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Ciro Avitabile[*], Irma Clots-Figueras[**] and Paolo Masella[***]

Abstract

Citizenship rights are associated with better economic opportunities for immigrants. This paper studies how in a country with a large fraction of temporary migrants the fertility decisions of foreign citizens respond to a change in the rules that regulate child legal status at birth. The introduction of birthright citizenship in Germany, following the introduction of the new German nationality law in 2000, represented a positive shock to the returns to investment in child human capital. Consistent with Becker's "quality-quantity" model of fertility, we find that birthright citizenship leads to a reduction in immigrant fertility and an improvement in health outcomes for the children affected by the reform.

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1 Introduction

Household fertility choices and investment in child human capital have long attracted the interest of economists and social scientists. Starting with Becker and Lewis (1973), an extensive theoretical literature suggests the existence of a trade-off between the *quantity* and *quality* of children within a family. An equally large empirical literature (see, among others, Rosenzweig and Wolpin (1980), Angrist and Evans (1998), Angrist et al. (2010)) debates whether plausibly exogenous changes in the number of children have an impact on their human capital. There has been less attention on understanding how shocks in the expected returns to investment in child human capital can change the household fertility decisions. Migration policies can have a significant impact on immigrants' opportunities in the host country. When entitled to citizenship, immigrants are both more likely to perform better in the labor market and be more integrated into the native culture. This paper exploits the introduction of birthright citizenship in Germany to isolate the effect of legal status at birth on immigrants' fertility decisions and to test the hypothesis that the effect we observe is driven by a change in the return to investment in child human capital.

Evidence from many Western countries shows that immigrant women, on average, have more children than the natives. Although the difference has declined in recent years, mostly as a consequence of the generalized drop in fertility (see Blau et al. (2008) in the US and Riphahn and Mayer (2000) for Germany), the gap between immigrants' and natives' fertility is wide. These differential fertility patterns are often perceived as a threat to local traditional values and national identity not only by the public opinion, but also by politicians (Sarrazin (2010)) and scholars (Huntington (2004)).

Understanding the determinants of immigrants' fertility has important macroeconomic implications. First, previous studies have shown that the number of children can significantly affect female labor supply (e.g., Angrist and Evans (1998)), so changes in the fertility behavior of immigrant women can have substantial effects on the aggregate female labor supply in many Western countries. Second, the higher fertility rates among immigrants are often seen as a factor that could offset the aging of the native population, thus guaranteeing the financial sustainability of the social security systems (see Razin and Sand (2009) for a recent discussion).

In this paper we show how a particular migration policy, namely the German citizenship law, affects immigrants' fertility choices. With the 2000 nationality law, Germany shifted from a *right of blood* to a *birthright* system.[1] Before 2000, the children of immigrants could acquire German citizenship through naturalization at the age of 18 upon complying with the requirement of 8 years of residency in Germany and after relinquishing their parents' citizenship. After 2000, children born to immigrant parents are granted German citizenship at birth if at least one parent has legally resided in Germany for at least 8 years, and are allowed to maintain dual citizenship up to the age of 23.

Citizenship provides unrestricted access to the host country labor market, and evidence from many countries shows that immigrants who naturalize earn more than those who do not.[2] Steinhardt (2008) finds that average wages for naturalized immigrants in Germany are 6% higher than the wages paid to foreign workers. Naturalization leads to an immediate increase in wages, and also to higher returns from work experience.[3] Nevertheless, immigrants often do not take advantage of the possibility to naturalize since this requires them to relinquish their former citizenship in many countries. Mazzolari (2009) shows for the US that immigrants from 5 Latin American countries were significantly more likely to naturalize after their home-country governments allowed for dual citizenship and, as a result, improved their labor market outcomes. Under the new regime, immigrants' children born in Germany (unlike their parents) have an extended period of time to enjoy dual citizenship and to decide which country's citizenship to adopt.

Even if willing to relinquish their former citizenship, some immigrants might find the residence requirements for naturalization too difficult to meet. Many migrate only for a limited period of time and temporary (as opposed to permanent) migration has increased over time. In 2006, for example, the OECD countries received 2.5 million temporary migrants, about three times the number of permanent migrants (OECD

[1] Bertocchi and Strozzi (2010) provide an extensive analysis of the determinants and the evolution of citizenship laws in the post-world war II period.

[2] See Bratsberg et al. (2002) for the US, DeVoretz and Pivnenko (2004) for Canada, and Bevelander and Veenman (2006) for the Netherlands. Fougere and Safi (2009) finds that naturalized immigrants in France are more likely to find a job than non-naturalized ones.

[3] The benefits of citizenship also include, among others, the possibility to invite relatives to reside in the host country, and the possibility to vote both in local and in national elections.

(2008)).[4] Previous work on Germany shows that return migration decisions have a large and significant effect on immigrants' human capital investment (Dustmann (1999)) and life-cycle savings decisions (Dustmann and Mestres (2010), and Dustmann and Mestres (2011)). Data from the German Socio-Economic Panel (GSOEP) show that among those immigrants planning to return to their home countries only 12% are willing to apply for citizenship compared to 31% of immigrants planning to stay in Germany for ever. Uncertainty about the length of stay in the host country is therefore likely to affect parental perceptions about the ability of their children to comply with the naturalization requirements. While returns on schooling and health investments are higher for citizen than non-citizen children, children's failure to meet the naturalization requirements would reduce parental incentives to invest in their human capital. Under the birthright system, parents' return plans have no effect on the newborn child's legal status.

In the standard "quality-quantity" (Q-Q) framework (see Becker and Lewis (1973) and Becker and Tomes (1976)) citizenship at birth can be interpreted as a reduction in the price of child "quality". In a closely related interpretation, citizenship at birth can be modeled as a positive shock on the child's initial endowment. Provided parental investment and child's endowments are complementary in the "quality" production function,[5] the shock driven by citizenship acquisition should translate into an improvement in the child "quality" level and ultimately a decrease in the optimal number of children, since, as in a standard Q-Q model, an increase in quality causes a rise of the shadow price of quantity.

Becoming citizen at birth might represent not just an economic shock; immigrants might perceive that natives are more willing to accept their citizen children, and as a consequence, might decide to assimilate more. A recent strand of literature emphasizes the role of cultural traits as an important determinant of fertility behavior (see, among others, Fernandez and Fogli (2009) and Almond et al. (2009)).[6] Therefore, a reduction in fertility might reflect cultural convergence of immigrants to natives'

[4]Depending on the country of destination, the OECD Immigration Report 2008 finds that 20% to 50% of longer-term immigrants leave the host country within 5 years after their arrival.

[5]Recent empirical literature finds evidence in support of this assumption. See, e.g. Datar et al. (2010) and Aizer and Cuhna (2011)

[6]La Ferrara et al. (2008) show the influence of TV shows on the culture and beliefs of Brazilian women and suggest it may be a channel through which the media and television affect fertility choices.

patterns.

In the first part of the paper we study how the legal status of prospective children affects immigrants' fertility. In order to identify the effect of birthright citizenship, we exploit the main provision of the law passed by the German Parliament in May 1999: a child born to foreign parents on 1^{st} January 2000 or after, is granted citizenship at birth if at least one parent has been ordinarily resident in Germany for at least 8 years. In this setting, households composed of foreign parents who have resided in Germany for 8 or more years represent the treatment group. We can define two control groups: the first includes all households where there is one German partner, the second includes all households where both partners are German. By comparing the fertility behavior of households in the treatment group with those in the two control groups, before and after the reform, in a standard difference-in-differences specification, we can identify how the introduction of birthright citizenship affects fertility. The analysis is based on data from the German Microcensus, a household-based, repeated cross-section, representative data set that includes 1% of all households in Germany, for the period 1996 to 2005.

Our results suggest a negative and significant effect of birthright citizenship on immigrants' fertility: after the reform the difference in fertility - as defined by the probability of having a child born within the last 12 months - between the treatment and the two control groups shrinks by approximately one percentage point. Additional results support the theoretical predictions of the Q-Q model. First, consistent with the fact that the advantages of German citizenship are higher for children of non-EU citizens than for those of parents with an EU passport, we find that the effect of the reform is large and statistically significant only for those households where neither parent is a EU citizen. Second, since only couples with at least one child face the trade off between quality and quantity of children, the reduction in fertility is driven by a lower probability of having two or more children, while there is no significant effect on the probability of having the first child.

A variety of robustness tests supports the causal interpretation of our findings. First, we perform different tests to control for the possibility that the observed reduction in immigrants' fertility might be an artifact of changes in the composition of immigrant population after the nationality reform. Second, we study whether other provisions of the reform that affect naturalization requirements might be affecting the

fertility behavior of non-citizen parents. Finally, we perform falsification exercises in order to assess whether our results might be driven by the presence of differential trends. We do not find support for any of these confounding mechanisms.

In order to test whether the introduction of citizenship at birth is associated with an improvement in child quality, we study whether children affected by the reform are healthier. In line with evidence for the US (see, among others, Popkin and Udry (1998)), epidemiological studies for Germany find that immigrants' children are significantly more likely than native children to be obese at school entry (Will et al. (2005)). Childhood obesity has negative consequences in both the short and long term.[7] Using information on height and weight as reported in the Microcensus, we construct the body mass index (BMI) of respondents' children and we find that the obesity gap between non-citizens' and citizens' children at pre-school age drops significantly for children born in 2000 or immediately afterwards, compared to those born immediately before 2000. Finally, relying on time-use data from the German Socio-Economic Panel (GSOEP), we provide some suggestive evidence that the improvement in child health might be related to mothers spending more time with their children.

In summary, our results are consistent with the predictions of the "quality-quantity" model of fertility. We find that (i) the increase in the return on parental investment in child human capital determined by the change in child legal status produces a reduction in immigrant fertility and, (ii) immigrants' children affected by the change in citizenship criteria display better health outcomes than those not affected.

To our knowledge this is the first paper to provide quantitative evidence on the effect of migration policies on immigrants' fertility. We contribute to the recent strand in the economic literature on the effect of legal status on individual behavior. Avitabile et al. (2010), based on another provision of the 2000 German nationality law, study how a change in child legal status affects the propensity of parents to engage in social contacts with Germans and use the German language. The present study adds to this literature showing that child legal status at birth not only affects attitudes but also affects the economically relevant behavior of parents.[8]

[7] Cawley and Spiess (2008) finds for Germany that obese children have worse school outcomes. Lindeboom et al. (2009) use data from the British National Child Development Study (NCDS) to show a negative association between childhood obesity and labor market outcomes.

[8] Mastrobuoni and Pinotti (2010) argue that crime rates among Romanian immigrants in Italy

This work also makes a more general contribution to the literature on the interaction between fertility and human capital accumulation. A large empirical literature examines how family size affects the school achievements of children.[9] As noted by Bleakley and Lange (2009), in the Becker "quantity-quality" model both the number of children and their quality are endogenous variables that are affected by the price of quality and quantity. Some recent work exploits policy changes in either child subsidy or birth control programs to study how the price of quantity can affect fertility,[10] but there is only limited evidence on how variations in the price of child quality affects fertility behavior and its interaction with investment in child human capital. Bleakley and Lange (2009) interpret the eradication of hookworm disease in the American South at the beginning of the 20th century as an exogenous reduction in the price of child quality, and find evidence of higher educational attainments and lower fertility rates in states where hookworm infection rates were high before eradication.

The paper is organized as follows. In section 2 we describe the German nationality reform and outline the benefits of German citizenship. We present a simple theoretical framework to interpret how a change in legal status can affect the fertility and health outcomes of children affected by the reform. In section 3 we present the empirical strategy and the data. In section 4 we report the main results for fertility and discuss potential confoundings. In section 5 we provide evidence that cohorts of immigrants´ children affected by the reform display better health outcomes. Section 6 concludes.

2 Background

2.1 The German Nationality Reform

In May 1999, the German Parliament amended the Citizenship and Nationality Law of 1913. The main objective of the reform was the introduction of birthright citizenship

decreased as a result of the economic opportunities related to their new status as EU citizens.

[9] Different strategies have been used to account for the endogeneity of family size. Rosenzweig and Wolpin (1980), Angrist and Evans (1998), Angrist et al. (2010) provide examples of the use of twinning as an instrument for family size, Lee (2008) uses sibling sex composition as an alternative instrument.

[10] Cohen et al. (2011) exploit variations in Israel's child subsidy program to study the effect of financial incentives on fertility. Rosenzweig and Zhang (2009) use the variation driven by China's one-child policy to study how the price of child quantity affects fertility decisions and children's school outcomes

for children born in Germany to foreign parents, but the law also introduced changes to the naturalization criteria and explicitly denied dual citizenship for immigrants who naturalize.

In this paper the main focus is on the introduction of birthright citizenship, although we test whether the other provisions affect our results. Before the reform, a child born in Germany was granted German citizenship at birth only if at least one parent was a German citizen at the time of its birth.[11] Under the new regime, a child born in Germany to foreign parents on 1^{st} January 2000 or after is granted citizenship at birth if two conditions are satisfied: a) at least one parent has been ordinarily resident in Germany for 8 years, and b) if at least one parent has been granted permanent right of residence. The child is then granted dual citizenship up to the age of 23, when he or she must decide which to retain. This is known as the *Optionsmodell*.[12] This clause represented an exception under the framework introduced by the new nationality law that explicitly denied dual citizenship. Under the old regime dual citizenship was not legally recognized and granted only on a discretionary basis. Anil (2006), however, reports anecdotal evidence suggesting that the German officialdom generally was unwilling to entertain the idea of dual citizenship.

Unlike the citizenship at birth provision, the policy for naturalization for adults underwent various changes in the years before the reform. Laws affecting naturalization applications were passed in 1990 and 1993. The changes involved limited discretion of officials to deny naturalization, and foreigners' legal rights to claim entitlement to naturalization. After 1993, foreigners aged between 16 and 23 years with 8 or more years of residency, and foreigners over the age of 23 with a minimum of 15 years of residency, had a *legal* claim to naturalization. From 2000 onwards, naturalization was no longer based exclusively on residence. Applicants for naturalization were required also to: i) express loyalty to the German Constitution, ii) be able to support themselves and their family without social security or unemployment benefits, iii) have a clean criminal record, iv) have proven adequate command of the German language, and v) renounce former citizenship. The minimum residency requirement was 8 years.

[11] In the case that only the father was a German citizen, citizenship was dependent on recognition or determination of paternity under German law.

[12] The reform also includes a transitional provision for children aged under 10 years on 1^{st} January 2000 with foreign parents. These children were granted naturalization upon application (to be completed before 31^{st} December 2000) if at least one parent had been ordinarily resident in Germany for at least 8 years at the time of the child's birth.

2.2 The benefits of German citizenship at birth

This section describes the benefits of German citizenship and analyzes the advantages of its being granted at birth rather than later in life. First, obtaining a German passport has labor market benefits. In Germany, there are several careers that require ownership of a German passport. In the public sector, most careers in the justice and national defense departments are accessible only to German citizens, irrespective of ownership of a passport from another EU member state. There are also restrictions on access to careers in other administrative departments, but most do not apply to EU citizens. In the private sector, professions such as dentistry, medicine, pharmacy, law and architecture are restricted to German citizens, but restrictions do not apply to citizens from other EU countries. Steinhardt (2008) provides evidence that naturalized immigrants are more likely to be employed in white collar occupations.

In addition, the possibility to travel without restriction within the European Union has significantly increased the advantages of a EU passport for individuals employed in occupations that require unrestricted mobility and no bureaucratic hurdles (transport sector or cross-border services, which are associated with frequent travel). Employment of German citizens often leads to a reduction in the costs to employers. In fact, to reduce the need for visas or other special administrative permits employers might find more convenient to hire individuals with a EU passport. Second, obtaining a German passport has some other non-economic benefits. As in most countries, citizenship endows the right to vote in general and in local elections.[13] Other advantages include the possibility to obtain visas for relatives, and legal protection in the case of criminal charges.

Before the introduction of 2000 nationality law German citizenship could be obtained through naturalization, marriage, or adoption, the first one being the most common route. The award of citizenship at birth rather than through naturalization as an adult has three main advantages: i) the possibility to hold dual citizenship; ii) no uncertainty related to possible changes in the rules on naturalization; iii) no uncertainty driven by the *return migration* decisions of parents. We explain these three types of benefits in more detail. Before the reform, foreigners aged over 16 years in principle were eligible for German citizenship if they had spent at least 8

[13] In Germany, and in other EU countries, citizens from other EU countries can vote in local, but not general elections

years in Germany since their birth; in practice, children born to immigrant parents had to wait until age 18 in order to become Germans (provided that they met all the residency requirements).[14] Children born in 2000 or after to households where at least one parent had been resident in Germany for 8 years, were entitled to hold dual citizenship at birth. This allowance represents a notable exception in the new institutional framework. Before 2000 dual citizenship was not legally recognized and was barely tolerated, after 2000 it was explicitly denied by law and immigrants had to relinquish their original citizenship in order to become German citizens.

Relinquishing birth country citizenship might imply some psychological costs for immigrants and is associated with serious limitations in their country of origin.[15] This likely explains why naturalization rates in Germany are among the lowest in Europe. Individuals with dual nationality also, in principle, have unrestricted access to two labor markets. Previous work documents the positive effect of dual citizenship on immigrants' labor market outcomes in the US. Mazzolari (2009) exploits the introduction of dual citizenship in 5 central and south America countries (Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador) to show that immigrants from these countries experienced a large and statistically significant increase in the probability of acquiring US citizenship through naturalization. As a result, they display a higher probability of being in a paid job and obtaining higher earnings, and a lower probability of claiming welfare state benefits. In the analysis in this paper, we cannot disentangle the effect of German citizenship per se from the effect of dual citizenship.

Acquiring citizenship at birth neutralizes two sources of uncertainty inherent in the possibility of naturalization later in life. First, it negates any uncertainty about possible changes in the institutional setting. While the norms approved in 1990 and 1993 introduced rule-based criteria for the acquisition of citizenship through naturalization, thus making it easier, a law passed in 1997 set out visa requirements for unaccompanied children from Turkey, the former Yugoslavia, Morocco and Tunisia, and required existing resident children of parents from these countries to apply for residence permits (Bosswick (2000)). Repeated changes in institutional arrangements

[14]The legal age for relinquishing former citizenship was 18 and dual citizenship was not allowed. Parents in principle could cancel the citizenship of their children, but only if they had formally resigned their own former citizenship.

[15]Mueller (2006) reports that pre-1996, Turkish regulation deprived individuals of their property rights in Turkey if they abandoned Turkish citizenship.

may have increased immigrants' uncertainty about the timing of citizenship acquisition via naturalization for their children.

Second, and most important, birthright citizenship makes the child's legal status independent of household *return migration* decisions. As already mentioned, after 1993 children born to immigrant parents and seeking naturalization had to provide evidence of at least 8 years of ordinary residence in Germany. According to section 12b of the German Nationality Act, in the presence of interruptions longer than 6 months, a previous period of residence in Germany might not be counted as contributing towards the duration of residence requirement, and if it were allowed, it would only be up to a period of 5 years. Immigrants to Germany are very likely to return home either permanently or temporarily. Using information on the return migration intentions elicited from the German Socio-Economic Panel, the graph in Fig. 1 shows that more than 60% of immigrants plan to return to their home country at some point and about 45% of the total are willing to return within 8 years. Thus, Fig. 1 shows that there is a large fraction of immigrants who might perceive the possibility to stay in Germany long enough to allow their children to meet the residence requirements as very unlikely. After the reform, the return plans of parents do not affect the legal position of the newborn.

The same dataset and survey questions have been used by previous work on Germany to discuss the relationship between return migration intentions and investments in both cultural and economic integration. Using the GSOEP, Dustmann (1999) finds that familiarity with the German language responds positively to an increase in the intended duration in the host country. Dustmann and Mestres (2010) find that a 10 percentage point increase in the probability of staying in Germany for ever leads to a 15% reduction in the total amount of remittances. Dustmann and Mestres (2011) show that, while return plans do not affect the total amount of savings, both the magnitude and the share of assets in the home country is significantly larger for immigrants who consider their migration to Germany to be temporary.

Returns on schooling and health investments are on average higher for citizen than non-citizen children. We find from the Microcensus that for naturalized immigrants completion of tertiary education is associated with a 20% increase in annual gross income, as opposed to 13% among non-naturalized ones. During the period predating the reform of the nationality law, parents who were not planning to stay

in Germany long enough to enable their children to meet the residence requirements might have been less inclined to invest in their children's human capital. However under the birthright system, uncertainty about parental return-migration decision does not affect either children´s ability to acquire German citizenship or its timing.

2.3 Theoretical Framework

In this section we outline a simple theoretical framework describing how child legal status can affect both fertility and human capital investment decisions. The model is simple and is designed to provide clear empirical predictions.

Citizenship rights at birth can be interpreted as a positive shock to children's endowments (their characteristics) at birth. Our simple theoretical framework departs from Becker and Lewis (1973) to incorporate the child's endowments and illustrate the assumptions that translate extension of citizenship rights into lower fertility rates and higher level of child "quality". We introduce a specific utility function to ease these calculations and identify the intuition behind the main results. As in Becker and Lewis (1973), the utility of the parents depends on a generic consumption good c, the number of of their children, n, and their average quality, q .

$$U = \gamma \ln c + (1-\gamma)\left(\ln n + \ln q(e;I)\right) \tag{1}$$

The average quality of children within each household is a function of the given average level of their endowments at birth, e, and parental per child investment in quality, I. We assume that parents invest the same amount of resources in each of their children.[16] For simplicity we use a standard CES function to characterize $q(e;I)$,

$$q = q(e;I) = \left[a^{\frac{1}{s}} e^{\frac{s-1}{s}} + (1-a)^{\frac{1}{s}} I^{\frac{s-1}{s}}\right]^{\frac{s}{s-1}} \tag{2}$$

where s represents the elasticity of substitution between child's initial endowment and parental investment. Parents choose n, I and c to maximize their utility function under a budget constraint that includes total expenditure on investment in child quality, total expenditure on the consumption good and the child costs that depend

[16] In Becker and Lewis (1973) and Becker and Tomes (1976) the quality, that enters parents' utility function, is assumed to be the same for all children.

on quantity but not quality.

$$Y = cp_c + nIp_I + np_n \tag{3}$$

where p_c is the price of the consumption good; p_I represents the price of per child parental investment in child quality; p_n is the unitary cost of the number of children that is not dependent on quality, for instance the opportunity cost of fertility control.

Thus, if $0 < s < 1$, then $\frac{\partial q(I^*;\, e)}{\partial e} > 0$ and $\frac{\partial n^*}{\partial e} < 0$.

If investment and endowment are complements in the quality production function,[17] a positive shock to the children's endowment translates into an increase in the marginal product of investment in quality and therefore in per child level of investment. The subsequent increase in the shadow price of quantity $(Ip_I + p_n)$ explains the decrease in the optimal number of children.

The effect of birthright citizenship on immigrants' fertility and child health outcomes can also be modeled in a standard "quality-quantity" model (see Becker and Lewis (1973) and Becker and Tomes (1976)). Parents maximize a utility function $U(n, q, c)$ which depends on n, the number of children, q, the "quality" per child, and c, the consumption rate of all other commodities. Agents face a non linear budget constraint: $Y = np_n + nqp + qp_q + cp_c$.

Quality and quantity enter into the budget constraint in a multiplicative way: the cost of an increase in quality is higher the larger the number of children because it will apply to more units. p_n is defined as above; p_q proxies for the costs of child quality that are not dependent on quantity; p represents the cost of child quality that depends on the total number of children; p_c is the price of the consumption good.

We can interpret the German nationality law reform and the extension of the citizenship rights as a decrease in the price of quality p_q. A decrease in p_q, as explained by Becker and Lewis (1973) (p. S283), has a positive direct effect on child quality q and a negative indirect effect on the number of children n, due to the increase in the shadow price of quantity $(p_n + qp)$.

The two theoretical frameworks presented above are clearly very close, and have similar implications. Empirically, it is hard to distinguish between a shock in endow-

[17] The assumption of complementarity is supported by findings in the empirical literature (Datar et al. (2010), Gelber and Isen (2011) and Aizer and Cuhna (2011) among the others) which provide evidence that parental investment reinforces the child's initial endowments.

ments from a change in the price of child quality. In the rest of the paper we refer generically to the introduction of birthright citizenship as a shock in the return to investment in child human capital.

3 Empirical Strategy and Data

3.1 Empirical Strategy

We study how the provision that introduced birthright citizenship affects immigrants' fertility. According to the new German nationality law, effective from January 1^{st} 2000, all children born in 2000 or after to non-Germans will be granted German citizenship if at least one parent has been legally resident in the country for at least 8 years at the time of the child's birth. In our setting, individuals born to couples at least one of whom has lived in Germany for 8 or more years represent the treatment group. There were no changes in the conditions for children born to couples at least one of whom was German citizen at the time of the birth, since they automatically received German citizenship. This allows the identification of two control groups: first, couples where only one partner is a German citizen (from here on referred to as *mixed* couples); second, couples where both partners are German citizens. By comparing the outcomes of the treatment and the two control groups before and after the reform, we can identify the effect of the birthright citizenship reform on parental outcomes. Formally, we estimate the following difference-in-differences (DD) model:

$$\begin{aligned} Y_{it} &= \alpha + \beta_1 C_i^1 + \beta_2 C_i^2 + \beta_3 Post_t + \beta_4 C_i^1 * Post_t + \beta_5 C_i^2 * Post_t + \\ &\quad + \beta_6 C_i^1 * t + \beta_7 C_i^2 * t + \gamma X_{it}^{'} + \mu_t + u_{it} \end{aligned} \tag{4}$$

where Y_{it} denotes the fertility outcome of the woman in couple i at time t. C_i^1 takes the value 1 if in couple i only one partner is a German citizen; C_i^2 takes the value 1 if in couple i both partners are German citizens. In this specification immigrant women in couples where neither partner is a German citizen, but at least one member of the partnership has been in Germany for 8 or more years, are the reference category. Because of the biological lag between fertility planning decisions and

actual outcomes, we treat as post reform period ($Post_t = 1$) all the surveys from 2001 onwards. $Post_t$ takes the value 0 for all surveys before 2001. In the baseline specification $X_{it}^{'}$ includes a set of women- specific characteristics, namely age, dummies for educational attainment, dummies for state of residence, and dummies for being German or citizen of another European Union member state. In this specification, being citizen of a non-EU state acts as reference category. μ_t represents a set of year dummies. The baseline specification also includes group-specific linear trends.

The parameters of interest are β_4 and β_5. Since the omitted category in eq. 19 is the dummy that denotes the treatment group, β_4 and β_5 measure how the fertility respectively of mixed couples and couples where both partners are German citizens, change in comparison to the treatment group after the reform. Standard errors are adjusted for clustering at group/year level in order to account for the possibility of shocks differentially affecting the three groups in a particular year.

We study separately the behavior of women living in mixed couples and the behavior of women in couples where both partners are citizens because the former are more likely to share the cultural traits and fertility related norms of women in the treatment group, either because they are foreigners or because of the influence of a foreign partner.[18]

We expect the reform to have an effect also on the fertility of those immigrant couples where neither of the partners has lived in Germany for 8 years. When deciding the optimal family size, they might take into account that prospective children will enjoy German citizenship once one of the spouses has fulfilled the 8 year residency requirement. Couples where at least one of the partners is close to having achieved 8 years of residence might decide to postpone the attempt to have a child in order to guarantee German citizenship to the new infant. Unfortunately, the extremely small number of couples in our sample with less than 8 years of residence does not allow us to study how fertility varies according to the length of residence and to separate out the effect of the reform on the optimal number of children from its effect on the timing of their birth. In addition, the introduction of birthright citizenship might increase the incentives for individuals with a higher preference for child quality, rather than quantity, to migrate to Germany, thus changing the composition of migrant inflows.

[18]Results for employing only one control group which includes both mixed couples and couples where both partners are German citizens, are provided in Table AII.

For these reasons, we exclude from our analysis individuals with less than 8 years of residence in Germany.

We next test whether the introduction of birthright citizenship is associated with an improvement in average health outcomes for the cohorts of children affected by the reform. We do not try to attribute causal interpretations to the relationship between citizenship rights and health status since the negative effect of the reform on the fertility decisions of immigrants might generate a selection bias. Parents who decide not to try to have a child after 2000, as a result of the reform, may be the same parents who would have invested less in their child's quality. Under certain assumptions, it is possible to provide a lower bound estimate of the effect of the reform on child health driven by increased parental investment. We present the results for this exercise in the Appendix.

If we look at the effect of family size on child quality, we note that previous work has focused on education (Rosenzweig and Zhang (2009), Angrist et al. (2010)) or on anthropometric outcomes (Rosenzweig and Zhang (2009)). The relatively short time period after the reform and the lack of school related information in the Microcensus does not allow us to test the effect of the reform on education outcomes. Instead, we study how BMI and the propensity to be obese change as a result of citizenship being acquired at birth. Information on children's weight and height, used to construct the BMI index, is available in the 1999, 2003 and 2005 surveys. In 2005 children aged 4 and 5 years, born to non-citizen parents who had been living in Germany for 8 or more years at the time of their birth, respectively in year 2001 and 2000, would be German citizens. That would not be the case for children in the same age group surveyed in the 2003 and the 1999 waves of the Microcensus. Formally, we estimate a child specific version of eq. 19 where the dependent variables are BMI related outcomes.

$$Q_{ic} = \alpha + \beta_1 C_i^1 + \beta_2 C_i^2 + \beta_3 D_c + \beta_4 D_c * C_i^1 + \beta_5 D_c * C_i^2 + \gamma X_i' + \mu_c + u_{ic} \qquad (5)$$

Q_{ic} is the quality (health outcome) of a child born to a couple i and belonging to cohort c. C_i^1 and C_i^2 are defined as above. D_c is a dummy variable equal to 1 if the child was born in 2000 or afterwards ($c >= 2000$), μ_c represents cohort fixed effects. X_i includes age and gender of the child, and controls for the female partner of couple

i, namely age, dummies for educational attainment, dummies for state of residence, and dummies for being German citizen or citizen of another European Union member state.[19] Standard errors are adjusted for clustering at group/cohort level.

In this case β_4 (β_5) larger than zero would be consistent with the "quality-quantity" model; indeed, we would expect that, since the reform may have increased the returns to investment in child human capital, immigrants' children born in 2000 or afterwards, relative to those born to couples where at least one is a citizen, may have better health outcomes (and therefore be less likely to be obese) than those born before 2000.

3.2 Data

The main data used in this study are from the German Microcensus, which is a household-based repeated cross-section survey carried out by the German Statistical Office. The survey covers 1% of all households in Germany with approximately 370,000 households with 820,000 persons interviewed every year. The primary goal of the Microcensus is to collect information on the structure of the German population, its labour market behavior, and housing situation. The survey started in 1973 and was conducted every two years till 1995, since when it has been annual. The Microcensus is characterized by mandatory participation, which reduces non-response to minimum levels: the response rate for compulsory questions is 97%.

Information on citizenship status has been collected since 1996; since this information is crucial for our analysis, we consider only those surveys between 1996 and 2005. The Microcensus provides detailed information on country of birth, citizenship, and the year of arrival of the immigrant, thus allowing us to define the group of households that is affected by the changes in citizenship rules.

Our sample includes all households where either the head of household's partner or the household head is a woman aged 15-49. For each individual in the household, including children, we know the year of birth. In order to identify the effect of the reform on fertility we use two different types of information. First using information on year of birth of each household member, we define a dummy variable that takes the value 1 if the household head has a child born within the last 12 months. This

[19] In line with the specification in eq. , being citizen of a non-EU state acts as omitted category.

is our main dependent variable. Since mothers are asked for information on the age structure of all the children living in the household, we can construct measures for the total number of children in different age groups (0-3; 6-9 and 9 years or above), and for the probability of having at least one child in each age group. Information on fertility outcomes was collected in each survey between 1996 and 2005. Table 1 reports descriptive statistics for the household characteristics of the three groups as elicited in 2000, the year of implementation of the new nationality law. Both mothers and fathers in the treatment group are on average younger than those in the group where both partners are German citizens, but they are older than those in the mixed couples group. Partners in the treatment group are poorer and less educated than those in the two control groups. On average, the number of children born to immigrant couples (1.6) is higher than the number of children born to mixed couples (1.1) and German couples (1.2).

Information on body weight (in kg) and height (in centimeters) was collected only in three surveys: 1999, 2003 and 2005. The literature suggests that BMI is a reliable measure of child health for children older than 3 years. We focus on preschool age children (4 and 5 years) and we use two dependent variables: BMI index, and a dummy variable indicating whether or not the child is obese. Obesity is defined using cutoff points varying by age and gender, recommended by the Childhood Obesity Working Group of the International Obesity Task force.

We rely also on data from the GSOEP, which is the longest-running longitudinal survey of private households and persons in the Federal Republic of Germany. It started in 1984, is conducted every year. It provides representative micro-data on individuals and households. Each individual in the relevant household aged over 15, is interviewed. The household head provides information on children under the age of 15. The dataset contains detailed information on country of origin and arrival date of immigrants, and family composition. In each survey foreign born individuals are asked about their citizenship status. On average, 12,000 households and 24,000 individuals have been interviewed every year since 1996. The survey contains quite detailed information on time usage. Both the head of the household and his partner are asked how many hours they spend on average every weekday[20] on each activity of: work outside the household, child care, household work, care of people in need,

[20]A few waves contain separate questions for weekends.

educational activities, and shopping. We created a variable for the number of hours of child care in an average working day.

4 The Effect of Child Legal Status on Fertility

4.1 Baseline Results

We present evidence of the demographic consequences of the German nationality law reform by plotting the evolution over time of the fertility behavior of the three groups defined in the previous section. Figure 2 displays the fraction of women (aged 15-49) with a child born within the previous 12 months, during the time period 1996 to 2005, for each of the three groups. A birth within the previous year is significantly more likely in households in the treatment group (on average 8.5% of the households in the treatment group experienced a new birth in 2000 or before) than in household in the two control groups: before the reform the average probability of having a child of age 0 is about 6.5% (4%) for women belonging to households where only one (both) partner is a German citizen. In 2001, one year after the reform became effective, the fraction of women within the treatment group who gave birth within the previous 12 months drops to 7%. The fertility behavior in the two control groups does not display on average any significant change after the reform.

In Figure 3 we consider the fraction of women who report having at least one child younger than 3 years in the time period 1996 to 2005. In line with the evidence presented in Figure 2, there is a sharp decline in the fertility of immigrants without German citizenship after 2001; the cumulative effect of the reform on the fraction of women with a child younger than 3 years of age is likely to explain the negative trend in the treatment group after 2001.

Table 2 reports the estimates of β_4 and β_5 in eq. 19. The two coefficients capture how the fertility of the households belonging to each of the two control groups defined above changes with respect to the treatment group, after the reform. The panels report the results for the three dependent variables discussed in the data section. In Panel A the dependent variable is the main variable of interest, the dummy for a child born in the previous 12 months. Column 1 presents the estimates for eq. 19 with no control variables and no time dummies. In this case the size of the two

coefficients provides an exact measure of the drop observed in Figure 2. Note that the fact that the two coefficients are positive indicates that the difference between the fertility levels of the treatment and the control groups decreased after the reform. We gradually introduce year dummies, group-specific linear trends and the control variables specified in Section 3.1. In each specification we find a significant negative effect of the reform on the fertility outcomes of households where both spouses are immigrants and not German citizens. Column 4 shows the baseline specification, which controls for the woman's age and includes dummies for secondary and tertiary education, for being German citizen or citizen of a EU member state, for federal state of residence, year and group specific linear trends. It is reassuring that the sizes of β_4 and β_5 are very similar, making it unlikely that we are capturing only pre-existing trends and confounding factors specific to one particular control group.[21]

Irrespective of the specification considered, the effect is sizeable and in line with that in Figure 2: households in the treatment group are about one percentage point less likely to have experienced a new birth within the previous 12 months as a result of the German nationality reform. The effect of the reform corresponds to a 7% standard deviation in the dependent variable and slightly above 15% of the mean for the treatment group.

In Panels B and C we estimate eq. 19 using the two alternative measures of fertility, a dummy variable equal to 1 if there is a child younger than 3 years of age in the household, and the number of children younger than 3 years, respectively. The results are consistent with those presented in Panel A. Overall, Table 2 presents evidence of a decline in the fertility of immigrants caused by the German nationality law reform.

As argued in Section 2.2 the economic benefits of German citizenship are substantially larger for non-EU than for EU citizens. As a result, the increase in the returns to human capital investment determined by the acquisition of German citizenship at birth is likely to be much larger for children in households where none of the parents has EU citizenship. If the reduction in fertility documented above is driven by an increase in the returns to children's human capital, we would expect a sharper de-

[21]The results do not change when we use richer specifications that control for household income, total number of children and the number of years of residence in Germany. The results of the probit specifications are similar to those in panels A and B.

crease in fertility among households where neither partner has EU citizenship since the increase in the returns to human capital of prospective children will be larger for this group. In order to test this hypothesis, we split the treatment group into two subgroups: households where neither spouse has EU citizenship and households where at least one partner has EU citizenship. In the latter case the newborn child will also be a EU citizen. In columns 1-2 in Table 3 we show that only households where neither partner has EU citizenship experienced a decline in the probability of having a child within the last 12 months, while the effect is basically null for households where at least one parent is a EU citizen.

If the reduction in fertility is driven by an increase in the return to human capital, we do expect the effect of the reform to vary with the child birth order. Only couples with at least one child face the trade-off between quantity and quality of children. We consider separately the fertility decisions of households with no children and households with at least one child. Columns 3 and 4 in Table 3 report the results for the sample of households with no children and those with at least one child, respectively. The coefficients are significantly different from zero only for the sample of households with at least one child, and the coefficients of the first child are very small and not statistically significant.

4.2 Potential Confoundings

We examine the possibility that our results are capturing the effect of the reform on the composition of the three groups, and in particular the age structure of the households in those groups rather than the effect of the reform on the fertility decisions of immigrants. The 2000 German nationality law may have induced a change in the composition of the treatment/control groups by affecting (i) the return migration decision of immigrant parents in the treatment group, (ii) their incentives to become naturalized, and (iii) the likelihood of observing assortive matching in the marriage market.

We first assess whether, after the reform, immigrants are more or less likely to be resident in Germany for 8 or more years. The evidence in Fig. 1 does not seem to support the hypothesis that the reform changed the return intentions of immigrants living in Germany. There is no variation over time and, in particular, before and after

2000 either in the fraction of immigrants who plan to return to their home countries at some point or in the fraction of immigrants willing to return within 8 years. In our sample the fraction of households belonging to the treatment group (households where neither spouse is a citizen and at least one has been in Germany for longer than 8 years) stays constant over time. This evidence is suggestive that neither the return intentions nor the return choices of immigrants are affected by the 2000 nationality law. The incentive to leave Germany should be lower for parents in the treatment group who had a child after 2000. Since this child will have German citizenship and supposedly will enjoy better opportunities in the German and European labor markets, they should be more likely to stay in Germany. Therefore, after the reform, we should observe a higher fraction of households with a recently born child. If anything, a reduction in the return migration probability would bias down the size of the drop in fertility. Changes in the incentives to migrate to Germany (inflows) do not play a role in our study since the sample is restricted to households where at least one spouse has been in Germany for at least 8 years.

We then investigate whether the results in Table 2 are capturing the effects of changes in naturalization decisions. Naturalization rates in Germany are extremely low and displayed very little changes over time: data from the German Statistical Office show that the naturalization rate in the period between 1998 and 2003 is relatively stable and is around 2%. We then test whether groups affected differentially by changes in naturalization rules introduced by the 2000 nationality law show a different response in terms of fertility. As discussed in Section 2, on the one hand, the reform introduces less strict residency requirements for naturalization since it lowers the minimum residency requirement from 15 years to 8 years. On the other hand, it includes additional requirements such as expressing loyalty to the German Constitution, ability to support self and family without social security aid or unemployment benefit, a clean criminal record, adequate command of the German language, and renunciation of former citizenship. We split the treatment group into two samples: (i) households where at least one spouse has been resident in Germany for more than 15 years at the time of the survey and (ii) households where at least one spouse has been resident in Germany for between 8 and 15 years at the time of the survey. For households in the first sample naturalization requirements have become stricter: before the reform they had an unconditional entitlement to naturalization. Individuals

in the second sample are allowed to apply for naturalization after the reform. Column 1 in Table 4 reports the results for the sample of households where neither spouse has been resident in Germany for more than 15 years; column 2 in Table 4 reports the results for the subsample of households where at least one partner has been resident in Germany for 15 or more years. The coefficients of β_4 and β_5 are positive for both samples, which increases confidence that our main results are not capturing a confounding effect related to the other provisions of the German nationality law reform. The size of the coefficients is larger for the sample of immigrant households where at least one spouse has lived in Germany for between 8 and 15 years, which is consistent with this group including a higher fraction of women of reproductive age.[22] The decline in fertility experienced by the immigrants in the treatment group does not seem to be driven by any of the changes to the naturalization criteria.

The reform might also have decreased foreigners' incentives to marry someone with German citizenship, thus leading to increase of the fraction of marriages among non-citizens. This does not seem to be the case since we observe that the percentage of marriages where both spouses are foreign citizens stays constant before and after the reform (around 3%).

If our results are an artifact of changes in the sample composition, we may observe changes in the overall age composition of the household. We conduct two tests to rule out this possibility. First, we run the baseline specification including a full set of single year female age dummies, which controls for potential non linear effects of female age on fertility. The results are reported in column 2 of Table 5. The coefficients of interest are positive, significantly different from zero, and of very similar size to those in Panel A in Table 2. Second, we assess whether there have been changes in the age composition of children not supposed to be affected by the reform. Since we observe fertility for a period of 5 years after the introduction of the new regime, we should not observe any change in the probability of having a child aged over 5 years. For this purpose, we estimate the specification in eq. 19 using as dependent variables (i) the probability of having a child aged between 6 and 9 years old, and (ii) the probability of having a child older than 9 years old. The results in columns 3 and 4 of Table 5 show that β_4 and β_5 are negative and not significantly different from zero. Overall,

[22] At the baseline, the fertility rate for this group is about twice as high as that for the group that has been in Germany for more than 15 years.

the results of these tests do not support the hypothesis that the drop in fertility is an artifact of changes in the sample composition.

A standard concern when using a difference-in-differences strategy is that results may be biased because trends in the dependent variable might not be the same, in the absence of the reform, for both the treatment and control groups. Graphical evidence provided in Figures 2 and 3 seems to rule this concerns out: both figures show a clear break in the demographic trends of the treatment group starting from 2001. Moreover, the inclusion of group specific linear trends in our baseline specification addresses this concern at least partially.

Differential trends might be driven by differences in either observable or unobservable characteristics between the treatment and the control groups. We use a semiparametric DD model (see Abadie (2005) and Blundell et al. (2004)) to rule out the possibility of differences in observable characteristics. Using a parametric propensity score matching method, we first restrict the treatment and the control groups only to those individuals who are more similar in terms of observable characteristics.[23] In practice, the sample includes only those observations for which the "common support" property holds. We then perform a DD model on the common support area, weighting each observation by the inverse of its estimated propensity score (see Imbens and Wooldridge (2009)). Women in the treatment group are 1.5 percentage point (s.e. 0.006) less likely to have a child after the reform, when compared to women living in couples where at least one partner has German citizenship.

In order to assess the possibility that differences in unobservable characteristics determine differential trends, we perform a standard robustness test: we consider only pre-reform surveys and we assume that the reform was implemented in 1997, thus restricting the sample to the years pre-reform. We then redefine the post reform variable ($Post_t$) as a dummy that takes the value zero for all surveys before 1998[24] and estimate the same specification as in eq. 19. If our results were artificially generated by non-parallel trends in the fertility outcomes of the treatment and control groups, we would expect the differences between the level of fertility of the treatment and the two control groups to be significantly different after the "placebo" reform. The

[23] For this specification we use only one control obtained by merging the two previously defined.

[24] In line with the main specification, we take into account the biological lag between fertility planning decisions and actual outcomes

results of this placebo test are reported in Table 5 column 1. The coefficients β_4 and β_5 are negative, small, and not significantly different from zero.

We also assess the possibility that we are capturing differential responses of households in the treatment groups to macroeconomic shocks and to policies that changed benefits and requirements associated with the Welfare State. While Germany did not experience any particularly strong macroeconomic shock in the period 1996 to 2005 (the inflation and GDP growth time series are fairly stable over time), we test whether households in the treatment and control groups experienced differential changes after 2000 in the reported household income. We do not find any support to this hypothesis (see Table AIV)

Other policies implemented around the time of the German nationality reform could potentially be affecting immigrants' fertility, such as the introduction of new childcare provisions in 2001, only one year after the nationality law reform. The 2001 law, however, was the last and probably the least decisive among a sequence of legislative acts aimed at increasing the length of parental leave and per child allowances.

The first policy reform in Germany was implemented in 1979 and increased paid maternity leave from 2 to 6 months. The second reform, in 1986, increased it from 6 to 10 months. Two legislative changes in July 1989 and July 1990 lengthened the job-protected leaves to 15 and 18 months, respectively. Finally, the reform implemented in 1992 increased it from 18 to 36 months, the longest in the world.[25] The 2001 law introduced only a minor extension of the set of choices available to parents by allowing both to take parental leave at the same time (with no change, however, in the total length of parental leave).[26] The 2001 law also extended the per child allowance to an additional small portion of the population: those households whose net annual income is between DEM 29,400 and DEM 32,200.[27] There is mixed evidence on the effect of child subsidies on fertility, but recent studies suggest that financial incentives stimulate fertility (e.g., Milligan (2005) for Canada; Cohen et al. (2011) for Israel). Therefore, the evidence in the previous literature seems not to justify a connection between the new childcare provisions and the sharp decline in the fertility

[25] As noted by Schoenberg and Ludsteck (2007), there does not seem to be a long-run trend in German fertility rates between 1977 and 1993. Lalive and Zweimuller (2009), however, provide evidence that in Austria, extending paid parental leave from 1 to 2 years increased fertility.

[26] This is also unlikely to be relevant for the households in our treatment group as female labor force participation is lower among immigrants.

[27] Between US$ 21000-23000.

of immigrants after 2001.

Before the approval of the new nationality law, there was heated discussion and strong opposition from the main political parties. However, it is unlikely that our results are driven by uncertainty about the future institutional setting. If anything, it is more likely that uncertainty would lead to reduced fertility in the years prior to the reform, since households might decide to delay their attempts to have a child, and therefore to an underestimate of the reduction in fertility experienced by immigrants after the nationality reform.

5 Child Health

In this section we conduct some further tests of the implications of the "quality-quantity" model of human fertility. If the introduction of birthright citizenship represents an increase in the returns to investment in the child's human capital, we can expect an accompanying increase in child quality.

As a measure of child quality we use BMI, constructed using Microcensus data on weight and height. Childhood obesity is becoming an increasingly relevant issue, and evidence from various countries (see, among others, Popkin and Udry (1998) for the US and Will et al. (2005) for Germany) suggests that obesity rates are dramatically higher among the children of immigrants than native children. Parents can reduce the risk of child obesity by improving the quality of nutritional intake and encouraging physical activity. In the absence of information on school performance, BMI is used to assess whether parents are more likely to invest in their German citizen children.

Because of the reduction in fertility documented above, on average, the characteristics of households with a child born in or after 2000 might differ from the characteristics of households whose last child was born in 1999 or before. Therefore, a negative estimate of β_4 and β_5 in eq. 5 might capture two effects: a) higher parental incentives to invest in children granted German nationality at birth, namely the effect of an increase in the returns to human capital of children; b) change in the sample composition driven by the reduction in immigrants' fertility, the so called "selection effect". At the end of this section we discuss an exercise that provides a lower bound estimate of the former effect. However, we would interpret these results as suggestive, rather than causal evidence.

In Figure 4 we plot the average BMI of children aged 4 and 5 in the treatment and the two control groups for each survey year in which questions on weight and height were asked, i.e. 1999, 2003 and 2005. Children in the treatment group are citizens only in 2005. Children in the treatment group on average display much higher BMI than those in the two control groups in 1999 and 2003, but the differences are significantly smaller in 2005.[28] Formally, we estimate the specification in eq. 5 using BMI and the indicator for being obese as the dependent variables. The results are reported in Table 6. In this specification standard errors are bootstrapped at group/cohort level. Since we only have 18 clusters, we follow Cameron et al. (2008) and we report in brackets the p-values based on wild bootstrap with 1000 replications in order to address the inference issues related to a potentially small number of clusters. The first two columns give the results for BMI. Columns 1 and 3 present the specification without controls, and columns 2 and 4 provide the full specification.[29] For children affected by the reform we observe a reduction in the BMI of 1.1 (0.8) points with respect to those born to mixed couples (couples where both partners are Germans). The size of the effect corresponds to approximately one-fifth of one standard deviation of the BMI observed in the treatment group for cohorts born before the reform. Results for the specifications that use the indicator for being obese as the dependent variable support the conclusion that there has been a substantial improvement in the anthropometric outcomes of immigrant children born after 2000.

Immigrant children aged over 5 in 2005 were not granted citizenship at birth. Therefore, if the reduction in BMI is driven by the reform, we would not expect the BMI of children aged 6-8 in 2005 to be systematically different from the BMI of children aged 6-8 in 2003 and 1999. The results of this falsification exercise are presented in Table 6 columns 5 and 6. Both for the BMI and the obesity dummy, the coefficients are small and statistically not significant.

The obesity gap between the pre-school age children of non-citizens and citizens drops significantly for children born in 2000 or immediately afterwards compared to those born immediately before 2000. However, our results might be reflecting, at least partially, changes in the composition of the sample of children belonging to the

[28] A similar picture emerges if instead of BMI we use the probability of being obese, as defined in Section 3.2.

[29] We introduce the same control variables as in the specifications where the dependent variables are fertility outcomes.

treatment group and born after 2000. This would apply if parents who decided not to have a child after 2000 are the same parents who would have invested less in their child's human capital. We provide an estimate of the effect of citizenship rights on health outcomes, which is bounded in order to take account of this possible source of bias. Our bounding procedure is in the spirit of Card et al. (2009) and Lee (2009). We assume that the children not born because of the reduction in fertility induced by the reform would have displayed the worst health outcomes. As in Card et al. (2009) and Lee (2009), we perform the bounding exercise using the specification in which the dependent variable is a dichotomous variable: being obese or not. In this case, unlike the case of the BMI variable, the worst outcome is naturally defined by the highest possible value of the variable, 1.

Following this procedure, which is detailed in the Appendix, we obtain that the higher incentives to invest in the health of citizen children have led to a reduction in childhood obesity of at least 3 percentage points. The size of the effect corresponds to 7% of one standard deviation in the obesity of children in the treatment group observed before the reform. Under the current German system, there are no differences in the provision of both child care and essential health services - including prenatal and postnatal ones - based on individual citizenship status. Therefore, we interpret the reduction in childhood obesity as evidence of increased parental attention rather than of a change in the access to health care. Higher parental incentives to invest in the health of children affected by the reform are consistent with the predictions of the "quality-quantity" theory, and with the reform interpreted as a positive shock to the cultural assimilation of immigrants if, for instance, child obesity is perceived as a violation of the German cultural model.[30]

5.1 Channel: Time with the mother

Previous studies report evidence of a positive relationship between maternal employment and childhood obesity (see Anderson et al. (2003) and von Hinke Kessler Scholder (2008)). Fertig et al. (2009) provide evidence for the US suggesting that the association between maternal employment and childhood obesity might be caused by working

[30]For instance, this may be the case within the Turkish community since the average fraction of overweight children in Turkey is about three times higher than in Germany (WHO Global Health Observatory (2011)).

mothers devoting less time to child supervision and meal preparation. Cawley and Liu (2007), based on the American Time Use Survey, find that working women spend significantly less time grocery shopping, cooking, eating, and playing with their children, and are more likely to buy prepared foods. Their results suggest also that decreased maternal time for childcare is only partly offset by partners.

In this section we test whether the time allocation of immigrant mothers changed in response to the presence of at least one German citizen among their offspring. In particular, we study whether the number of hours dedicated to childcare, elicited from the GSOEP, changed in response to the introduction of birthright citizenship. We do not have child specific measures of parental investment, but only a measure of the total number of hours of child care spent by mothers and fathers within an average week day. In the absence of full reallocation of childcare from non-citizen to citizen children, however, non-citizen mothers whose youngest child was born in 2000 or afterwards should spend more time childrearing than non-citizen mothers whose youngest child was born before 2000. Whether the youngest child was born before or after 2000 should not matter for those households where at least one parent is a German citizen. We restrict our sample to households where the youngest child was aged 3 years old or less.

We use a difference-in-differences specification and we compare the time allocation of parents whose child was born in or after 2000 with the time allocation of parents whose child was born before 2000 in the treatment group and in the control groups. Estimates are reported in Table 7. The first two columns, respectively without and with controls, show that mothers in the treatment group spend around one and half hour more per day engaged in childcare if their youngest child is citizen. The size of the effect corresponds to approximately one-third of one standard deviation of the dependent variable computed for the cohorts in the treatment group born before the reform.

While the coefficients of fathers are not negligible in size, they are not significant. We perform a falsification exercise where we restrict the sample to the parents with a youngest child born before 2000 and we compare mothers whose youngest child was born after or in 1997, with those whose youngest child was born before 1997. Given that neither children born before nor after nor in 1997 were affected by the reform, we do not expect to find any effect when comparing the time allocation of their mothers;

the coefficients reported in column 4 are much smaller and not significant[31].

6 Conclusion

The results of the investigation in this paper suggest a negative and significant effect of birthright citizenship on immigrants' fertility. We can provide evidence that changes in child´quality are consistent with the predictions of the "quality-quantity" model of human fertility. We find that the effect of the reform is large and statistically significant only for those households where neither parent is a citizen of a EU member state, which are those more likely to benefit from the change in legal status. The reduction is driven by a decrease in the probability of having more than one child, not in the probability of having a first child. We provide evidence that the obesity gap between pre-school aged children of non-citizens and citizens drops significantly for children born in 2000 or immediately afterwards, compared to those born immediately before.

For most of the outcomes considered in this work, the change in the child's legal status at birth determines a convergence of immigrant fertility towards natives' levels. Therefore, our findings might also be explained, at least partially, by an increase in cultural assimilation caused by the reform.

Citizenship rights are often perceived as formal rights. Our results provide evidence instead that, when granted at birth, they can significantly increase the incentives of immigrant parents to invest in their children's human capital. These effects are likely to be stronger in countries where non-citizens have less economic opportunities.

[31]Results are robust to including dummies for the number of children aged between 0 and 6.

Appendix

We consider the relevant health outcome to be the outcome defined by the binomial variable that is equal to 1 if the child is classified as obese and zero otherwise. $o_{i,c}$ is then the average obesity rate of group i belonging to cohort c. To improve readability we use $c >= 2000$ to indicate all cohorts in our sample born in or after 2000 and $c <= 1999$ to denote all cohorts born before 2000. Given that we consider only children aged between 4 and 5 and that information on the weight and height of respondents is provided only by the 1999, 2003 and 2005 surveys, the only cohorts observed after 2000 are the cohorts of children born either in 2000 or in 2001.

Let us now define two groups, T_1 and T_2, of sizes α and $(1-\alpha)$ respectively. The first is the group of children who would have been born anyway regardless of their citizenship rights; the second is the group of children who may not have been born were their prospective legal status to have been different. C is the control group. Note that in the following discussion we consider the two control groups defined in the previous part of the paper as a single control group.[32] The coefficient we observe is determined by the following expression:

$$\beta^{OBS} = [o_{T_1,c>=2000} - o_{C,c>=2000}] - [\alpha o_{T_1,c<=1999} + (1-\alpha) o_{T_2,c<=1999} - o_{C,c<=1999}]$$

while the true causal effect of the reform on obesity rates is

$$\begin{aligned} \beta^{CAUS} &= [\alpha o_{T_1,c>=2000} + (1-\alpha) o_{T_2,c>=2000} - o_{C,c>=2000}] \\ &- [\alpha o_{T_1,c<=1999} + (1-\alpha) o_{T_2,c<=1999} - o_{C,c<=1999}] \end{aligned}$$

It is straightforward to rewrite the two expressions as follows:

$$\beta^{CAUS} = \beta^{OBS} - (1-\alpha)(o_{T_1,c>=2000} - o_{T_2,c>=2000})$$

where $-(1-\alpha)(o_{T_1,c>=2000} - o_{T_2,c>=2000})$ is the correction we need to apply to

[32] Table AIII shows that results obtained from merging the two control groups are similar to the results obtained using our baseline specification.

β^{OBS} to obtain an estimate of β^{CAUS}. In the last expression $(1-\alpha)$ represents the percent decline in size experienced by cohorts 2000 and 2001 of treated children caused by the reform. In order to estimate $(1-\alpha)$ we need to estimate a specification that gives us the effect of the reform on these two cohorts. We then estimate the following specification, which is only a slight variation of our main specification:

$$\begin{aligned} Y_{it} &= \alpha + \beta_1 C_i + \beta_2 C_i * D_{t=1996\&t=1997} + \beta_3 C_i * D_{t=2000\&t=2001} + \beta_4 C_i * D_{t=2002\&t=2003} \\ &+ \beta_5 C_i * D_{t=2004\&t=2005} + \beta_6 C_i * t + \gamma X'_{it} + \mu_t + u_{it} \end{aligned}$$

Now the control group includes both the control groups discussed previously. C_i takes the value 1 if woman i belongs to a couple where one or both partners are German citizens. In addition, in place of a dummy for cohorts born after the reform, we use four different dummies, for survey years 1996-1997, 2000-2001, 2002-2003, and 2004-2005. $D_{t=2000\&t=2001}$ is a dummy variable that is equal to 1 if the survey year is 2000 or 2001.[33] β_3, the coefficient of the interaction term $C_i * D_{t=2000\&t=2001}$, is our coefficient of interest and can be interpreted as the effect of the reform on the fertility outcomes of women in the treatment group during the survey years 2000 and 2001. We can then estimate $(1-\alpha)$ by using the ratio of β_3 to the average of the dependent variable Y (the probability of having a child aged zero) among treated women before the introduction of the new nationality law, that is 0.08352. Table AI in the Appendix provides an estimate of the coefficient β_3 which we can use to calculate $(1-\alpha)$ $((1-\alpha) = 0.0598)$. As already argued, we assume the highest possible bias, therefore $o_{T_2,c>=2000} = 1$. $o_{T_1,c>=2000}$ should instead correspond to the average obesity rates (0.1897) of the children in the treated group born after 2000. The size of the correction we need to apply then is $-0.0598(0.1897-1) = 0.048$ and the bounded estimates of our coefficient of interest, $\beta^{CAUS} = -0.08 + 0.048 = -0.032$.[34]

[33] $D_{t=1998\&t=1999}$ is the omitted time category employed in order to calculate the effect of the reform on fertility outcomes of the treated group in the survey years 2000 and 2001. This allows us to compare directly the 2000/2001 group with the group that was not affected by the reform but was born immediately before it was implemented. Also, this choice provides a higher estimate of the bias and therefore a more conservative estimate of the effect of the reform on the obesity rates among of immigrants' children.

[34] β^{OBS} is obtained by using the specification in eq. 2 but merging the two control groups already introduced to define the control group. The results are provided in the Appendix table AIII.

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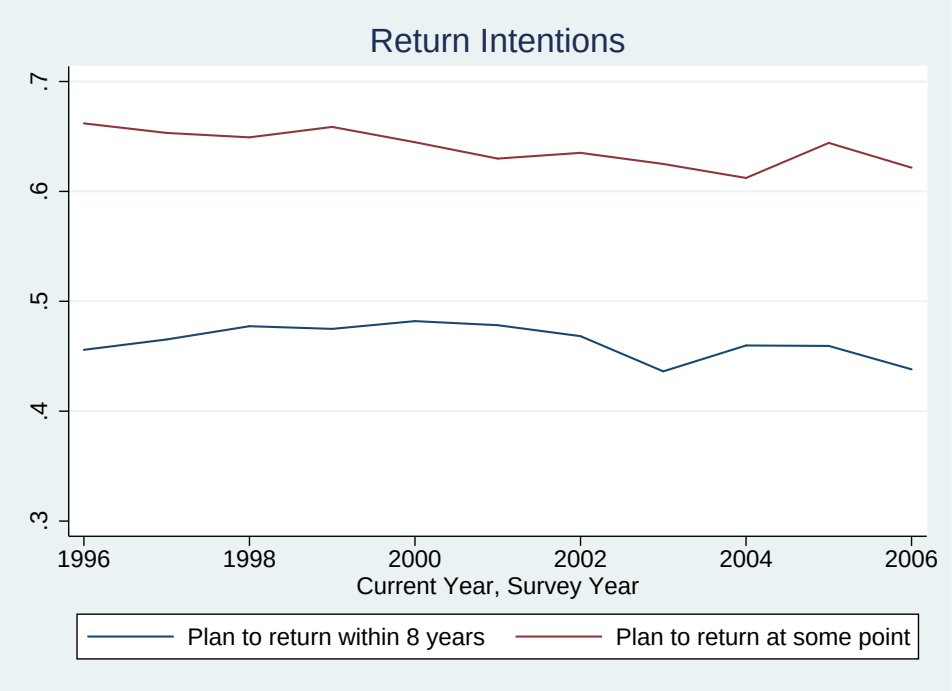
Figure 1: Return Probability



Source: German Socio-Economic Panel. The red line is the proportion of immigrants who answered yes to the question on whether they plan to return to their home country at some point, by survey year. The blue line is the proportion of immigrants who plan to return within 8 years, by survey year.

Figure 2: Probability of having a child less than 12 months old

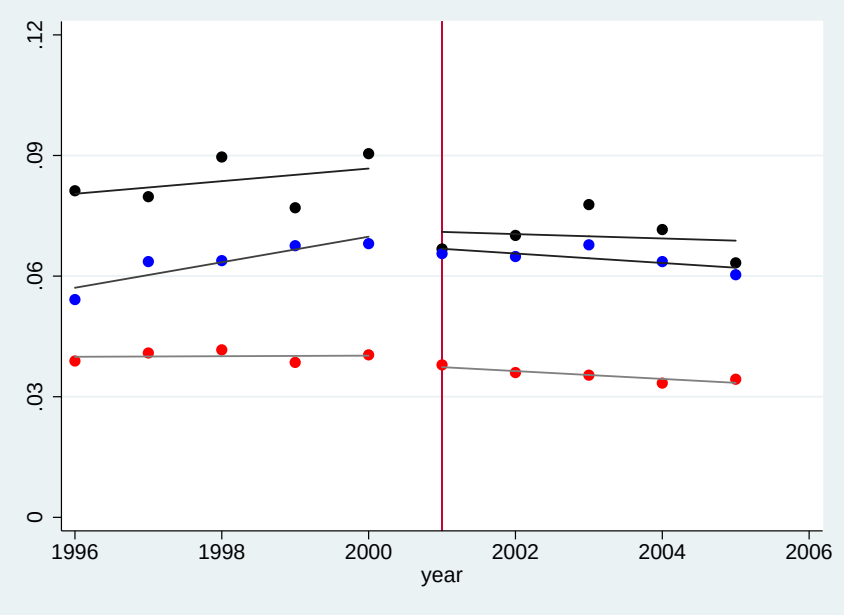
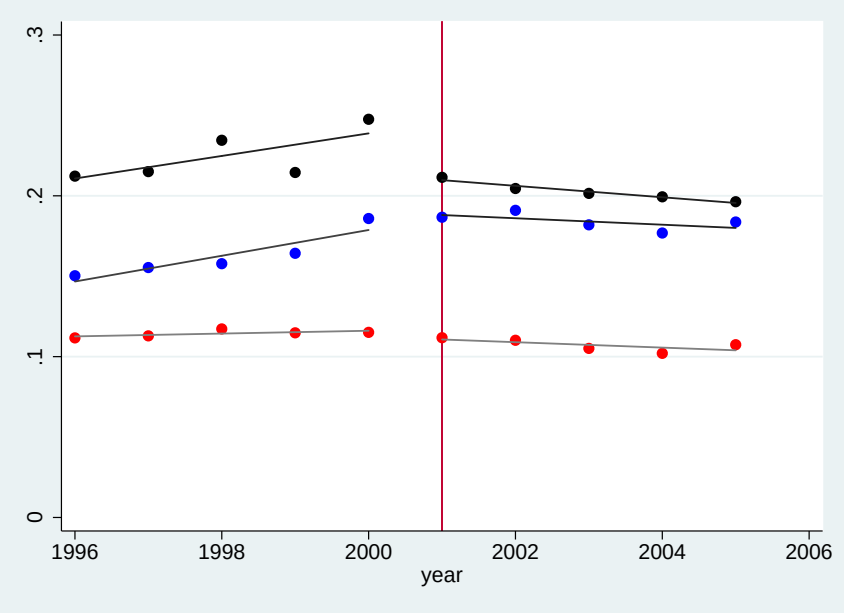
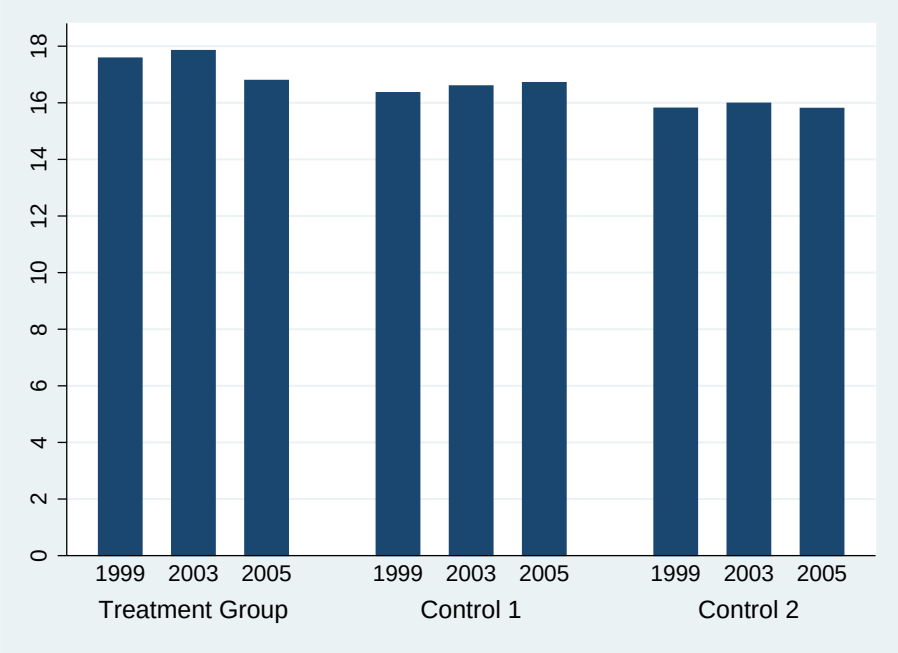


Figure 3: Probability of having at least one child aged 0-3 years



Source: German Microcensus. In Figure 2 we plot the fraction of women (aged 15-49) with a child less than 12 months old, by year and group. In Figure 3 we plot the fraction of women (aged 15-49) with a child younger than 3 years, by year and group. The black dots denote the Treatment group; the blue ones the control group where only parent is German citizen; the red ones the control group where both parents are German citizens.

Figure 4: Body Mass Index of children age 4-5 by survey year



Source: German Microcensus. In this figure we plot the computed Body Mass Index for children aged 4 and 5 years, by survey year. In the treatment group, only children aged 4-5 in 2005 are affected by the reform. Control 1 denotes the group where only one parent is German citizen; Control 2 denotes the group where both parents are German citizens.

Table 1: Sample Characteristics in 2000

	(1) Treatment	(2) Control 1	(3) Control 2
	mean/sd	mean/sd	mean/sd
Age mother	35.991	34.255	38.400
	(7.961)	(7.877)	(6.720)
Mother has primary education	0.225	0.042	0.008
	(0.418)	(0.200)	(0.091)
Mother has secondary education	0.485	0.251	0.145
	(0.500)	(0.433)	(0.352)
Mother has tertiary education	0.248	0.668	0.817
	(0.432)	(0.471)	(0.386)
Mother is German	———	0.464	———
	———	(0.499)	———
Mother is EU	0.206	0.125	———
	(0.405)	(0.331)	———
Age father	40.189	38.280	41.469
	(9.213)	(9.505)	(7.826)
Father has primary education	0.154	0.041	0.006
	(0.361)	(0.197)	(0.076)
Father has secondary education	0.410	0.183	0.083
	(0.492)	(0.387)	(0.275)
Father has tertiary education	0.402	0.739	0.882
	(0.490)	(0.439)	(0.323)
Total number of children	1.613	1.088	1.201
	(1.200)	(1.032)	(1.020)
Observations	2448	3277	50202

Note: The sample includes couples where the female partner is in the age group 15-49. The treatment group are couples where at least one partner has lived in Germany for 8 or more years. Control 1 are couples where only one partner is a German citizen. Control 2 are couples where both partners are German citizens. Summary statistics are computed using the 2000 survey. By construction, the mother is never German in the treatment group and is always German in the second control group.

Table 2: Fertility

	(1)	(2)	(3)	(4)
PANEL A. Dependent variable:	Newborn Child			
Only one spouse German citizen*after	0.014***	0.014***	0.013*	0.011*
	(0.004)	(0.004)	(0.007)	(0.006)
Both spouses German citizen*after	0.009**	0.009***	0.014**	0.014**
	(0.003)	(0.003)	(0.006)	(0.005)
Time dummies		x	x	x
Group Trends			x	x
Controls				x
Observations	941586	941586	941586	941586
PANEL B. Dependent variable:	Probability of at least one child younger than 3			
Only one spouse German citizen*after	0.042***	0.042***	0.039**	0.034**
	(0.009)	(0.008)	(0.019)	(0.015)
Both spouses German citizen*after	0.014**	0.015**	0.027*	0.026**
	(0.007)	(0.005)	(0.015)	(0.012)
Time dummies		x	x	x
Group Trends			x	x
Controls				x
Observations	941586	941586	941586	941586
PANEL C. Dependent variable:	Number of children younger than 3 years old			
Only one spouse German citizen*after	0.048***	0.049***	0.041*	0.035**
	(0.010)	(0.008)	(0.020)	(0.016)
Both spouses German citizen*after	0.017**	0.017***	0.027*	0.026**
	(0.007)	(0.006)	(0.015)	(0.012)
Time dummies		x	x	x
Group Trends			x	x
Controls				x
Observations	941586	941586	941586	941586

Note: Robust standard errors clustered at the group-year level in parentheses. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. The sample includes couples where the female partner is in the age group 15-49. Panel A's dependent variable is a dummy equal to one if there is a child born within the last 12 months. Panel B's dependent variable is a dummy for whether there is at least one child younger than 3 years old. Panel C's dependent variable is the number of children younger than 3 years old. After is a dummy equal to one for all the surveys from 2001 onwards. The treatment group is the reference category. Controls include mother's age, mother's education dummies, state of residence dummies and dummies for whether the mother is German or a EU citizen.

Table 3: Heterogeneous Effects in Fertility

	(1)	(2)	(3)	(4)
	Newborn	Newborn	First child	Higher order
Only one spouse German citizen*after	-0.008	0.017**	0.001	0.015**
	(0.009)	(0.007)	(0.013)	(0.006)
Both spouses German citizen*after	-0.006	0.019***	0.004	0.016***
	(0.008)	(0.006)	(0.013)	(0.004)
Sample	EU	Not EU	No children	At least 1 child
Time dummies	x	x	x	x
Group Trends	x	x	x	x
Controls	x	x	x	x
Observations	921223	935879	384257	574586

Note: Robust standard errors clustered at the group-year level in parentheses. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. The sample includes couples where the female partner is in the age group 15-49. The dependent variable is a dummy equal to one if there is a child born within the last 12 months. Controls are the same as those defined in Table 2. Column 1 restricts the sample to couples where at least one of the parents is a EU citizen. Column 2 restricts the sample to couples where none of the parents is a EU citizen. Column 3 includes only households without children. Column 4 includes only households with at least one child.

Table 4: Other Provisions

	(1)	(2)
	Newborn	
Only one spouse German citizen*after	0.020*	0.008
	(0.011)	(0.005)
Both spouses German citizen*after	0.023**	0.011**
	(0.011)	(0.004)
Sample	8-15 years	more 15 years
Time dummies	x	x
Group Trends	x	x
Controls	x	x
Observations	921797	935305

Note: Robust standard errors clustered at the group-year level in parentheses. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. The sample includes couples where the female partner is in the age group 15-49. The dependent variable is a dummy equal to one if there is a child born within the last 12 months. Controls are the same as those defined in Table 2. Column 1 includes households where none of the parents has spent more than 15 years in Germany and where at least one has spent between 8 and 15 years in Germany. Column 2 includes households where at least one of the parents has spent more than 15 years in Germany.

Table 5: Fertility: Potential Confounders

	(1)	(2)	(3)	(4)
	Newborn	Newborn	6-9 years old	10-17 years old
Only one spouse German citizen*after 98	-0.006			
	(0.005)			
Both spouses German citizen*after 98	-0.005			
	(0.005)			
Only one spouse German citizen*after		0.011*	-0.007	-0.017
		(0.006)	(0.016)	(0.015)
Both spouses German citizen*after		0.013**	-0.009	-0.016
		(0.005)	(0.015)	(0.011)
Time dummies	x	x	x	x
Group Trends	x	x	x	x
Controls	x	x	x	x
Mother Age Dummies		x		
Observations	479632	941586	941586	941586

Note: Robust standard errors clustered at the group-year level in parentheses. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. The sample includes couples where the female partner is in the age group 15-49. In columns 1 and 2 the dependent variable is a dummy equal to one if there is a child born within the last 12 months. In column 3 the dependent variable is a dummy equal to one if there is a child aged between 6 and 9 years old. In column 4 the dependent variable is a dummy equal to one if there is a child aged between 10 and 17 years old. Controls are the same as those defined in Table 2. In column 1 we restrict the sample to the years pre-reform, after 98 is a dummy equal to one for 1998 onwards. In column 2 we control for mother's single year age dummies.

Table 6: Child Quality

	(1)	(2)	(3)	(4)	(5)	(6)
	BMI	BMI	Obese	Obese	BMI	Obese
Only one spouse German citizen*after	1.123**	1.168**	0.120***	0.118***	-0.467	-0.017
	(0.517)	(0.517)	(0.049)	(0.049)	(0.364)	(0.039)
	[0.016]	[0.011]	[0.002]	[0.003]	[0.301]	[0.651]
Both spouses German citizen*after	0.816*	0.882*	0.074*	0.079*	-0.296	-0.007
	(0.457)	(0.458)	(0.044)	(0.044)	(0.307)	(0.033)
	[0.091]	[0.064]	[0.095]	[0.064]	[0.546]	[0.910]
Time dummies		x		x	x	x
Controls		x		x	x	x
Sample	Age 4-5	Age 4-5	Age 4-5	Age 4-5	Age 6-8	Age 6-8
Observations	10991	10800	10991	10800	17095	17095

Note: Robust standard errors clustered at the group-year level in parentheses. P-values based on the wild bootstrap method with 1000 replications are reported in brackets. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. In columns 1-4 the sample is composed of children aged 4 and 5 years old. In columns 5 and 6 the sample is composed of children aged 6-8 years old. BMI is constructed using Microcensus data on weight and height. Obese is a dummy variable equal to one if the child is classified as obese, according to the cutoff points varying by age and gender recommended by the Childhood Obesity Working Group of the International Obesity Task force. The treatment and control groups are defined as before. After is a dummy equal to one if the child was born in 2000 or afterwards. Controls include child's age and gender, mother's age, mother's education dummies, state of residence dummies, and dummies for whether the mother is German or a EU citizen.

Table 7: Parental Investment: Hours of Childcare

	(1)	(2)	(3)	(4)
	mother	mother	father	mother
Only one spouse German citizen*after	-1.785**	-1.517*	-0.512	
	(0.775)	(0.809)	(0.323)	
Both spouses German citizen*after	-1.791***	-1.506**	-0.208	
	(0.594)	(0.600)	(0.213)	
Only one spouse German citizen*after 1997				0.506
				(1.364)
Both spouses German citizen*after 1997				0.553
				(1.224)
Youngest child cohort dummies		x	x	x
Time dummies		x	x	x
Controls		x	x	x
Observations	5488	5441	4744	2284

Note: Robust standard errors clustered at the group-youngest child cohort level in parentheses. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. The sample includes couples whose youngest child is aged 3 years old or less. In columns 1, 2 and 4 the dependent variable is the mother's total number of hours of child care on an average week day. In column 3 the dependent variable is the father's total number of hours of child care on an average week day. The treatment and control groups are defined as before. After is a dummy equal to one if the youngest child was born in 2000 or after. Controls include mother's age, mother's education dummies, state of residence dummies, dummies for the age of the last child, and dummies for whether the mother is German or a EU citizen. Column 3 also includes father's age as a control. In column 4 we restrict the sample to parents with a youngest child born before 2000, after 1997 is a dummy equal to one if the youngest child was born from 1997 onwards.

Table AI: Time Specific Effects

	(1)
	Newborn
One or both spouses German citizen*96-97	0.002
	(0.003)
One or both spouses German citizen*00-01	0.005
	(0.008)
One or both spouses German citizen*02-03	0.006
	(0.004)
One or both spouses German citizen*04-05	0.010**
	(0.004)
Time dummies	x
Controls	x
Observations	941586

Note: Robust standard errors clustered at the group-year level in parentheses. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. In this specification the two control groups are merged. The control group dummy is interacted with four different dummies, for survey years 1996-1997, 2000-2001, 2002-2003, and 2004-2005. Thus years 1998 and 1999 are the reference category. Controls are the same as those included in Table 2.

Table AII: Merged control groups

	(1)	(2)	(3)	(4)
	Newborn			
One or both spouses German citizen*after	0.010**	0.010***	0.014**	0.014**
	(0.004)	(0.003)	(0.006)	(0.005)
Time dummies		x	x	x
Group Trends			x	x
Controls				x
Observations	941586	941586	941586	941586

Note: Robust standard errors clustered at the group-year level in parentheses. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. In this table we merge both control groups. Controls are the same as those in Table 2.

Table AIII: Merged control groups

	(1)	(2)
	BMI	Obese
One or both spouses German citizen*after	0.864*	0.080*
	(0.457)	(0.044)
Observations	10991	10991

Note: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. In this table we merge both control groups.

Table AIV: Alternative explanation: Economic shocks

	(1)	(2)
	Family Income (log)	
Only one spouse German citizen*after	-0.018	0.010
	(0.185)	(0.010)
Both spouses German citizen*after	0.000	0.014
	(0.193)	(0.010)
Time dummies		x
Group Trends		x
Controls		x
Observations	941568	941586

Note: Robust standard errors clustered at the group-year level in parentheses. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. The dependent variable is log deflated family income.