findings as a result of an inappropriate method of comparing pregnancies.[3] The existing epidemiological studies on immigrant newborns do not provide unequivocal evidence. In particular, those on European experiences link a higher risk of pre-term and lower birth weight among immigrants to a lower use of prenatal care (Troe et al. (2007); Kelly et al. (2008); Reeske et al. (2009). However, Malin and Gissler (2009) exploit the fact that immigrants and natives receive the same amount of prenatal care, with immigrant babies showing worse health outcomes than natives, as evidence against any HIE. By contrast, David et al. (2006) show that although immigrant mothers consume slightly less prenatal care, their babies outperform those of natives. The authors argue that the importance of family networks, rather than a superior health status of immigrants, is what leads to these outcomes.

Our work further enriches the evidence provided by the current literature. In doing so, we develop our analysis in four stages. First, we apply a machine learning approach to the entire population of deliveries in Czech public hospitals for a period spanning from 2000 to 2013 (1,546,211 deliveries). We use a predictive machine learning algorithm that is able to rank observable characteristics (mother- and pregnancy-specific) by correlation with our main variables of interest. In all cases, we let the algorithm rank the characteristics without imposing any priors (Currie and MacLeod (2017) and Mullainathan and Spiess (2017)).

Second, including the regressors identified by the first step, we perform a regression analysis on deliveries in the period 2005-2013 for which we know whether the mother was an immigrant and whether she came from a European (EU) or a non-European (non-EU) country (969,422 deliveries, 37,785 immigrants and 941,287 natives).[4] We run the regression analysis on five samples: the whole 2005-2013 population of births; a sample including only immigrants from non-EU countries for whom the immigration process should be more costly and therefore the self-selection (if any) should be stronger; a sample containing only births that occurred in the four main cities, where the most skilled immigrants are assumed to live and accessing care should be easier; a sample with only first-time mothers to reduce any role played by previous pregnancies; and a final sample with only first-time mothers of singletons. Overall, no robust difference is detected among the different vitality and the gestational length measures. There are no robust differences in the likelihood of

[3] Among others, Conway and Deb (2005) document that the lack of results stems from the fact that some researchers fail to distinguish between “complicated" and “normal" pregnancies, while Lu et al. (2003) argue that low birth weight cannot be prevented by the current way that prenatal care is implemented.

[4] Information on the country of origin is not available.

suffering from very low birth weight (*i.e.*, below 1,500 grams), but natives consistently weigh less at birth than immigrants (by from -13 grams to -30 grams depending on the sample).

Third, we examine the use of prenatal care and c-sections. Across all samples, natives are more likely to receive prenatal care by the 13th week of gestation (+14% to +18% at the mean of the variable in the different samples) and perform more than 11 medical controls (+16% to +22%). Similarly, they are also less likely to have only one ultrasound (-14% to -29%). Native mothers are more likely to undergo a planned c-section (+2% to +3%), while there is no robust result on a different use of emergency c-sections.

Assessing the link between prenatal consumption and health outcomes at birth faces substantial empirical challenges, as the consumption of prenatal care is clearly endogenous to unobservable characteristics. For instance, a family history of miscarriages could induce mothers to anticipate the use of prenatal care. It could also be that women who tend to have a healthier diet and lifestyle might be more engaged in prenatal care. As a result, basic ordinary least squares (OLS) estimations will overestimate the effect of prenatal care. To address endogeneity problem, we rely on an instrumental variable (IV) strategy based on a measure of hostility towards immigrants for a period that precedes our analysis (*see* Evans and Lien, 2005; Sonchak, 2015).

Our identification stems from the fact that immigrants might face challenges in accessing prenatal care due to linguistic barriers and information gaps. To decrease heterogeneities to the greatest possible extent, we build our instrument only for the subsample of immigrants. Specifically, we rely on the territorial differences across Czech districts in attitudes toward the main groups of resident foreigners in 2002 as an instrument for differences in the consumption of prenatal care by immigrants in the period 2005-2013. Our instrument captures different levels of "hostility" of the resident population toward the main groups of immigrants before the adhesion of the Czech Republic to the European Union (2005). We show that our instrument does not predict immigrants settlement pattern across districts or the distribution of their types (high risk vs. low risk). Unlike OLS results, the IV estimates do not detect a significant effect of increased prenatal care on health outcomes at birth. Hence, it appears that mothers' unobservable characteristics have a larger impact on health outcomes than does an additional unit of consumed prenatal care.

As the use of health care services may be driven by numerous non-medical reasons, our findings cast some doubt on the view that immigrants consume less than the optimal amount of health care. We believe that this should be taken into account when designing specific policies to facilitate immigrant health care consumption. Unfortunately, the available dataset does not allow us to further investigate the origin of the birth weight advantage of immigrants (*i.e.*, habits, family ties, genetics), which we leave as a fruitful avenue for future research.

The paper is organized as follows. Section 2 provides an overview of the type of immigration and health care system in the Czech Republic. Section 3 describes in detail the data and outcomes, while Sections 4 and 5 present the machine learning approach and the regression analysis and related results respectively. Section 6 studies the role of prenatal care and Section 6 concludes the paper.

2 Health and Immigration in the Czech Republic

The Czech health care system ensures universal coverage through a statutory health insurance (SHI) that prescribes compulsory income-based membership in a health insurance fund for all residents. These funds are semi-public, self-governing entities operating under public law. They are responsible for purchasing health care services for their members on the basis of contracts signed with the individual health care providers (Alexa et al., 2015).[5] Health insurance automatically covers all permanent residents of the Czech Republic, as well as non-permanent residents who work for an employer based in the country.[6]

Once insured, individuals can freely register with the general practitioner of their choice. Patients can also directly visit specialists without any referral; thus, general practitioners do not actually act as gatekeepers in the Czech Republic. The majority of hospitals are public facilities directly owned and managed by public authorities (*i.e.*, the Ministry of Health, regions, districts, and municipalities).

Insurance provides full coverage for the medical examinations and screenings recommended during pregnancy. The beginning of prenatal care coincides with the first gynecological examination that diagnoses the pregnancy and its gestational age. At this stage, the gynecologist also issues the so-called pregnancy card (ID) where all controls and examinations will be registered. Table 1 summarizes the guidelines generally followed in the Czech Republic for prenatal care. For comparison, we also report the guidelines proposed by the Office on Women's Health in the US Department of Health and Human Services. The recommended controls are more conservative in the Czech Republic than in the US, with only one visit per month up to the 36th week of ges-

[5] Every year, funds and providers negotiate the conditions of these contracts and the negotiations are hosted and supervised by the Ministry of Health, which acts as an arbiter between the two parties. The Ministry is also in charge of setting of the health policy agenda, while regional governments are tasked with the licensing and supervision of health care providers.

[6] The SHI coverage offers a wide range of benefits including inpatient and outpatient care, drug prescriptions, rehabilitation, some dental procedures, and over-the-counter drugs (when prescribed by a doctor). Health services were offered free of charge until 2008, when user fees and co-payments for drug prescriptions and certain health services (*e.g.* ambulatory services) were introduced for the first time. However, out-of-pocket payments are marginal: for instance, fees for both doctors visits and per prescription amount to 30 CZK (1.20 euros).

tation, increasing thereafter. However, the number of recommended ultrasounds during a regular pregnancy is in the Czech Republic double that in the US (four versus two). Overall, a low risk pregnancy for a woman reaching the 38th gestational week would entail 11 controls according to the Czech guidelines and 14 controls according to the US guidelines.

Table 1, about here

Immigration in the Czech Republic has been steadily increasing in the recent decades. After its split from Slovakia in 1993, the Czech Republic began to attract immigrants thanks to a favorable migration policy and a strong labor market.[7] In 2004, its accession to the European Union further encouraged immigration as shown in Figure 1. As a result, in 2005, 3% of the population were foreigners, while by 2013, this figure had grown to 4.2%, of whom 40% are female. As shown in Table A1 in the Online Appendix, during our observational period, between 69% (2005) and 60% (2013) of immigrants come from non-EU countries among which Ukraine is the most represented country of origin followed by Vietnam and Russia. The remaining part is composed by EU nationals who are primarily Slovaks, with strong communities of Germans and Poles.[8]

Figure 1, about here

Immigrants are distributed across the 90 districts of the Czech Republic.[9] Based on the 2008 International Migration Statistics of the OECD, the foreigners in the country mainly belong to the 25-64 age group regardless of their nationality, while Europeans and non-Europeans differ in the duration of their stay in the country (Figure 2). European immigrants report longer stays, as more than 75% of them have been in the Czech Republic for more than 10 years. For the largest share of non-European immigrants, the data show that they have lived in the country for a minimum of 5 years and up to 10 years. The percentage of foreigners unemployed is extremely low and they tend to be employed in white collar jobs.[10]

Figure 2 , about here

[7] The 2007/2008 Great Recession did not particularly damage the Czech labor market.

[8] The country reports a very low level of illegal immigration as the average number of illegal stays amounts to 0.03% of the Czech population according to the latest statistics from the Directorate of the Alien Police Service.

[9] According to the classification used by the NRROD, Prague is divided into 15 districts, rather than being considered a single district.

[10] For simplicity, the distinction applied is only between blue and white collar jobs. The latter refer to occupations that primarily entail professional, managerial, clerical or administrative work, while the former include all forms of skilled and unskilled manual labor.

Consistent with the increasing number of immigrants, shown in Figure 1, Table 2 shows that the share of immigrants giving birth in the Czech Republic increased from 2% in 2005 to 5% in 2013. Among foreigner mothers, non-EU nationals tend to be slightly more represented than the EU nationals (54% versus 46%) and this difference is generally stable during the period of our research.

Table 2, about here

3 Data and Outcomes

With data drawn from public hospitals in the Czech Republic, we employ a unique database that provides information on newborn and maternal health outcomes (during and after pregnancy), as well as information regarding pregnancy screenings and other individual information. For the period 2000-2013 we have the universe of deliveries for a total of 1,546,211 observations. The data are based on the hospital discharge records recorded in the National Register of Mothers at Childbirth (Národní registr rodicek – NRROD) and were provided by the Institute of Health Information and Statistics (Ústav zdravotnick'ych informací a statistiky).

From the universe of deliveries, we dropped mothers (*i.e.*, 13,688 observations) who resorted to *in vitro* fertilization (IVF), as both their pregnancy and consumption of health care are expected to structurally differ from those of the remaining population of mothers. After also dropping cases in which the information about the maternal age, marital status or education is missing, and those without the sex of the newborn, we count 1,531,670 observations for the period 2000-2013. We exploit these data to identify the regressors for our econometric analysis through a machine learning approach as explained in Section 4. In contrast, to study the differences (if any) in health performance and consumption of care between immigrants and natives, we have to restrict our observational period to the period 2005-2013. This is because information about mothers' nationalities was systematically recorded starting in the year 2005 with a distinction between EU and non-EU countries of origins due to the 2004 entry of the Czech Republic into the European Union. As a result, the final dataset for our regression analysis counts 979,072 observations.

Our outcomes of interest can be divided into three groups: birth health outcomes, use of c-sections, and use of prenatal care. In investigating the health performances of newborns, we use different measures of neonatal vitality, birth weight and gestational age. Specifically, $Apgar\ 1$ and $Apgar\ 5$ are dummies that represent an Apgar score less than or equal to 7, measured at 1 and 5 minutes after birth respectively. Apgar scores are commonly used vitality indicators to evaluate

the health of the newborn and her need for resuscitation measures. A value lower than 8 indicates critical neonatal conditions. Two other dummies are used to capture serious health conditions for newborns: *Low weight*, which indicates whether the newborn faces life-threatening situation (weighting less than 1,500 grams), and $Pre-term$, which tells us whether the baby is premature (born before the 35th gestational week).[11] Finally, we also take into account two general measures of a newborn's health: the weight at birth expressed in grams (*Weight*) and the length of the gestational period expressed in weeks (*Gestational age*). We also distinguish the reasons for the use of c-sections. $Emergency\ C-section$ indicates whether the mother underwent a c-section for emergency reasons, while $C-section$ captures the performance of a planned cesarean delivery.

In studying the use of prenatal care, we are interested in both its timing and intensity. On the timing side, we focus on whether there was any prenatal care within the first trimester ($Prenatal13$). We capture the intensity of care using two dummies. $Only\ 1\ ultrasound$ equals one if the mother received only 1 ultrasound, and $Number\ of\ Controls$ equals one if the number of controls was equal to or above 11, which as we show, is the recommended number of controls for a normal pregnancy.

Table 3 reports the descriptive statistics of our outcomes. Overall, it appears that native newborns weigh slightly less than immigrant newborns and are less likely to have a low Apgar score, regardless of how this score is defined. In addition, native babies are less likely to be extremely immature (< 1,500 grams) or pre-termed. Similarly, native mothers appear less likely to undergo a c-section regardless of the nature of the procedure (*i.e.*, planned or emergency). The differences between natives and immigrants become unequivocal when we examine the use of prenatal care. Compared to immigrants, natives are less likely to have only 1 ultrasound, more likely to start prenatal care during the first trimester of pregnancy, and more likely to receive more than 11 controls.

Table 3, about here

4 Machine Learning Approach

In health economics, outcomes are explained as functions of a set of regressors that are usually selected following the expectations and predictions commonly shared by health care professionals. For example, when the dependent variable is the use of a c-section, it is good practice to include, among other regressors, the mother's age and whether it is a multiple pregnancy. Nevertheless,

[11] 35 weeks is the threshold identified by a machine learning approach to identify the main conditions associated with the death of a newborn.

using this criterion is not free from limitations. Different approaches to delivery methods and pregnancy care might consider different factors to be essential. As shown in Table 1, there might be general guidelines on the amount and timing of prenatal care, but the actual consumption of care might vary substantially depending, for instance, on previous pregnancies of the mother or her risk profile. To overcome these potential limitations and fully exploit the richness of the administrative data, we select the regressors for each of our outcomes by applying a Logic Learning Machine analysis (LLM) as in Currie and MacLeod (2017) and Mullainathan and Spiess (2017). The intuition for this choice is simple. There might be a multitude of observable characteristics that could play a role in explaining the variation in a given outcome. However, it could be that the combination of just few of them is able to explain most of this variation. Based on actual data, the machine learning analysis identifies these observables.

At this stage, it is not necessary to differentiate between immigrants and natives and we can use the universe of deliveries that occurred during the period 2000-2013 (1,531,670 observations). A longer time period, and thus a larger dataset, allows us to fully exploit any relationships in the data without relying on *ex ante* personal priors but rather "training" correlations on actual data. The training process we employed is performed through a rule-generation method based on the synthesis of positive Boolean functions on the Rulex platform. We select models with a prescriptive capacity that always exceeds 90%, while their predictive capacity with respect to the whole dataset is close to 99%. The analysis is performed allowing a maximum error of 5%, that is the percentage of cases in which the output of the predictions differs from the output of the model. Therefore, the chosen error allows us to mitigate the probability of having problems of overfitting or underfitting.

Through a future ranking function, each model first identifies the bundles of variables that are actually correlated with the outcome under investigation, and then ranks these correlations. Based on these rankings, we include as regressors in our analysis the 20 conditions among maternal and pregnancy characteristics that are the most correlated with each birth health outcome and measure of c-section use. Since the different outcomes share several of these top-20 most-correlated conditions, we ultimately control for a total of 45 elements that we divide into four sets of covariates. As shown in Table 4, the first set of covariates, $Mother_i^{'}$, controls for the basic socio-economic characteristics of the mother (*e.g.*, education, marital status).[12] The second, $Pregnancy_i^{'}$, captures the risk profile of the pregnancy (*e.g.*, obesity, HIV, multiple pregnancy), the third, $Extra_i^{'}$, includes additional risk conditions that matter when we are not considering first-time mothers (*e.g.*, previous pre-terms, previous miscarriages), while the fourth, $Delivery_i^{'}$, controls for the type of medical intervention provided during the delivery (*e.g.*, failed induction, use of forceps and/or vacuum).

[12] Although information on income and employment status is not available through the birth registry, marital status and education indirectly control for most of the wealth effect.

Table 4, about here

We replicate the same machine learning analysis with respect to the prenatal outcomes and find that, regardless of the specific outcome considered, the conditions driving the use of prenatal care are mostly the same although the magnitude of the correlations changes (Figure 3). As a result, when investigating the use of prenatal care, we have one common set of controls $Drivers_i^{'}$, that includes the maternal age, whether the mother smokes, is drug addicted or diabetic, whether she has an elementary degree and whether she suffers from anemia, hypertension, problems with the amniotic fluid, bleeding problems, or pre-eclampsia.

Figure 3, about here

5 Regressions approach

We run the regression analysis on both birth outcomes and the performance of c-sections, as well as on the use of prenatal care. For each birth outcome of delivery i that took place in hospital h in year t we estimate the following model:

$$\begin{aligned} Birth\_outcome_{iht} = {} & Native_i\beta + Mother_i^{'}\delta + Pregnancy_i^{'}\sigma + Delivery_i^{'}\eta + Extra_i\lambda \\ & + \alpha_t + \tau_m + \pi_d + \varepsilon_{iht}, \end{aligned} \tag{1}$$

where α_t are year fixed effects, τ_m are month-of-conception fixed effects,[13] and π_d are the mother's district fixed effects. Fixed effects are used to control for any time-invariant characteristics at the district level that might affect immigrants' access to health care and health-related conditions. We add four vectors of controls as identified in Section 4. The coefficient of interest is β, which is the coefficient of the dummy *Native* that is equal to one if the mother is a native and zero if she is an immigrant.[14] The same model applies when the dependent variable is the performance of a c-section (*i.e.*, either an emergency or planned) with respect to delivery i that took place in hospital h in year t.

When studying the consumption of prenatal care, we modify Equation (1) as follows:

[13] Pregnant women during the fall/winter months might have a poorer eating regime versus pregnant women in the spring/summer months. Currie and Schwandt (2013) demonstrate that women who conceived in May tend to deliver lighter babies because these pregnancies are more exposed to flu season.

[14] A person acquires Czech citizenship when at least one of her parents is Czech. Children born in the Czech Republic to foreign parents can obtain Czech citizenship if the parents request it before their 15th birthday. However, naturalization is not automatic as it requires the approval of the Interior Ministry.

$$Prenatal_{iht} = Native_i\beta + Mother_i^{'}\delta + Drivers_i^{'}\sigma + \alpha_t + \tau_m + \pi_d + \varepsilon_{iht} \quad (2)$$

We estimate the model described by Equations (1) and (2) on five different samples. The first sample includes all deliveries that occurred during 2005-2013. Then, we exploit the fact that the selection of immigrants and the consequent HIE is expected to be stronger the farther away the country of origin is (Chiswick, 1999). This means that non-EU nationals, who come primarily from Ukraine, Russia, and Vietnam, should have better outcomes and need less prenatal care compared to EU nationals who come primarily from Slovakia, Germany, and Poland, as noted by the descriptive statistics. Hence, we define our second sample to include data on natives and non-EU immigrants. Given the characteristics of immigration to the Czech Republic, we also expect the most skilled immigrants to tend to locate in the largest cities, where health care professionals and facilities might be more accustomed to foreigners.[15] As a result, the third sample includes only the deliveries that took place in one of the four main Czech cities: Prague (1,259,079 inhabitants, 2011 Census), Brno (377,440), Ostrava (294,200), and Plzen (169,033). The fourth sample focuses only on the deliveries of first-time mothers. This is done to reduce the possible systematic heterogeneities in the data. Mothers who experienced a previous pregnancy or delivery are more likely to suffer from more complications, be older, and carry heavier babies than first-time mothers. Finally, to further reduce these heterogeneities, we drop from the latter sample multiple pregnancies. Hence, our fifth and last sample concerns only the deliveries of first-time mothers of singletons.

5.1 Results

Table 5 presents the results for the different measures of health at birth and that of c-section based on the five samples we discussed above. On the newborns' side, the only robust advantage of immigrants over natives is in birth weight. Our preferred specification, which includes all observable characteristics and fixed effects, reveals that native newborns weigh approximately 14 to 30 grams less (depending on the sample used). In the sample of first-time mothers of singleton babies, native newborns weigh 25 grams less than immigrant newborns. Furthermore, our analysis reveals that there is no statistically significant difference between native and immigrant babies in terms of Apgar scores and gestational age. The same holds for emergency c-sections, although for the case of native mothers we find that the use of scheduled c-sections is higher—based on the sample used the

[15] We expect higher skilled medical practitioners to be found in large urban centers, which are also better equipped with medical supplies. Since we cannot control for the type of job an individual has, we expect that jobs requiring highly skilled employees will be found in urban areas, where agglomeration is more likely to occur.

numbers vary, spanning from a low of +2.3% to a high of +3%. The results on c-sections reverse what we observed in the descriptive statistics, where immigrants appear to receive more cesarean deliveries. This provides further evidence of the soundness of the control variables.

Table 5 about here

Table 6 shows that native mothers are between 15.5% (in the sample of non-EU immigrants) and 17.9% (in the sample of first-mothers of singleton babies) more likely to receive prenatal care in the first trimester, 18.7% to 41% less likely to have only one ultrasound, and between 16.7% and 22% more likely to have more than 11 controls during their pregnancy. Aside from the sample of non-EU immigrants, and that of first-time mothers of singletons, these results are consistently robust. The estimation of Equation (2) conditional on the use of some prenatal care confirms these findings.

Table 6 about here

6 Disentangling the Channels

If we focus on the sample of first-time mothers of singletons, immigrant mothers consume less prenatal care, perform their first ultrasound a little later during their pregnancy, and deliver heavier babies using fewer planned c-sections. These findings are consistent with both the HIE and over-medicalization of pregnancy hypotheses. According to the HIE hypothesis, natives and immigrants should have different optimal levels of health care consumption, with the latter requiring less health care, as they are positively selected (on average they have better health than natives). According to the hypothesis of the over-medicalization of pregnancies (*e.g.*, Van Teijlingen et al. (2010)), in developed countries, pregnant women have more medical screenings, checks, and ultrasound examinations, as well as c-sections than what is required by their medical needs. Thus, the presence of over-medicalization leads to levels of health care consumption above the optimal value.

In this section we address the link between consumption of health care (defined as the consumption of prenatal care during pregnancy) and health outcomes at birth. However, the task of empirically evaluating the role of prenatal care poses several challenges. The main challenge is the presence of unobservable factors that allow mothers to benefit the most from the use of prenatal care regardless of a low level of usage. For instance, mothers more committed to prenatal guidelines might have healthier lifestyles. Thus, it could be that they have better health outcomes (themselves and their babies) not because they visited the doctor more often than others but because they were

healthier in the first place. Hence, a standard OLS approach would undermine and cast doubt on our research outcomes. To overcome these difficulties, we rely on an IV strategy that focuses solely on the population of immigrant mothers. If patients always benefit from more prenatal care, then on average the health outcomes of immigrants should improve as their consumption of health care increases.

Thus, we first apply an OLS strategy to estimate Equation (3) and then compare its results with those of an IV strategy of which Equation (4) represents the first stage.

$$\begin{aligned} Birth\_outcome_{iht} = {} & Prenatal_i^{'}\rho + Native_i\beta + Mother_i^{'}\delta + Pregnancy_i^{'}\sigma + Delivery_i^{'}\eta \\ & + Extra_i\lambda + \alpha_t + \tau_m + \pi_r + \varepsilon_{iht} \end{aligned} \tag{3}$$

$$\begin{aligned} Prenatal_{iht} = {} & Hostility_i^{'}\chi + Native_i\beta + Mother_i^{'}\delta + Pregnancy_i^{'}\sigma + Delivery_i^{'}\eta \\ & + Extra_i\lambda + \alpha_t + \tau_m + \pi_r + \varepsilon_{iht} \end{aligned} \tag{4}$$

To instrument the use of prenatal care, we exploit the attitude of Czechs toward the main foreigner nationalities resident in the country. How immigrants are perceived by the local community in which they live might affect the effort that the community itself spends on facilitating the integration of foreigners. In particular, it is reasonable to expect that the more positive the attitude of people toward certain groups already in the country is, the more services and/or polices are in place to facilitate their integration into the community. To measure the Czech attitude toward foreigners, we rely on a survey conducted in 2002, before the country's entry into the European Union, on the relationship between Czechs and the different major groups settled in the country (Karlova, 2002), which are Germans, Poles, Slovaks, Russians, Ukrainians, and Vietnamese. In particular, respondents were asked to express on a scale from 1 (*i.e.*, absolutely agree) to 5 (*i.e.*, absolutely disagree) how much they agreed with the presence of each one of these groups in the Czech Republic. The average score obtained by each nationality expresses how hostile the attitude of Czech people is toward the presence of that group. The higher the average score, the worse the perception by Czechs.[16] For each district, we multiply these scores by the number of residents belonging to the related foreign group. Dividing the sum of the resulting figures by the total number of foreign residents belonging to all major foreign groups, we obtain an index named $Hostility$, which is time

[16]For instance, Slovaks score 1.6, making them the most welcomed foreign group by Czechs. By contrast, Ukrainians score 3.2, making them the least welcomed group in the country.

invariant at the district level.[17] The higher the value of the index is, the greater the presence of the least welcome foreign groups in a district, and thus the less favorable we expect the general attitude of the native population to be toward the presence of immigrants. However, it is evident that a higher *Hostility* index does not coincide with a negative opinion of all types of immigrants. Therefore, a higher index is not necessarily associated with a low presence of immigrants *per se*.

The instrument has two challenges for the exclusion restriction assumption. The first is that attitudes toward immigrants in 2002 might have affected immigrants' location, with immigrants settling only in the most "welcoming" districts. By comparing the differences in the hostility index across districts with the actual distribution of foreigners, becomes clear that there is no selection of immigrants in favor of the least hostile districts (Table 4). In 2002, the districts recording the highest percentages of resident foreigners are those characterized by high levels of hostility. The same trend is also confirmed when examining the distribution of foreigners in 2013. Note that although immigrants are located primarily in the hostile districts, the presence of immigrants increased consistently throughout the country. The second challenge is given by the distribution of different types of immigrants in terms of health across the different districts. In other words, we could have the most "self-selected" immigrants being located in the less-welcoming districts, while those immigrants with lower health capital settle in more-welcoming districts. However, this is not generally the case as shown by Figure 5 where the distribution of *Hostility* among Czech districts is compared to that of the four main predictors of prenatal health care consumption in 2005: mother's age, having an elementary degree, smoking, and suffering from anemia. The more hostile districts (*i.e.*, the darker areas) tend to not coincide with those where immigrant mothers smoke less, suffer less from anemia, or are on average younger or more educated (*i.e*, lighter areas). Moreover, self-selection by immigrants based on their health should not be a concern because we always control for the risk profile of mothers.

Figures 4 and 5, about here

Since our instrument is fixed at the district-mother level, to identify both Equations 3 and 4, we have to include regional fixed effects (*i.e.*, π_r) instead of mother's district fixed effects. Overall, there are 13 regions plus the city of Prague with regional status in the Czech Republic and these are the administrative units just above districts, which allow us to control at a broader territorial level.

Tables 7 and 8 show our results for the two samples where possible heterogeneities are minimized, that is, the sample of first-time mothers and that of first-time mothers of singletons. It is

[17] For example, imagine a district where there are 200 Slovaks and 150 Ukrainians. Then, the *Hostility* index is given by [(200*1.6)+(150*3.2)]/(200+150)=2.29.

apparent that the OLS estimates are upward biased. All the considered measures of prenatal care consistently improve newborns' health. Beginning prenatal care within the first trimester and conducting more than 11 controls reduce the likelihood of reporting the Apgar scores below 7, of being highly premature (*i.e.*, birth weight <1,500 grams) and of being born before the 35th week of pregnancy, while improving the weight and gestational age of newborns. Consistently, performing only 1 ultrasound leads to the opposite results. However, once we introduce the IV approach, higher or more timely consumption of prenatal care does not produce any effect. The comparison of the OLS and IV results favor the hypothesis of the over-medicalization of pregnancies.

7 Conclusions

The medical and economic literatures have long supported the existence of the so-called healthy immigrant effect. Immigrants should enjoy a health advantage relative to the natives of the host country; thus, a lower use of health care services by immigrants has commonly been associated with immigrants seeking less-than-optimal care. However, no evidence has been provided of actual sub-optimal use of health care by immigrants, and an alternative story exists. At present, over-medicalization is a widely debated topic, especially in developed countries. According to this view, non-medical reasons play an important role in determining the provision of health services; thus, they can inflate the consumption of care. In such a setting, less consumption of care by immigrants relative to natives might simply mean that immigrants are not overusing health services, while natives are.

Using administrative data from the register of births in the Czech Republic, we use the consumption of prenatal care and health outcomes at birth to provide support for the hypothesis of the over-medicalization of pregnancies and to raise some doubts that lower consumption of health care is always negative for patients. Our results show that immigrant newborns have an advantage over native newborns in terms of birth weight despite that the former mothers tend to receive less prenatal care. Using an IV approach, we provide evidence of a lack of positive effects of additional prenatal care on birth outcomes; thus, we conclude that the lower use of care by immigrant mothers relative to native mothers cannot be defined as sub-optimal.

Although our findings concern the case of pregnancies and prenatal care, they have important policy implications. First, we provide empirical evidence that increased prenatal care does not necessarily benefit patients (*mothers and/or newborns*). Second, this evidence also undermines the commonly accepted idea that immigrants receive less care than needed. The traditional assumption of below-optimal care for immigrants may not hold once we examine the specific health service

under investigation. As the phenomenon of over-medicalization spreads, immigrants may be less easily subject to it, ultimately reporting a lower health care consumption that cannot be defined as sub-optimal. Policy makers should take this possibility into account when claiming the necessity of facilitating the access of immigrants to the health care system and target their interventions on the basis of the specific health services under consideration.

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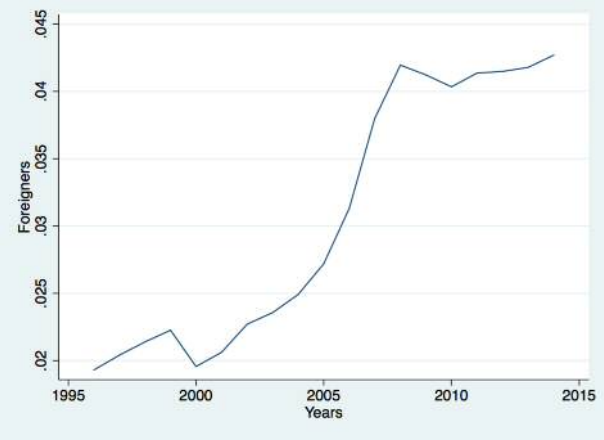
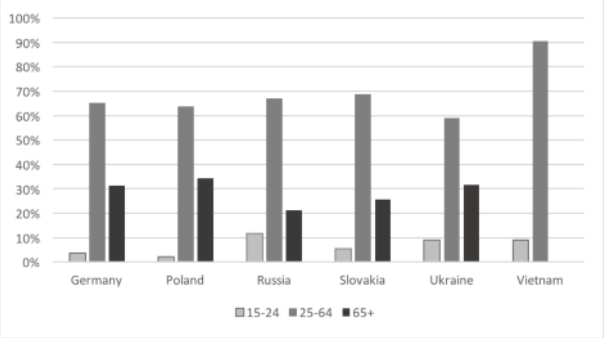
Figure 1: **Foreigners in the Czech Republic**



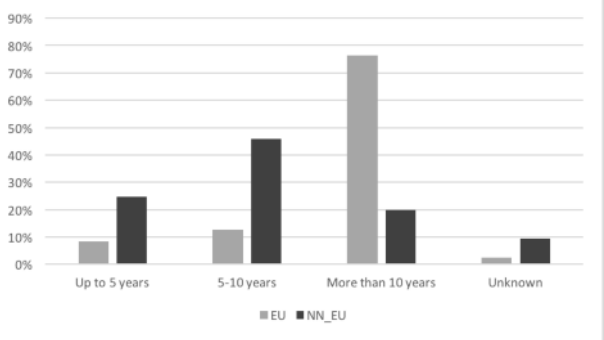
Notes: Distribution of the percentage of immigrants out of the total population in the Czech Republic between 1995 and 2015. Source: Institute of Statistics in the Czech Republic.

Figure 2: **Foreigners in the Czech Republic**

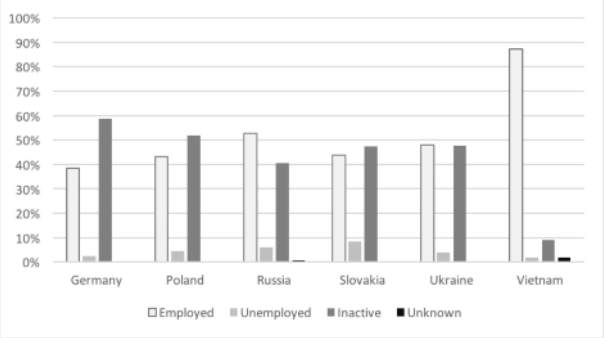
(a) Age



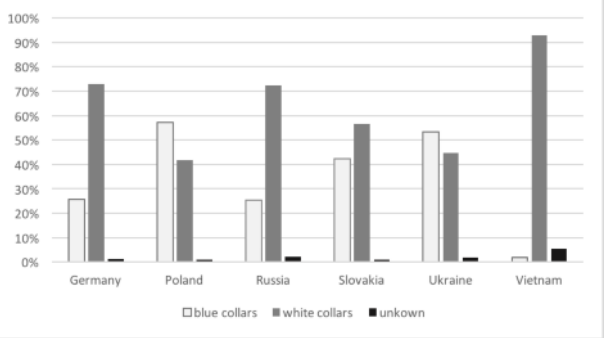
(b) Duration of Stay



(c) Labor Status



(d) Blue vs. White Collars



Notes: Data for these figures are from the Database on Immigrants in OECD Countries (DIOC), which covers the resident population 15 years old and above. Data for the Czech Republic are based on register data from 2005, Census 2001, and the labor force 2005. White collar jobs refer to occupations primarily involving professional, managerial, clerical or administrative work, while blue collar occupations include all forms of skilled and unskilled manual labor.

Table 1: **Prenatal Guidelines**

Number of Examinations	Czech Republic	U.S. Department of Health and Human Services
	Controls	
1	monthly up to week 36	monthly up to week 28
2	monthly between week 36 and 38	monthly between 28 and 36
1	weekly between week 39 and 40	weekly from week 36 on
	Ultrasounds	
1	upon pregnancy diagnosed	
1	around week 12	between week 11 and 14
1	between week 18 and 20	between week 18 and 20
1	between week 30 and 32	

Notes: Guidelines for the Czech Republic are based on (Cermakova, 2008). Guidelines for the US are provided by the US Department of Health and Human Services, Office on Women's Health. See https://www.womenshealth.gov/a-z-topics/prenatal-care. The guidelines refer to a normal pregnancy. Adjustments are introduced in the case of an at-risk pregnancy.

Table 2: **Delivery Distribution (2005-2013)**

Years	**Deliveries**	**Foreigners**	**EU**	**Non EU**
2005	99,164	2,063	987	1,076
2006	102,744	2,899	1,297	1,602
2007	110,929	3,498	1,489	2,009
2008	116,182	4,232	1,692	2,540
2009	114,550	4,803	1,977	2,826
2010	113,164	4,765	1,989	2,776
2011	105,198	4,788	2,074	2,714
2012	104,684	5,001	2,149	2,852
2013	102,807	4,928	2,254	2,674
Tot	969,422	36,977	15,908	21,069

Notes: *EU* means European Union citizens, mainly immigrants from Germany, Slovakia, and Poland. *NoEU* means non-European Union citizens, mainly immigrants from Ukraine, the Russian Federation, and Vietnam.

Table 3: **Outcomes Descriptive Statistics**

Variables	Whole sample		Natives		Immigrants		EU citizens		Non-EU citizens	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Newborns										
Apgar 1	0.073	0.259	0.072	0.259	0.080	0.271	0.076	0.264	0.083	0.276
Apgar 5	0.018	0.133	0.018	0.133	0.021	0.144	0.020	0.140	0.022	0.147
Weight	3,306.119	542.197	3,306.015	553.510	3,308.747	553.510	3,282.859	562,555	3,328.293	545.781
Low weight ($<$ 1,500 gr)	0.009	0.093	0.009	0.093	0.012	0.109	0.011	0.102	0.011	0.102
Pre-term ($<$ 35 wks)	0.028	0.164	0.027	0.163	0.032	0.175	0.035	0.184	0.029	0.168
Gestational length	38.100	1.909	39.002	1.905	38.928	2.013	38.899	2.043	38.950	1.990
Mothers										
Emergency c-section	0.109	0.312	0.109	0.311	0.127	0.333	0.123	0.328	0.130	0.336
C-section	0.215	0.411	0.214	0.410	0.248	0.432	0.239	0.427	0.255	0.436
Prenatal care										
Prenatal 13	0.871	0.336	0.876	0.329	0.727	0.445	0.780	0.414	0.688	0.463
Only 1 ultrasound	0.080	0.272	0.078	0.268	0.140	0.347	0.136	0.343	0.144	0.351
N controls	0.598	0.490	0.603	0.489	0.463	0.499	0.511	0.500	0.428	0.495

Notes: *Gestational length*, is in weeks. *Prenatal*13 is a dummy equal to 1 if the mother received any prenatal care before week 14. *N controls* is a dummy equal to 1 if the mother underwent a number of controls equal to or greater than 11 (*i.e.*, the median of the number of controls). See the Appendix for a more detailed description of the variables.

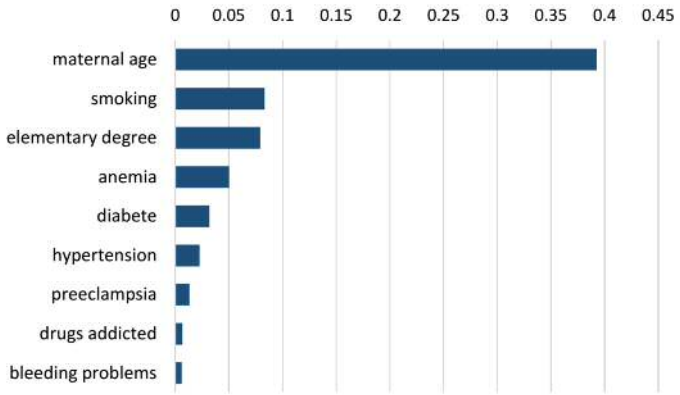
Table 4: **Controls**

$Mother_i^{'}$	$Pregnancy_i^{'}$	$Extra_i^{'}$	$Delivery_i^{'}$
Socio-economic characteristics	**Risk factors**	**Extra risk factors if no first-time mothers**	**Medical intervention characteristics**
Married	Age	Previous abortion	Failed induction
Single	Amniotic liquid	Previous c-section	Head first
High school degree	Anemia	Previous deliveries	Opioids
University degree	Cardiac problems	Previous early births	Spasmolytic drugs
Professional	Obesity	Previous ectopic abortion	Uterotonic drugs
	Hypertension	Previous late newborns	Vacuum&Forceps
	Diabetes	Previous pre-term newborn	
	Eclampsia	Previous miscarriages	
	Pre-eclampsia	Previous stillborn	
	Isoimmunization		
	Placenta previa		
	Bleeding		
	Respiratory disease		
	Eating problems		
	Liver problems		
	Parasitic disease		
	Abortion threats		
	Multiple pregnancy		
	HIV		
	Alcohol&drug consumption		
	Smoker		
	Newborn sex (=1 if boy)		
	Other risks		

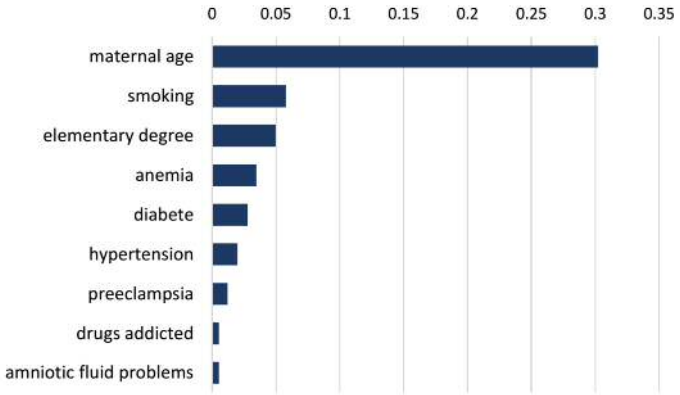
Notes: *Other risk* includes sexually transmitted diseases and cancer-related problems.

Figure 3: **Correlations between Prenatal Outcomes and Mother's Characteristics**

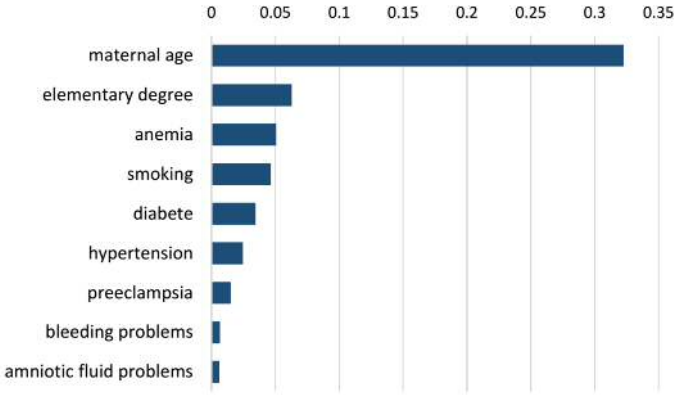
(a) Prenatal 13



(b) Only 1 ultrasound



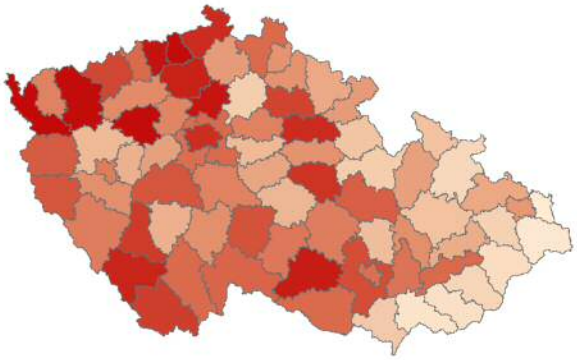
(c) Number of controls



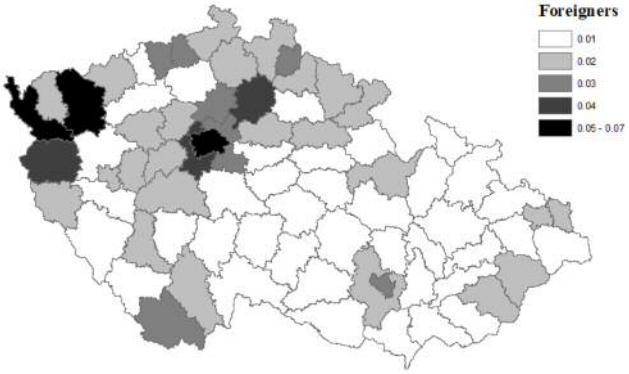
Notes: These figures depict the correlations between each prenatal outcome and the 10 most correlated maternal and/or pregnancy characteristics as obtained from a machine learning analysis.

Figure 4: **Foreigners Distribution in the Czech Republic and Hostility Index**

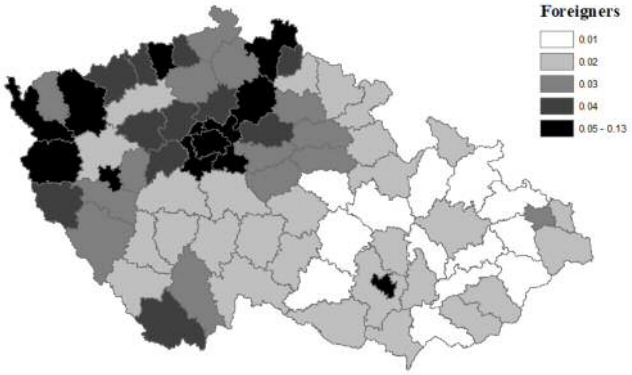
(a) Hostility Index



(b) Foreigners 2002



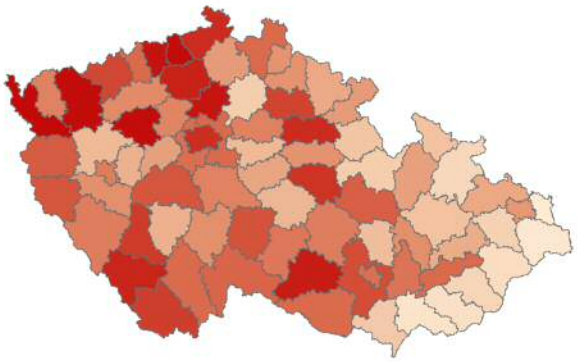
(c) Foreigners 2013



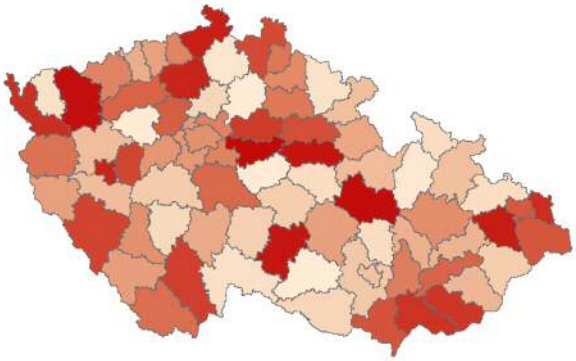
Notes: Figure (a) depicts the distribution of the hostility index across all Czech districts. The darker an area is, the more hostile to immigrants. Figure (b) and (c) show the quantile distribution of foreigners across all Czech districts. Again, the darker the area is, the higher the percentage of resident immigrants out of total residents.

Figure 5: **Distribution of the Main Health/Socio Characteristics among Immigrants in 2005 and Hostility Index**

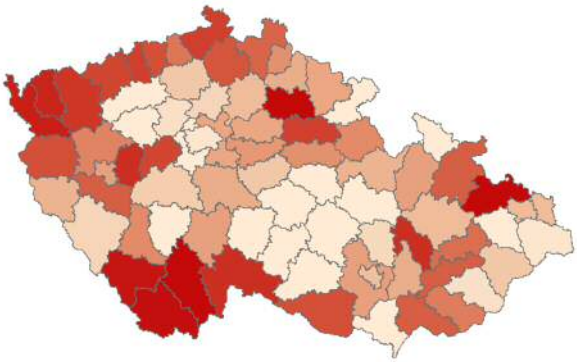
(a) Hostility Index



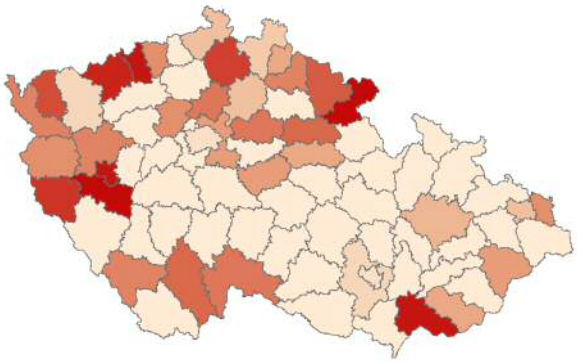
(b) Average Age



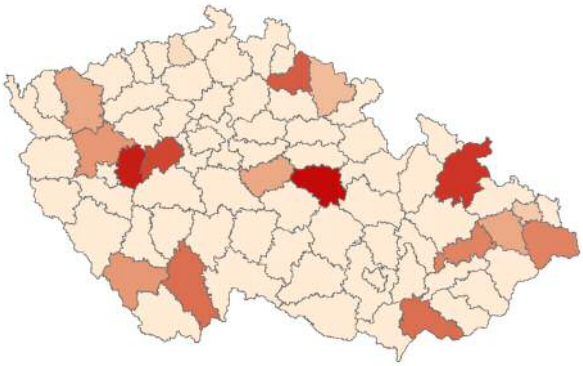
(c) Elementary Degree



(d) Smokers



(e) Anemia



Notes: Figure (a) depicts the distribution of the hostility index across all Czech districts. The darker an area is, the more hostile against immigrants. Figure (b) shows the average age of immigrants mothers per district. The darker the area, the higher the average age. Figure (c), (d) and (e) display the percentages of immigrants mothers who, in 2005, have an elementary degree, smoke, and suffer from anemia respectively. Again, the darker the area, the higher the percentage of immigrant mother who have an elementary degree, smoke, and suffer from anemia.

Table 5: **Health Outcomes**

	Vitality		**Weight**		**Gestational Length**	
	Apgar 1	Apgar 5	Weight	Low weight (< 1500 gr)	Pre-term (<35 wks)	Gestational Age
	(1)	(2)	(3)	(4)	(5)	(6)
			Whole sample			
Native	-0.000	-0.001	-14.936***	-0.002**	-0.002	0.040**
	(0.002)	(0.001)	(4.224)	(0.001)	(0.001)	(0.018)
Obs.	969,422	969,422	969,355	969,422	969,422	969,422
Mean	0.073	0.018	3,306.119	0.009	0.028	38.100
			Non-EU			
Native	-0.000	-0.000	-30.032***	-0.001	-0.000	0.022
	(0.002)	(0.001)	(4.902)	(0.001)	(0.002)	(0.022)
Obs.	953,512	953,512	953,449	953,512	953,512	953,512
Mean	0.076	0.022	3,306.507	0.009	0.027	39.000
			Only 4 big cities			
Native	-0.006*	-0.003**	-13.738**	-0.002	-0.002	0.042
	(0.003)	(0.002)	(4.934)	(0.001)	(0.002)	(0.026)
Obs.	240,904	240,904	240,899	240,904	240,904	240,904
Mean	0.084	0.023	3,327.133	0.008	0.027	39.021
			Only 1st child			
Native	0.004	0.000	-26.026***	-0.001	0.001	0.029
	(0.003)	(0.001)	(4.648)	(0.001)	(0.002)	(0.021)
Obs.	479,282	479,282	479,254	479,282	479,282	479,282
Mean	0.096	0.026	3,256.240	0.010	0.031	39.008
			Only 1st child singleton			
Native	0.004	0.001	-25.378***	-0.001	0.000	0.034
	(0.003)	(0.001)	(4.687)	(0.001)	(0.001)	(0.021)
Obs	474,029	474,029	474,029	474,029	474,029	474,029
Mean	0.095	0.025	3,266.652	0.009	0.028	39.049
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The standard errors in parentheses are clustered at the mother-district level. *** indicates significance at the 1%, ** at the 5%, and * at the 10% level.

Table 6: **Health Care Consumption**

	C-sections		**Unconditional on Using Prenatal Care**			**Conditional on Using Prenatal Care**		
	Emergency c-section	C-section	Prenatal 13	Only 1 ultrasound	Number of controls	Prenatal 13	Only 1 ultrasound	Number of controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Whole sample								
Native	-0.003*	0.005***	0.126***	-0.020***	0.105***	0.125***	-0.017***	0.105***
	(0.002)	(0.001)	(0.006)	(0.003)	(0.006)	(0.006)	(0.003)	(0.006)
Obs.	969,422	969,422	969,422	969,422	969,422	958,817	958,817	958,817
Mean	0.109	0.215	0.871	0.080	0.598	0.887	0.070	0.604
Non-EU								
Native	-0.003	0.006***	0.161***	-0.023***	0.132***	0.163***	-0.022***	0.134***
	(0.002)	(0.001)	(0.008)	(0.005)	(0.008)	(0.008)	(0.004)	(0.008)
Obs.	953,512	953,512	953,512	953,512	953,512	943,420	943,422	943,422
Mean	0.109	0.215	0.879	0.079	0.599	0.888	0.069	0.605
Only 4 big cities								
Native	-0.008***	0.006***	0.143***	-0.018***	0.114***	0.144***	-0.015***	0.116***
	(0.002)	(0.002)	(0.009)	(0.004)	(0.008)	(0.009)	(0.003)	(0.008)
Obs.	240,904	240,904	240,904	240,904	240,904	236,254	236,254	236,254
Mean	0.113	0.233	0.861	0.129	0.526	0.878	0.112	0.536
Only 1st child								
Native	-0.000	0.007***	0.126***	-0.016***	0.099***	0.126***	-0.014***	0.100***
	(0.003)	(0.001)	(0.008)	(0.005)	(0.007)	(0.008)	(0.004)	(0.007)
Obs.	479,282	479,282	479,282	479,282	479,282	473,881	473,881	473,881
Mean	0.140	0.244	0.888	0.089	0.612	0.898	0.079	0.619
Only 1st child singleton								
Native	-0.001	0.007***	0.127***	-0.015***	0.100***	0.127***	-0.014***	0.100***
	(0.002)	(0.002)	(0.008)	(0.005)	(0.007)	(0.008)	(0.004)	(0.007)
Obs	474,029	474,029	474,029	474,029	474,029	468,751	468,751	468,751
Mean	0.137	0.236	0.888	0.089	0.614	0.898	0.079	0.621
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mother district FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The standard errors in parentheses are clustered at the mother-district level. *** indicates significance at the 1%, ** at the 5%, and * at the 10% level.

Table 7: **Health Care Consumption and Health Outcomes: Immigrants First Child**

	Vitality		**Weight**		**Gestational Leght**	
	Apgar 1	Apgar 5	Weight	Low weight (< 1500 gr)	Pre-term (<35 wks)	Gestational Age
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: OLS						
Prenatal 13	-0.003	-0.006*	43.223***	-0.004*	-0.005**	0.089***
	(0.005)	(0.003)	(8.634)	(0.002)	(0.003)	(0.029)
Only 1 Ultrasound	0.014**	0.008**	-39.444**	0.007**	0.019***	-0.211***
	(0.006)	(0.004)	(17.401)	(0.003)	(0.006)	(0.066)
N controls	-0.024***	-0.013***	210.197***	-0.019***	-0.052***	1.014***
	(0.004)	(0.002)	(9.937)	(0.002)	(0.004)	(0.040)
Panel B: IV						
Second-stage Statistics						
Prenatal 13	0.059	-0.018	285.426	0.013	0.043	0.044
	(0.092)	(0.042)	(221.012)	(0.039)	(0.090)	(0.937)
First-stage Statistics						
Hostility			-0.058***			
			(0.009)			
R^2			0.060			
Adj R^2			0.057			
Partial R^2			0.002			
Robust F			36.520			
Second-stage Statistics						
Only 1 Ultrasound	-0.037	0.011	-172.842	-0.008	-0.026	-0.027
	(0.058)	(0.027)	(144.913)	(0.024)	(0.053)	(0.568)
First-stage Statistics						
Hostility			0.091***			
			(0.008)			
R^2			0.091			
Adj R^2			0.088			
Partial R^2			0.007			
Robust F			136.380			
Second-stage Statistics						
N controls	0.065	-0.019	314.022	0.014	0.048	0.049
	(0.109)	(0.051)	(274.668)	(0.042)	(0.096)	(1.035)
First-stage Statistics						
Hostility			-0.052***			
			(0.011)			
R^2			0.060			
Adj R^2			0.057			
Partial R^2			0.001			
Robust F			22.240			
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Month and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	20,558	20,558	20,558	20,558	20,558	20,558
Mean	0.096	0.026	3,256.240	0.010	0.031	39.008

Notes: The standard errors in parentheses are clustered at the mother-district level. *** indicates significance the 1%, ** at the 5%, and * at the 10% level.

Table 8: **Health Care Consumption and Health Outcomes: Immigrants First Single Child**

	Vitality		**Weight**		**Gestational Leght**	
	Apgar 1	Apgar 5	Weight	Low weight (< 1500 gr)	Pre-term (<35 wks)	Gestational Age
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: OLS						
Prenatal 13	-0.003	-0.006*	43.930***	-0.004*	-0.006**	0.092***
	(0.005)	(0.003)	(8.599)	(0.002)	(0.003)	(0.029)
Only 1 Ultrasound	0.013**	0.007*	-39.642*	0.007**	0.020***	-0.212***
	(0.006)	(0.003)	(17.025)	(0.003)	(0.006)	(0.065)
N controls	-0.023***	-0.012***	208.578***	-0.017***	-0.050***	1.002***
	(0.004)	(0.002)	(9.870)	(0.002)	(0.003)	(0.039)
Panel B: IV						
Second-stage Statistics						
Prenatal 13	0.071	-0.015	275.954	0.023	0.045	0.071
	(0.097)	(0.042)	(219.956)	(0.041)	(0.098)	(0.968)
First-stage Statistics						
Hostility			-0.058***			
			(0.009)			
R^2			0.060			
Adj R^2			0.057			
Partial R^2			0.002			
Robust F			36.310			
Second-stage Statistics						
Only 1 Ultrasound	-0.045	0.009	-168.174	-0.014	-0.027	-0.043
	(0.061)	(0.027)	(145.109)	(0.025)	(0.059)	(0.592)
First-stage Statistics						
Hostility			0.091***			
			(0.030)			
R^2			0.092			
Adj R^2			0.089			
Partial R^2			0.007			
Robust F			134.110			
Second-stage Statistics						
N controls	0.078	-0.016	304.637	0.025	0.049	0.078
	(0.117)	(0.049)	(272.668)	(0.044)	(0.104)	(1.076)
First-stage Statistics						
Hostility			-0.052***			
			(0.011)			
R^2			0.060			
Adj R^2			0.056			
Partial R^2			0.001			
Robust F			21.970			
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Month and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	20,353	20,353	20,353	20,353	20,353	20,353
Mean	0.095	0.025	3,266.652	0.009	0.028	39.049

Notes: The standard errors in parentheses are clustered at the mother-district level. *** indicates significance the 1%, ** at the 5%, and * at the 10% level.

A Appendix

This Appendix provides additional tables and figures, which are also discussed in the paper. In particular, we present the following:

- Immigrant distribution (Table A1);
- Explanation of the variables used in the regressions (Table A2);
- Results on the use of prenatal care using the general regressors applied in the related literature (Table A3);
- T-Tests of differences in maternal characteristics between immigrants and natives (Table A4).

Table A1: **Immigrant Distribution**

			EU				No EU			
Year	**Foreigners**	**Female**	**Tot**	**Slovakia**	**German**	**Poland**	**Tot**	**Ukraine**	**Viet Nam**	**Russia**
2005	278,312	0.40	0.31	0.57	0.08	0.20	0.69	0.46	0.19	0.09
2006	321,456	0.40	0.32	0.57	0.10	0.18	0.68	0.47	0.19	0.08
2007	392,315	0.40	0.33	0.52	0.12	0.16	0.67	0.48	0.20	0.09
2008	437,565	0.40	0.33	0.52	0.12	0.15	0.67	0.45	0.21	0.09
2009	432,503	0.41	0.32	0.54	0.10	0.14	0.68	0.45	0.21	0.10
2010	424,291	0.42	0.32	0.53	0.10	0.13	0.68	0.43	0.21	0.11
2011	434,153	0.43	0.35	0.54	0.10	0.13	0.65	0.42	0.21	0.11
2012	435,946	0.43	0.37	0.53	0.11	0.12	0.63	0.41	0.21	0.12
2013	439,189	0.43	0.40	0.52	0.11	0.11	0.60	0.40	0.22	0.12

Notes: Data from the Institute of Statistics in the Czech Republic. The total percentage of EU and non-EU are out of the total number of immigrants per year.

Table A2: **Variables' explanation**

Variable Name	Variable Description
Newborns	
Apgar 1	Dummy equal to 1 if the Apgar score at 1 minute is equal to or below 7
Apgar 5	Dummy equal to 1 if the Apgar score at 5 minutes is equal to or below 7
Weight	Newborn's weight in grams
Very low weight	Dummy equal to 1 if the newborn weighs less than 1,500 gr
Pre-term	Dummy equal to 1 if the baby was born before the 35th week
Gestational length	Newborn's gestational age in weeks
Mothers	
Emergency c-sections	Dummy equal to 1 if a c-section was performed for emergency reasons
C-section	Dummy equal to 1 if a c-section was performed
Prenatal Care	
Prenatal 13	Dummy equal to 1 if prenatal care started before the 13th week of pregnancy, inclusive
Only 1 ultrasound	Dummy equal to 1 if only one ultrasound examination was performed during pregnancy
N Controls	Dummy equal to 1 if the total number of medical checks done by the mother is equal to or above 11 (median of the number of controls)

Table A3: **Prenatal care - General Regressors**

	Unconditional on Using Prenatal Care			**Conditional on Using Prenatal Care**		
	Prenatal 13	Only 1 ultrasound	Number of controls	Prenatal 13	Only 1 ultrasound	Number of controls
	(1)	(2)	(3)	(4)	(5)	(6)
Whole sample						
Native	0.126***	-0.020***	0.105***	0.125***	-0.017***	0.105***
	(0.006)	(0.003)	(0.006)	(0.006)	(0.003)	(0.006)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Month and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mother district FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	969,420	969,420	969,420	958,817	958,817	958,817
Mean						
Non-EU						
Native	0.161***	-0.023***	0.132***	0.163***	-0.022***	0.134***
	(0.008)	(0.005)	(0.008)	(0.008)	(0.004)	(0.008)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Month and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mother district FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	953,512	953,512	953,512	943,420	943,420	943,420
Mean						
Only 4 big cities						
Native	0.143***	-0.018***	0.114***	0.144***	-0.015***	0.116***
	(0.009)	(0.004)	(0.008)	(0.009)	(0.003)	(0.008)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Month and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mother district FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	240,904	240,904	240,904	236,254	236,254	236,254
Mean						
Only 1st child						
Native	0.126***	-0.028***	0.099***	0.126***	-0.014***	0.100***
	(0.008)	(0.004)	(0.007)	(0.008)	(0.004)	(0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Month and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mother district FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	479,282	479,282	479,282	473,881	473,881	473,881
Mean						

Notes: The standard errors in parentheses are clustered at the mother-district level. *** indicates significance the 1%, ** at the 5%, and * at the 10% level.