



Immigration and large banknotes

Andreas M. Fischer

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Immigration and large banknotes*

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Abstract

Do immigrants have a higher demand for large denominated banknotes than natives? This micro study examines whether banknote orders for CHF 1,000 notes, a banknote used for storage purposes, is concentrated in Swiss municipalities with a high foreign-to-native ratio. The evidence for 251 Swiss municipalities finds that immigrants hoard fewer CHF 1,000 banknotes than natives. This result means that immigration reduces seigniorage (per person) as measured by banknote orders. A 1% increase in the immigrant-to-native ratio is coincident with a reduction in banknote orders by CHF 4,000. This reduction is attributed to wealth and age effects linked to immigrants.

Key words: immigration, large banknotes, hoarding, money demand
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1. Introduction

The inability to track banknotes in circulation complicates the estimation of regional money demand functions. This estimation hurdle is even more pronounced for the world's largest banknote, the CHF 1,000 note.¹ It is rarely used in daily transactions, yet the currency volume of CHF 22.4 billion for the CHF 1,000 note means that the average Swiss resident holds at least three of them (Swiss population was 7.4 million in 2007). Of these residents, a large percentage are foreigners (22.1% of the Swiss resident population in 2007). Their residencies and those of natives are well known as are the banknotes' delivery destinations. With this information, I ask: what can the traits of municipalities with a high share of immigrants, hereafter immigrant municipalities, tell us about the demand for large banknotes?

This empirical analysis investigates the impact of immigration on large banknotes across 251 Swiss municipalities. A priori, the correlation between immigration and large banknotes is unclear. A positive correlation may reflect a low level of financial participation in banking services or immigrant preferences to send home remittances. Alternatively, a negative correlation

¹The EUR 500 note is the second largest banknote in nominal value. Historically, the CHF/EUR exchange rate has hovered around 1.5, yielding 666 euros.

may capture tax avoidance (Boeschoten and Fase, 1992) or particular traits (e.g., lower average age or lower wealth than natives) that enter a traditional model of precautionary money demand.

The study contributes to the vast literature on money demand by touching on the domains of immigration and monetary policy. It is the first to estimate a currency demand specification at the regional level. Previous studies on regional money demand have used bank deposits as a measure of narrow money.² I overcome this data problem for regional cash holdings by using banknote orders at the bank-branch level. A further contribution is to identify immigration's impact in money demand. A contentious issue in many micro studies on immigration and prices is the separation between demand and supply effects, see Lach (2007), Cortes (2008), and Frattini (2008). This identification issue is simplified, because banknote orders are strictly demand oriented.

²Recent micro studies include Bover and Watson (2007), Fischer (2007), Fujiki (2002). See also the earlier studies by Fujiki and Mulligan (1996), Mulligan (1997), and Mulligan and Sala-i-Martin (1992). In a related study, Jankowski et al. (2007) match banknote orders with Hispanic immigrant concentration for the Chicago area using census data from 2000. It is unclear, however, whether their cross-section estimates are valid at the state or national level.

The results show that large banknote hoarding is less prevalent in immigrant municipalities. A 1% increase in the immigrant-to-native ratio is coincident with a reduction of CHF 4,000. This result means that immigration reduces seigniorage-per-capita as measured by banknote orders. This reduction in banknote orders, which is consistent with the precautionary demand hypothesis, is attributed to two factors. First, immigrant wealth is lower than native wealth. Second, traits linked to immigrants (e.g., lower age) also account for the low demand for large banknotes.

The paper begins in Section 2 by presenting four hypotheses linking immigration and large banknotes. Section 3 then lays out the empirical framework together with the data. Thereafter, Section 4 presents the main results with robustness checks. Section 5 offers conclusions on the importance of immigrant traits for money demand estimation at the regional level.

2. Four hypotheses linking immigration and large banknotes

Of the four hypotheses that link large banknote hoarding to immigrants, the first two - on precautionary money demand and tax avoidance - predict that immigrants hold fewer large denominated banknotes than natives. While less germane for Switzerland, the third and fourth hypotheses - on remittances

and lack of financial participation - predict that immigrants hold larger banknotes.³

The most popular hypothesis is the precautionary demand for money. In the microfoundations literature developed by Whalen (1966), Miller and Orr (1966), and Frenkel and Jovanovic (1988), the real quantity of money balances demanded for transactions and precautionary purposes is a function of several factors: real income, the variance of real income, the rate of interest on an alternative asset, and a set of demographic variables. Aside from income differences between regions, immigration captures important socio-demographic traits such as age and education.⁴ Mulligan and Sala-i-Martin

³Because it is largely believed that Swiss banknotes do not leave the national borders, the hypothesis of currency substitution is not considered, see Porter and Judon, (1996) for the United States and Maradan (2007) for Switzerland. This observation is confirmed by the UK's recent ban on handling EUR 500 notes. Since May 15, 2010, British banks and currency exchanges have been banned from importing EUR 500 notes because of fears of organized crime. The UK ban does not apply to CHF 1,000 notes because there is no widespread evidence of its use. Another hypothesis that is advanced but does not apply to Switzerland is the link between large banknotes and the informal sector (see Rogoff, 1998). Schneider (2008), for example, finds that the Swiss informal sector is smaller than 8%, which is low by international standards.

⁴Although many European countries have good regional data on immigration flows,

(1996) argue that the cost of adopting financial technologies is positively related to age (opportunity costs) and negatively related to the level of education.⁵ Adoption, or not, of new financial technologies available in a new country is a decision that confronts immigrants.

Immigrants in Switzerland are different from natives. First, on average, they are younger than natives. The share of immigrant workers below the age of 40 was 56% in 2006, whereas for Swiss workers it was 44% according to the Swiss Bureau for Statistics (BfS) (2008).⁶ This lower average age additional demographic information is often difficult to obtain. Hence, in a precautionary money demand function, the immigrant-to-native ratio may serve as a simple proxy for omitted variables. Crucial is that average immigrant traits differ from average native traits.

⁵Tin (2008), for example, using information from the Survey of Income and Program Participation, estimates a precautionary money demand function for U.S. households that includes family traits. He finds that age and education correlates positively with non-interest earning checking accounts. Similarly, Duca and Whitesell (1995) show that age correlates positively with the demand for credit cards.

⁶Information from the most recent 2000 census shows that the average age of Swiss residents is 39.3 for natives versus 33.7 for immigrants. The average age differences are even larger for large municipalities (i.e., population greater than 10,000): 42.8 for natives versus 32.7 for immigrants. These results show that average age of immigrants is evenly distributed across municipalities, whereas the average age of natives is heavily skewed

should yield a negative correlation between immigrant municipalities and large banknotes. Second, their average educational level is lower than that of natives. Table 1 shows the absolute numbers and their percentages for three education categories: high school certificate, apprenticeship, and university degree. A striking feature is the high percentage of immigrants with only a high school degree (32%) compared to the Swiss (13%) in 2006.⁷ The demographic trait of low immigrant education should result in low adoption rates of new financial technologies. Thus, a positive correlation between immigrant municipalities and large banknotes is predicted.

A second hypothesis for holding large banknotes is tax avoidance (see Boeschoten and Fase, 1992 and Maradan, 2007). The Swiss wealth tax is annual and is levied at the cantonal level.⁸ The basis of assessment is as follows: residents pay an annual wealth tax on the value of all assets located

⁷The level of education is not uniform across immigrant groups. This feature will be tested in the empirical section.

⁸Several other European countries impose a wealth tax. They include France, the Netherlands, Norway, Greece, and Liechtenstein. This tax was recently lifted in Austria (1997), Finland (2006), Germany (1997), Iceland (2006), Luxembourg (2006), Sweden (2007), and Spain (2008). Countries without a wealth tax include Belgium, Italy, Portugal, and the United Kingdom.

in Switzerland. The progressive wealth tax varies slightly between cantons with a maximum of around 1.5% levied on net assets. Individuals whose wealth is below CHF 250,000 are exempted from the tax.

Large banknote holdings are a simple means for avoiding the wealth tax and should yield a distinct seasonal pattern. Because this tax is based on the end-of-year financial position, large banknote holdings should increase before year's end to reduce the wealth stated on financial statements. However in the new year, large banknote holdings should fall to reap interest income. Thus at the quarterly frequency, a rise in the fourth quarter in year t and a fall in the first quarter of year $t + 1$ is expected for large banknotes.

In the aggregate, the seasonal pattern of tax evasion should behave similarly to a Christmas shopping effect but more strongly because of the larger wealth effect. Figure 1 shows the seasonal pattern of notes in circulation for transaction purposes (i.e., CHF 10, 20, 50, and 100 notes added together) and for storage purposes (i.e., CHF 1,000 note) from 1980:1 to 2009:12. The graph shows indirect evidence consistent with the tax evasion argument: the seasonal pattern for the CHF 1,000 note is larger than the combined Christmas effect stemming from the aggregated notes for transaction purposes. The values are normalized at 1980:1. Because the CHF 1,000 note is not readily

available at all ATM machines and is not accepted in all stores, the marked seasonal pattern in Figure 1 is attributed to other non shopping domestic activities: tax evasion (i.e., CHF 1,000 notes dispersed regionally) or bank window dressing (i.e., CHF 1,000 notes concentrated in cities of major bank headquarters).⁹

The wealth tax's deduction means that the less wealthy, which includes immigrants, have a lower incentive to evade (or are not affected by) the tax. While there is no direct comparative information on immigrant and native wealth in Switzerland, several indicators suggest that average native wealth is higher. One measure is salary and employment. Immigrants in Switzerland on average earn less and are more likely to be unemployed than natives. According to the BfS (2008), the median monthly salary for immigrants was just over CHF 5,000 in 2006, while for natives it was just under 6,000. Similarly, the unemployment rate for immigrants was 7.1% in 2006, while the rate for natives was only 2.6%. A further measure of wealth is home ownership. Again according to the BfS (2008), native home ownership stood

⁹The rise in the volume of the CHF 1,000 notes relative to the other notes starting in 1997 is partially explained by the introduction of the CHF 200 note, which replaced the CHF 500 note in the same year. The newly introduced note is used both for transaction and storage purposes, while the CHF 500 banknote is used primarily for storage.

at 52.7% in 2007:Q2, whereas immigrant home ownership was just 18.6%. The incentive to avoid wealth taxes on the part of wealthier natives means that a negative (seasonal) correlation between immigrant municipalities and large denominated notes is expected.

The third hypothesis is based on remittances. Jankowski et al. (2007) argue that remittances operating through global cash transfer services are attractive for immigrant groups that send cash to recipient countries with weak financial infrastructure. Although the practice of remittances is widespread in the United States and Saudi Arabia, several factors speak against this argument as a plausible explanation of large banknote holdings among immigrants in Switzerland.

One counterargument is the small size of remittances to poor countries. Arapovic and Brown (2009) estimate the total amount of remittances to the Balkans and Turkey; the most likely immigrant groups to use cash transfer services. The estimated sum is only CHF 0.7 billion for 404,000 immigrants in 2006. This total yields CHF 1,700 per immigrant: an amount well below the average holdings of three CHF 1,000 notes per person. A further counterargument is that immigrants from the Balkans and Turkey comprise only 25% of the immigrant population living in Switzerland. It is thus unlikely

that these two immigrant groups at the municipality level can influence the demand for large banknotes in the aggregate.

The fourth hypothesis is financial participation. This hypothesis is again motivated by the U.S. experience. Jankowski et al. (2007) show empirically for the Chicago area that Hispanics, in contrast to other immigrant groups, hoard USD 100 notes. The conjecture advanced by the authors is that Hispanics hardly use banking services. Frictions in these services for Hispanic immigrants include lack of a common language, lack of residence documentation, and salary payments by cash or check.

The “unbanked” hypothesis does not readily apply to immigrants in Switzerland. Independent of their skill-level or language skills, employees in Switzerland need a bank account to receive their salary. Almost all salary payments in Switzerland are electronic transfers.

3. Econometric specification and data

This section first presents the empirical model together with the instrumentation strategy. Empirical estimates from the first-stage regression are shown. In a second subsection, the data are discussed.

3.1 Empirical specification

The econometric model estimates the demand effect of immigrants to natives of a Swiss municipality on banknote orders in the same city. Banknote orders are volume measures in Swiss francs for six banknotes: CHF 10, CHF 20, CHF 50, CHF 100, CHF 200, and CHF 1,000. The following specification adapted from Lach (2007) and Frattini (2008) defines the banknote order, BO_{mt} , for municipality, m , ($m = 1, \dots, 251$) for time, t , covering the quarterly sample from 2006:Q1 to 2007:Q4 (defined by data availability) as

$$\ln BO_{mt} = \mu_t + \mu_m + \delta(I_{mt}/N_{mt}) + \beta \ln(I_{mt} + N_{mt}) + \lambda X_{mt} + u_{mt}, \quad (1)$$

where I_{mt} and N_{mt} are the number of immigrants and natives in municipality, m , in quarter, t , μ 's are time and municipality effects, X_{mt} are additional municipality specific factors (i.e., the unemployment rate serves as a proxy for economic activity or overnight stays capturing tourism effects), and u_{mt} is a shock to banknote orders in quarter t . Total population, $(I_{mt} + N_{mt})$, which captures size effects, should be positively correlated with banknote orders. The size effect of different notes may be nonlinear because the distribution of ATM services is greater in larger cities.¹⁰

¹⁰See Lach (2007) for a discussion of nonlinear effects for population in a similar specification for CPI prices.

The coefficient of interest in equation (1) is δ . An insignificant coefficient estimate for I/N says that preferences for banknote holdings between immigrants and natives are similar. Alternatively, when δ is positive this says that immigrants in Switzerland have strong preferences to hold large banknotes. Such behavior is consistent with remittances or a lack of financial participation. Alternatively, when δ is negative, this says that possible immigrant traits such as age, education, or income are captured through I/N .

Although equation (1) is not subject to the endogeneity conundrum between supply and demand (banknote orders are demand driven), other estimation issues need to be addressed. First, omitted variables, such as prices or income unavailable at the municipality level, influence an immigrant's decision to reside in a particular Swiss city and are certainly correlated with banknote orders. The omitted variables problem biases the estimates of δ in (1). In the case of rising income, this leads to an upward biased estimate of δ .

Second, potential measurement problems of the immigrant stock raise concerns of attenuation bias for the estimate of δ (see Aydemir and Borjas, 2006). Immigration is measured as the number of foreign nationals residing in Switzerland. Because the immigration stock varies in response to natu-

ralized citizens and births of foreign nationals, our measure of immigration is contaminated. This measurement problem drives the OLS estimate of δ towards zero. Although at the national level the difference between foreign nationals and foreign born population is small by international comparisons, it is difficult to determine how large the measurement problem is across regions.¹¹

I resolve both problems of omitted variables and of measurement error by instrumenting for I_{mt}/N_{mt} . The instrumental variable is based on settlement patterns of previous immigrants. Following Card (2001), I construct a variable that predicts immigrant flows for each municipality and for each quarter.¹² The intuition is to exploit the location choices of past immigrants from each area of origin to predict settlement decisions of immigrants from the same country. The instrument variable predicts the immigrant stock filtering local contemporary demand factors.

The instrument's construction involves several steps. In a first step, immi-

¹¹Swiss record keeping of immigrants follows the "ius sanguinis" concept. In 2006, foreign nationals were 20.2% of the population, while foreign born were 22.9% of the population. See Table 3 in Münz (2008) for European comparisons.

¹²Cortes (2008), Frattini (2009), Lach (2007), and Saiz (2007) use the same instrument strategy in a similar specification to equation (1).

grants are divided into 11 countries of origin. I then calculate I_{it} , the number of immigrants from each country, i , that reside in Switzerland in quarter t .¹³ Next, the fraction of immigrants from country, i , in municipality, m , is the quarterly average for the year 2004, $\bar{\lambda}_{mi} = \bar{I}_{mi}/\bar{I}_i$. The predicted number of immigrants from country i in quarter t is $\bar{\lambda}_{mi}I_{it}$. By summing over i , a measure of the predicted total immigrant inflow into municipality, m , at time, t , is obtained that is free of local shocks. A final step normalizes the instrument by the number of natives in the municipality two years before at $t - 8$:

$$SP_{mt} = \sum_{i=1}^{11} \frac{\bar{\lambda}_{mi}I_{it}}{N_{mt-8}}. \quad (2)$$

The regression of the immigrant-to-native ratio on the supply push instrument, SP_{mt} , offers a simple test of an instrument's strength. Table 2 presents OLS regressions from 2006:Q1 to 2007:Q4 with municipality effects. In each regression, the instrument has a t -value above 5, suggesting that SP passes the critic of weak instruments. The first regression in column 1 is unrestricted. It includes information on immigrants from 2675 municipalities. Next in column 2, the sample is restricted to 243 municipalities receiving

¹³The European countries of origin are Austria, France, Germany, Italy, Netherlands, Serbia, Portugal, Serbia, Spain, Turkey, United Kingdom, and others.

banknote orders for CHF 1,000 notes in 2006 and 2007. Column 3 shows the restricted first-stage regression of column 2 with time effects. The last specification in column 4, which is used in the analysis in section 4, includes $\ln(\text{population})$ and the unemployed-to-population ratio in the specification of column (3).

3.2 The data

The quarterly sample from 2006:Q1 to 2007:Q4 covers a maximum of 251 municipalities. Data on banknote orders at the bank-branch level are aggregated to the municipality level. The quarterly data are from UBS, the largest national distributor of banknotes in Switzerland.¹⁴ Banknote orders across municipalities should be treated as homogenous in that UBS note distributors have monopoly power at the local level and operate with equal delivery times (i.e., two and half hours or less) for the served municipalities. UBS handles roughly one-third of the banknote distribution activity in Switzerland.

The broad coverage of banknote orders is first shown graphically followed by statistical information that confirms this result. UBS's distribution is

¹⁴Most distributors operate only regionally. The distribution of banknotes is fully privatized in Switzerland. Information on the location of notes returned to the Swiss National Bank is unavailable.

shown in Figure 2. The darker shaded dots denote the banks served by UBS and the lighter shaded dots depict the remaining municipalities in Switzerland. The sparse areas in Figure 2 are consistent with Switzerland's mountain regions.

Table 3 provides statistical information on banknote orders that confirms the broad-based coverage.¹⁵ The first column shows the number of municipalities served. They range between 199 and 251, depending on the banknote's size. Column 2 shows the percentage of German speaking municipalities served. Apart from the CHF 50 note, the currency percentages lie close to the national average of 72% for the German-speaking population. Next, columns 3 to 6 provide information on the average, the minimum and the maximum, and the standard deviation of the quarterly total of the distributed currency. In the last column, the quarterly average from column 3 is divided by the average quarterly outstanding currency for the respective banknote. Except for the CHF 10 and the CHF 200 banknote, the percentages lie between 10% and 15%. The low percentage for the CHF 10 note (0.005%) suggests that UBS coverage is problematic for the smallest banknote, whereas the distri-

¹⁵The appendix offers further additional descriptive information at the municipality level. It shows that smaller municipalities are subject to large outliers.

bution of the CHF 200 note (46%) may be over-representative with respect to the others. Because of the broader coverage of the CHF 200 note, this banknote is included in the empirical analysis as a control for the regression estimates for the CHF 1,000 notes.

The postal code from the banknote orders is matched with other data sources. From the Federal Office for Migration, I obtained data on the number of foreigners grouped by their origin for each municipality in Switzerland. The data are available at the quarterly frequency. The quarterly variable on overnight hotel stays by foreigners, which seeks to capture a tourism effect, is from the Federal Office of Statistics. Further, the number of unemployed workers for each community is from the State Secretariat for Economic Affairs. The monthly data are averaged at the quarterly frequency. In addition, I obtained data on the total resident population for each municipality from the Federal Office of Statistics. The population data, available only at the annual frequency, are disaggregated by a linear interpolation over a 20-year period from 1989 to 2008.

4. Empirical results

This section presents the empirical results that the immigrant-to-native ratio

captures wealth and age effects entering a precautionary demand function. In the first subsection, the main result for large banknotes is documented: the correlation between banknote orders and the immigrant-to-native ratio is negative.¹⁶ The second subsection presents robustness tests that control for income effects by excluding geographical areas where poorer natives reside (i.e., mountainous and rural areas). These results show that the hoarding effect is linked to wealthier natives. The third subsection presents empirical results that examine the seasonal pattern of equation (1). The empirical findings are inconsistent with the tax evasion argument.

4.1 The main results

Table 4 presents OLS and IV regression estimates for CHF 200 and CHF 1,000 banknote orders. All regressions are for the full sample and control for municipality effects. The coefficient estimates for the immigrant-to-native ratio and population are sensitive to estimation type and the introduction of time effects. In the OLS and IV regressions, the introduction of time effects lowers the coefficient estimates for the immigrant-to-native ratio. This result says that macroeconomic trends, such as interest rates, interact strongly with

¹⁶Table Appendix A shows that this negative relationship for municipalities with the 10 highest and 10 lowest immigrant to native ratios.

the immigrant-to-native ratio. Further, the introduction of the unemployed-to-population ratio is positive reflecting the view that immigrant unemployment is highly concentrated in larger cities. This variable, however, does not influence the coefficient estimates for the immigrant-to-native ratio.

OLS estimates find that the immigrant-to-native ratio is insignificant. These estimates are presented in the top panel of Table 4. The immigrant-to-native ratios are insignificant in all regressions for the CHF 200 banknotes. The introduction of municipality size (natural log population), economic activity (unemployed-to-population ratio), natural log of overnight hotel stays, or time effects does not change the result that the demand for 200 banknotes does not differ between immigrants and natives. In each of these regressions, the variable of interest is insignificant and the size effects captured by population have the wrong sign.

A somewhat similar picture emerges for the OLS estimates for the CHF 1,000 notes. The immigrant-to-native ratio is positive and significant in the regression without time effects, see columns 6 and 7 versus column 8. The introduction of time dummies reduces the coefficient estimate of the immigrant-to-native ratio fourfold and eliminates its significance, see columns 8 to 10. The introduction of population, the unemployed-to-population ratio,

or overnight stays has no significant bearing on the results for the immigrant-to-native ratio.

Next, IV estimates reveal that immigrant municipalities hoard fewer larger banknotes. The bottom panel of Table 4 shows IV estimates of different specifications of equation (1). The F-tests from the first-stage regression are all high, suggesting that the critic of weak instruments does not apply. The coefficient estimates for the immigrant-to-native ratio are negative and significant at the 1% critical level in the regression for the CHF 200 banknotes. The coefficient size for I/N jumps from -10 to -20 with the introduction of time effects. In other words, a 1% increase in the immigrant-to-native ratio leads to a reduction by CHF 4,000. This result is partially compensated by population size by CHF 1,000 (i.e., it has a coefficient size of 5).¹⁷ These results are not sensitive to the introduction of the unemployed-to-population ratio. This latter variable enters with a positive coefficient and is significant at the 5% level. The introduction of the overnight stays in column 5 is significant and mitigates the population effect without influencing the coefficient

¹⁷This estimate needs to be treated with caution in that population is not necessarily exogenous in this specification, see Lach (2007). The results are not sensitive to whether N or $(I + N)$ is used to control for size effects.

on the immigrant-to-native ratio.

The IV estimates for CHF 1,000 banknotes resemble those for CHF 200 banknotes. The coefficient estimates for I/N fall from 7.7 to -7.7 with the introduction of time effects, see columns 6 and 7. The coefficient estimates of I/N are negative and significant at the 10% level in regressions with time effects, see columns 8 to 10. The regressions with time effects show that a 1% increase in the immigrant-to-native ratio leads to a CHF 7,000 reduction in the demand for large banknotes. This result is compensated by population size in the order of CHF 3,000. As for the CHF 200 note, hotel stays in column 10 captures size effects rather than separate tourist effects. Thus, the preferred specifications in Table 4 are columns 4 and 9. These regressions are estimated with greater degrees of freedom and show positive and significant size effects for population.

Next, I examine whether the disproportionate effect between immigrants and natives for large banknotes holds for other banknote denominations. A significant negative result across all banknote denominations is consistent with the traditional and not the precautionary demand for money. The IV regressions in Table 5 are based on specifications 4 and 9 in Table 4. Only the coefficient estimates for the immigrant-to-native ratio are shown.

The empirical results for various banknotes show that the immigrant demand for smaller banknotes is not distinct from natives, except for the CHF 20 notes. The coefficient estimates are insignificant for the CHF 10, the CHF 50, and the CHF 100 banknote, whereas for the CHF 20 note it is negative and significant at the 5% level. These results are consistent with the precautionary demand specification and the view that natives hoard larger banknotes.

A further consideration is whether the hoarding of large CHF banknotes by natives is more pronounced with a particular immigrant group linked to education. If education matters for the adoption of new financial technologies, then the demand for large banknotes by well educated immigrants should be lower than for less educated immigrants. To test this claim, I examine the behavior of the four largest immigrant groups in Switzerland: Germans, Italians, Serbians, and Portuguese. A striking feature is that these nationals have different levels of education. German immigrants have the highest percentage of university degrees (64% in 2007, see Table 1), while the Portuguese the lowest (6% in 2007). The IV regressions in Table 6 again show only the estimates of the immigrant-to-native ratio for specifications 4 and 9 in Table 4 for the CHF 200 and CHF 1,000 banknotes. The in-

struments have been adjusted so that only the fixed immigrant share at the municipality level in 2004 is multiplied by the aggregate of the respective immigrant group.¹⁸

The IV regressions for immigrant groups show that the coefficients are all negative except for Serbian immigrants in the demand specification for CHF 1,000 notes. The negative and significant results for the more educated immigrants (i.e., Germans with CHF 200 notes and Italians with CHF 1,000 notes) is consistent with the micro evidence in Mulligan and Sala-i-Martin (1996) that find education to be negatively correlated with money demand. Because the significance for the higher educated immigrants is not uniform across the large banknotes, the evidence that the immigrant-to native ratio is capturing demographic effects related to education must be interpreted as weak.

4.2 Controlling for municipality and regional characteristics

This subsection presents robustness checks for the result that natives hoard large banknotes. The robustness checks control for income and non linear effects with sample splits for municipality and regional characteristics. The

¹⁸Data for Swiss education levels at the local level is not available for the observed sample.

evidence shows that these factors are non neutral, however the main result that natives hoard more than immigrants holds.

The first set of regressions presents coefficient estimates for I/N that control for municipality characteristics linked to wealth. Panel A of Table 7 divides the sample based on a municipality population below or above 10,000 residents for the CHF 200 and CHF 1,000 note.¹⁹ The conjecture is that larger municipalities are wealthier and thus the immigrant effect should be stronger with the CHF 1,000 note than with the CHF 200 note.

Indeed, this is what the results based on population size show. The results show strong evidence of native hoarding for CHF 200 notes in smaller municipalities. The opposite result holds for the largest banknote in the larger municipalities. The immigrant-to-native ratio is negative and significant at the 10% level for large municipalities. This hoarding result is consistent with the fact that incomes are higher in larger municipalities.

The role of special tax reductions is examined next. To do so, the sample is divided between municipalities that are exempt from special taxes because of their weak fiscal position. The estimates are recorded in panel B of Table

¹⁹Table A1 in the appendix shows that banknote orders for smaller municipalities are subject to large outliers.

7. The coefficient estimates for I/N show that municipalities not benefiting from the tax reduction, hoarding prevails. These coefficient estimates are close to the full sample estimates recorded in Table 4, but their level of significance is higher. The insignificant estimates for the sample of municipalities enjoying tax benefits, however, must be interpreted with care. The sample size is small and the F-test values from the first-stage regressions are low.

The next robustness test considers the influence of regional location on the distribution of CHF 200 and CHF 1,000 banknote orders. Table 8 splits the sample at the municipality level in two ways: rural versus urban areas and mountain versus low-land regions. The sample splits are motivated by location of commercial activity: agriculture sector (rural) and tourism (mountain region). The agriculture (8.1% immigrant labor participation in 2006) and tourist (51%) sector control for income effects and contrasting immigrant participation rates in the labor force.

Again, the results from the sample split on rural versus non rural areas reconfirm the conjecture that wealthier natives are driving the demand for large banknotes. Panel A of Table 8 shows regression results for rural and non rural areas. This sample split controls for higher-income effects and higher

labor participation effects on the part of immigrants in non rural areas. Only for the non rural areas is a negative and significant result found. The result for the rural areas instead has to be interpreted with caution because of the low F-test values from the first-stage regressions.

Further tests based on elevation reveal that the wealthier low land regions generate the strongest negative correlation with immigrant municipalities. Panel B of Table 8 shows regression results for high and low elevation municipalities (i.e., 800 meters or more). Only for the low municipalities is a negative and significant result for I/N observed. The estimates for the immigrant-to-native ratio are insignificant for mountain municipalities. The insignificance result is consistent with the fact that incomes of municipalities in the mountain areas lie well below the national average.

4.3 Seasonal patterns and tax evasion

The empirical results in the previous section show that a higher level of native wealth is associated with a negative correlation between large banknotes and the immigrant-to-native ratio. This negative correlation is inconsistent with the unbanked and the remittance hypotheses. However, an open issue remains whether the negative coefficient for the immigrant-to-native ratio captures tax evasion or wealth effects in a precautionary demand function.

A simple test for tax evasion examines seasonal patterns between banknote orders and immigration flows. This seasonal pattern is defined by a strong rise in the demand for banknotes in the fourth quarter in year t followed by a sudden fall in the demand for banknotes in the first quarter in year $t + 1$. The rationale for this seasonal pattern is that higher banknote holdings in the fourth quarter lead to a lower end-of-year balance on financial statements used for tax declarations. In contrast, reduced banknote holdings in the first quarter next year compensate the forgone loss on interest income.

The quarterly regression results do not uncover a seasonal pattern consistent with tax evasion. Table 9 reruns the IV regressions of Table 4 of columns 4 and 9 for individual quarters. Because of the low degrees of freedom, the results need to be treated with caution. Despite this shortcoming, the quarterly estimates for the CHF 200 and the CHF 1,000 notes are significant at the 10% level only for the fourth quarter. Furthermore, the strength of the first-stage regressions is reasonable only for the fourth quarter. The absence of a significant seasonal pattern in the fourth and the first quarter suggests that banknote orders are not driven by tax evasion considerations. Rather, I interpret the negative correlation between banknote orders and immigrant cities in Tables 4 and 5 to be driven by immigrant traits: a result consistent

with the precautionary demand hypothesis.

5. Conclusions

This paper is the first country study to examine immigration's effect on banknote circulation. The empirical results show that immigrant municipalities have a lower demand for large banknotes. In other words, immigration reduces seigniorage per person as measured by banknote orders. Controlling for population size, a 1% increase in the native-to-population ratio lowers the demand for the CHF 1,000 banknote by CHF 4,000. A similar immigrant effect is found for the CHF 200 note, while for the smaller denominated notes no effect is identified. Consistent with the hypothesis of the precautionary demand for money, I attribute this immigrant effect for large banknotes to specific immigrant traits such as lower average age and lower average income.

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Table A: Descriptive Statistics

| District | Immigrant to Population Ratio $(I / Pop)_{2007Q4}$ | Population Pop_{2007Q4} | Change in Immigrants over Population $((I_{2007Q4} - I_{2006Q1}) / Pop_{2006Q1}) \times 100$ | Relative Change in Banknote Orders $((Banknote\ Orders_{2007Q4} - Banknote\ Orders_{2006Q1}) / Banknote\ Orders_{2006Q1}) \times 100$ | | | | | |
|--|---|------------------------------|---|--|--------------|--------------|--------------|--------------|--------------|
| | | | | CHF 1000 | CHF 200 | CHF 100 | CHF 50 | CHF 20 | CHF 10 |
| Largest immigrant-municipalities | | | | | | | | | |
| Renens (VD) | 0.50 | 18904 | -1.88 | 13.58 | 2.90 | . | . | -17.19 | . |
| Vernier | 0.43 | 31105 | -0.80 | -3.54 | -48.45 | -1.68 | -74.19 | -42.00 | . |
| Rorschach | 0.40 | 8646 | 1.46 | 62.57 | -8.50 | 0.00 | -2.86 | -13.83 | 138.63 |
| Ecublens (VD) | 0.40 | 10677 | 0.15 | . | -9.17 | -1.47 | . | 26.16 | . |
| Vevey | 0.40 | 17381 | -0.13 | 27.25 | 5.34 | 14.78 | 94.45 | 32.99 | . |
| St. Margrethen | 0.39 | 5351 | 1.41 | 32.34 | -17.85 | -1.39 | 13.76 | 42.90 | 41.99 |
| Rolle | 0.38 | 4950 | -1.70 | 3.70 | 2.30 | 8.27 | -40.55 | 38.70 | 179.18 |
| Biasca | 0.38 | 5919 | -1.16 | 15.42 | -9.70 | -17.64 | 8.31 | -2.99 | . |
| Genève | 0.36 | 183654 | -0.78 | 12.53 | 12.49 | 7.37 | 50.16 | 23.22 | -25.45 |
| Carouge (GE) | 0.35 | 19336 | -1.98 | -11.78 | 45.50 | -55.56 | 109.54 | -12.10 | . |
| Average | 0.40 | 30'592 | -0.54 | 16.90 | -2.51 | -5.26 | 19.83 | 7.59 | 83.58 |
| Smallest immigrant-municipalities | | | | | | | | | |
| Freimettigen | 0.05 | 362 | -2.16 | 14.11 | -10.13 | 31.02 | 69.31 | 24.85 | . |
| Bolligen | 0.05 | 6021 | 0.45 | -26.76 | 16.58 | -6.45 | . | 0.00 | 91.63 |
| Koppigen | 0.05 | 2142 | 0.09 | 6.62 | -2.41 | 37.68 | . | 46.86 | . |
| Schüpfen | 0.05 | 3306 | 1.13 | -2.67 | 12.78 | -70.19 | . | 100.02 | . |
| Hasle bei Burgdorf | 0.05 | 2970 | -0.48 | 10.98 | 3.97 | 2.78 | . | 66.50 | . |
| Mötschwil | 0.04 | 133 | 10.95 | -7.41 | -5.05 | 19.88 | 46.43 | 32.90 | . |
| Grächen | 0.04 | 1357 | 0.60 | 24.29 | -77.87 | 58.78 | . | -55.96 | . |
| Deisswil bei Münchenbuchsee | 0.02 | 99 | 0.00 | 53.71 | -2.15 | 51.08 | . | 27.03 | . |
| Ursenbach | 0.02 | 909 | 0.77 | . | . | 25.13 | . | 36.29 | . |
| Aeschlen | 0.02 | 311 | 0.00 | 11.28 | -5.22 | 25.57 | 0.00 | 31.75 | -69.31 |
| Average | 0.04 | 1'761 | 1.13 | 9.35 | -7.72 | 17.53 | 38.58 | 31.02 | 11.16 |

Notes: Table A shows the municipalities with the 10 largest and 10 smallest immigrant-to-population ratios (in 2007Q4). The changes in immigration and banknote orders display the aggregate changes over 2006Q1 to 2007Q4. Changes in banknote orders are shown for CHF 1000, CHF 200, CHF 100, CHF 50, CHF 20 and CHF 10 notes.

Figure 1: Seasonal pattern of notes for transaction and storage purposes

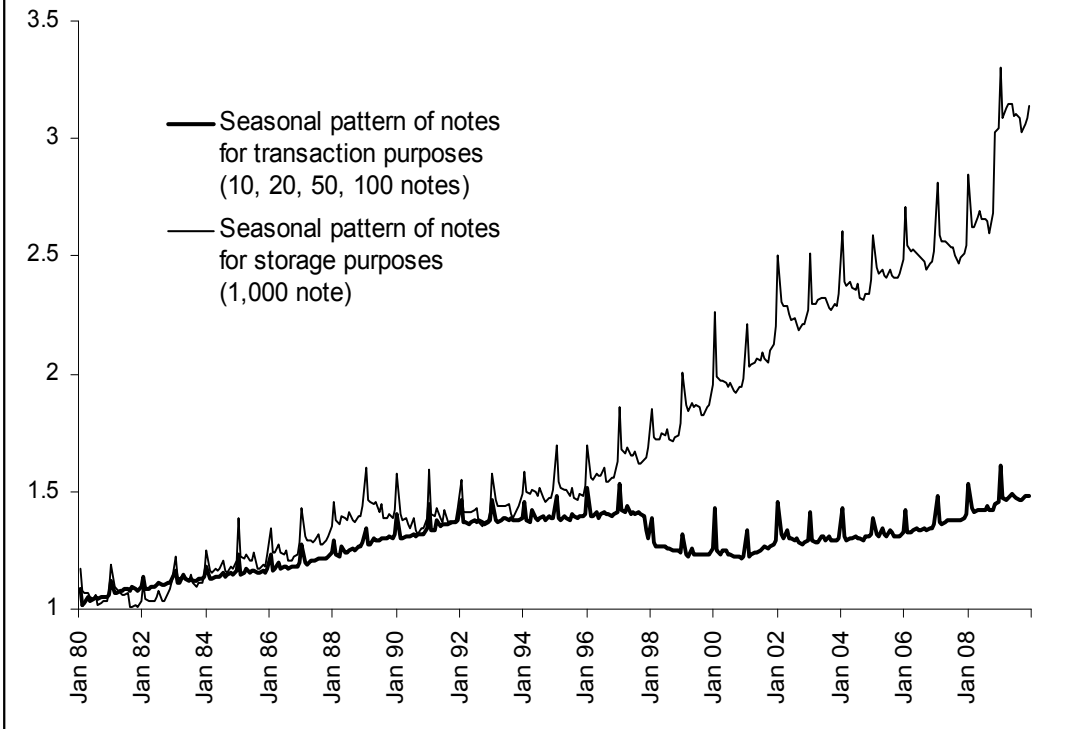


Figure 2:

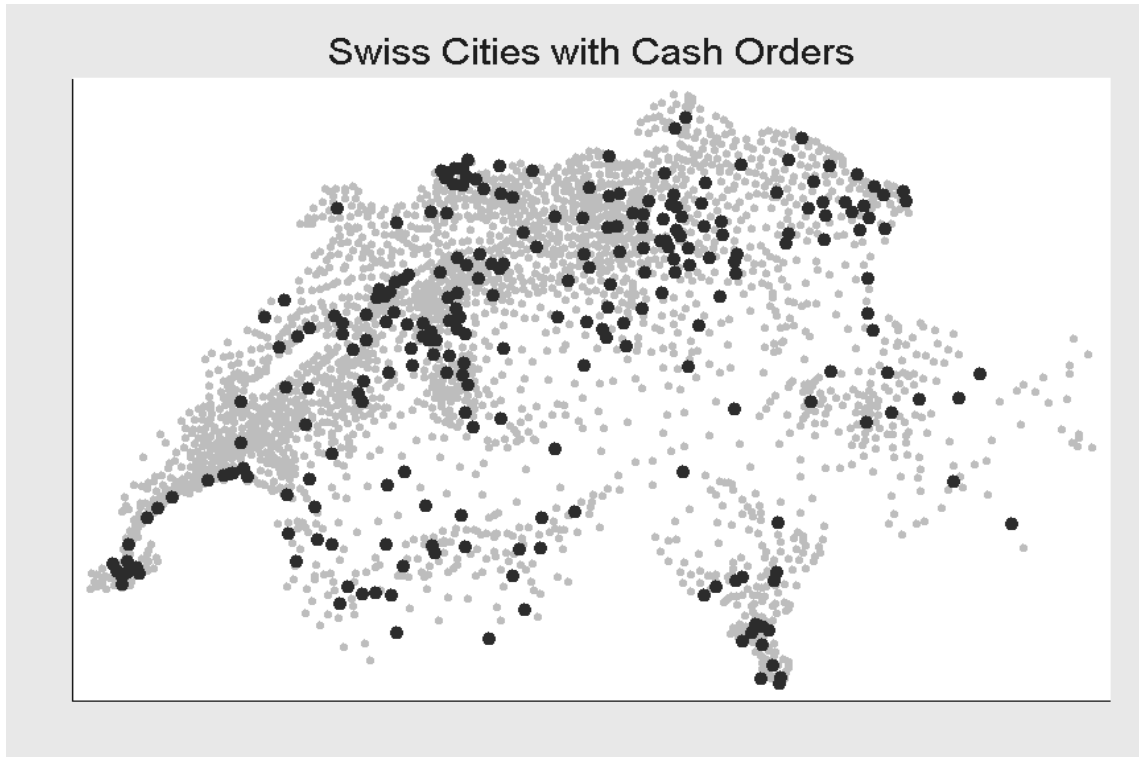


Table 1: Education of Swiss and Immigrants (thousands)

| | 2006 | 2007 | 2006 | 2007 |
|-------------------------|------|------|-------|-------|
| High School Certificate | 680 | 675 | 0.168 | 0.164 |
| Swiss | 410 | 408 | 0.128 | 0.128 |
| Immigrants | 270 | 267 | 0.318 | 0.305 |
| Germany | 3 | 3 | 0.031 | 0.023 |
| France | 3 | 4 | 0.067 | 0.082 |
| Italy | 54 | 52 | 0.332 | 0.318 |
| Spain and Greece | 18 | 15 | 0.337 | 0.309 |
| Portugal | 70 | 73 | 0.676 | 0.661 |
| Serbia | 71 | 70 | 0.445 | 0.431 |
| Apprenticeship | 2198 | 2204 | 0.543 | 0.535 |
| Swiss | 1852 | 1850 | 0.579 | 0.570 |
| Immigrants | 346 | 354 | 0.407 | 0.404 |
| Germany | 36 | 38 | 0.348 | 0.333 |
| France | 16 | 16 | 0.381 | 0.357 |
| Italy | 83 | 84 | 0.510 | 0.518 |
| Spain and Greece | 25 | 23 | 0.479 | 0.467 |
| Portugal | 28 | 31 | 0.273 | 0.281 |
| Serbia | 79 | 82 | 0.494 | 0.507 |
| University Degree | 1173 | 1243 | 0.290 | 0.302 |
| Swiss | 939 | 988 | 0.293 | 0.304 |
| Immigrants | 234 | 255 | 0.275 | 0.291 |
| Germany | 64 | 74 | 0.622 | 0.644 |
| France | 23 | 25 | 0.553 | 0.561 |
| Italy | 26 | 26 | 0.158 | 0.163 |
| Spain and Greece | 10 | 11 | 0.184 | 0.224 |
| Portugal | 5 | 6 | 0.051 | 0.058 |
| Serbia | 10 | 10 | 0.060 | 0.062 |
| Total | 4051 | 4122 | 1.000 | 1.000 |
| Swiss | 3201 | 3246 | 1.000 | 1.000 |
| Immigrants | 850 | 876 | 1.000 | 1.000 |
| Germany | 103 | 115 | 1.000 | 1.000 |
| France | 43 | 45 | 1.000 | 1.000 |
| Italy | 163 | 162 | 1.000 | 1.000 |
| Spain and Greece | 52 | 50 | 1.000 | 1.000 |
| Portugal | 103 | 110 | 1.000 | 1.000 |
| Serbia | 159 | 161 | 1.000 | 1.000 |

Notes: source Swiss Federal Statistics Office. Sake Survey

Table 2: Immigrant-to-Native Ratio and the Instrument SP

| | (1) | (2) | (3) | (4) |
|-------------------------|---------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | <i>unrestricted</i> | <i>restricted</i> CHF 1,000 only | <i>restricted</i> CHF 1,000 only | <i>restricted</i> CHF 1,000 only |
| OLS Estimation | | | | |
| SP | 1.690*** (0.310) | 1.730*** (0.1760) | 1.931*** (0.424) | 2.028*** (0.400) |
| In population | no | no | no | yes |
| unemployment/population | no | no | no | yes |
| time effects | no | no | yes | yes |
| Number of observations | 20414 | 1859 | 1859 | 1859 |
| Number of cities | 2675 | 243 | 243 | 243 |

Notes: Estimation is OLS with fixed (city) effects. SP is the instrument. Sample is from 2006:Q1 to 2007:Q4. *, **, *** denotes significance at the 10%, 5%, and 1% level. Standard errors are in parentheses.

Table 3: Statistics on UBS Banknote Orders

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|-----------|--------------|--------------------------------|------------------------|------|------|----------|--------------------------------------|
| | total cities | German speaking cities only | average per quarter | min | max | St. Dev. | ave note order.to ave outstanding |
| CHF 10 | 199 | 0.754 | 3.0 | 2.3 | 3.8 | 0.6 | 0.005 |
| CHF 20 | 249 | 0.715 | 194 | 169 | 213 | 14.7 | 0.148 |
| CHF 50 | 173 | 0.867 | 188 | 150 | 229 | 26.7 | 0.106 |
| CHF 100 | 242 | 0.736 | 948 | 835 | 1280 | 149.0 | 0.125 |
| CHF 200 | 251 | 0.708 | 2760 | 2560 | 3110 | 178.0 | 0.461 |
| CHF 1,000 | 244 | 0.713 | 2220 | 1870 | 2840 | 392.0 | 0.102 |

Notes: Total cities are number of cities covered by UBS banknote orders. German speaking cities is the percentage of German speaking cities to total cities served by UBS. Ave. per quarter denotes the average banknote volume for a particular banknote in millions. min and max are with respect to the quarterly volume from 2006:Q1 to 2007:Q4. st. dev. is the standard deviation in millions. ave cur order to ave outstanding is the average quarterly volume of banknote orders to the quarterly average of notes in circulation.

Table 4: Immigrant-to-Native Ratio and Large Banknotes

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---------------------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|---------------------|---------------------|--------------------|--------------------|---------------------|
| CHF banknotes | 200 | 200 | 200 | 200 | 200 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| OLS Estimation | | | | | | | | | | |
| Immigrant/Natives | -0.042 (0.950) | 0.500 (0.983) | -0.421 (0.909) | -0.472 (0.910) | -0.347 (1.323) | 3.523*** (0.213) | 2.727*** (0.791) | 0.753 (0.622) | 0.725 (0.603) | 1.054 (0.909) |
| In population | | -2.099*** (0.784) | -0.321 (0.800) | -0.281 (0.802) | -0.757 (1.697) | | 3.058** (1.077) | 0.473 (1.048) | 0.495 (1.046) | -0.197 (1.167) |
| unemployment/population | | | | 4.839* (2.584) | 8.318** (3.499) | | | | 3.382 (2.366) | 6.256*** (2.424) |
| In hotel overnight stays | | | | | 0.021** (0.009) | | | | | 0.023*** (0.006) |
| time effects | no | no | yes | yes | yes | no | no | yes | yes | yes |
| Number of observations | 1927 | 1927 | 1927 | 1927 | 1724 | 1876 | 1876 | 1876 | 1876 | 1712 |
| Number of cities | 250 | 250 | 250 | 250 | 225 | 244 | 244 | 244 | 244 | 226 |
| R-square (within) | 0.000 | 0.002 | 0.052 | 0.054 | 0.53 | 0.009 | 0.015 | 0.361 | 0.361 | 0.378 |
| IV Estimation | | | | | | | | | | |
| Immigrant/Natives | -9.790*** (3.412) | -10.845** (4.411) | -21.047*** (6.313) | -20.586*** (6.241) | -20.771*** (6.972) | 9.206*** (2.928) | 7.741** (3.746) | -7.703* (4.129) | -7.416* (4.091) | -7.041* (4.111) |
| In population | | 1.188 (1.716) | 5.192** (2.202) | 5.106** (2.185) | 1.414 (1.995) | | 1.651 (1.465) | 2.753* (4.129) | 2.693* (1.464) | 0.311 (1.293) |
| unemployment/population | | | | 6.586** (3.315) | 7.213* (3.694) | | | | 3.913* (2.314) | 4.628* (2.415) |
| In hotel overnight stays | | | | | 0.037 (0.064) | | | | | 0.165*** (0.042) |
| time effects | no | no | yes | yes | yes | no | no | yes | yes | yes |
| Number of observations | 1911 | 1911 | 1911 | 1911 | 1707 | 1859 | 1859 | 1859 | 1859 | 1683 |
| Number of cities | 249 | 249 | 249 | 249 | 226 | 243 | 243 | 243 | 243 | 223 |
| R-square (first stage within) | 0.100 | 0.135 | 0.157 | 0.158 | 0.152 | 0.100 | 0.137 | 0.159 | 0.160 | 0.152 |
| F-test (first stage regression) | 184.3 | 129.95 | 34.24 | 31.10 | 23.79 | 181.04 | 127.83 | 33.81 | 30.65 | 23.78 |

Notes: Estimation is OLS or IV with fixed (city) effects. Sample is from 2006:Q1 to 2007:Q4.

*, **, *** denotes significance at the 10%, 5%, and 1% level. Standard errors are in parentheses.

Table 5: Immigrant-to-Native Ratio on Banknote Orders of Different Denomination

| CHF banknotes | 10 | 20 | 50 | 100 | 200 | 1,000 |
|---------------------------------|---------------------|----------------------|-------------------|--------------------|-----------------------|--------------------|
| Immigrant/Natives | -11.465 (14.095) | -21.938** (8.715) | 7.476 (11.831) | -11.936 (7.753) | -20.568*** (6.241) | -7.416* (4.091) |
| Number of observations | 896 | 1764 | 1497 | 1884 | 1991 | 1859 |
| Number of cities | 198 | 248 | 241 | 250 | 249 | 243 |
| R-square | 0.158 | 0.056 | 0.126 | 0.110 | 0.063 | 0.120 |
| F-test (first stage regression) | 21.64 | 29.25 | 23.01 | 31.24 | 31.10 | 30.65 |

Notes: Only the estimates of the immigrant-to-native ratio from an IV regression with fixed effects at the city time level (that includes ln population, unemployment/ population, and time effects) are shown. F-Test(10, Observations-cities-10) is from the first stage regression that includes the instrument (see equation 2). Sample is from 2006:Q1 to 2007:Q4. *, **, *** denotes significance at the 10%, 5%, and 1% level. Standard errors are in parentheses.

Table 6: Ethnic Cities and Large Banknote Orders

| CHF 200 banknote | | | | |
|---------------------------------|-----------------------|----------------------|-----------------------|--------------------|
| Immigrant group | Germans | Italians | Serbians | Portuguese |
| Immigrant/Natives | -19.277*** (5.592) | -69.889 (63.580) | -593.963 (848.131) | -8.516 (22.308) |
| Number of observations | 1911 | 1911 | 1911 | 1911 |
| Number of cities | 249 | 249 | 249 | 249 |
| R-square (first stage within) | 0.576 | 0.142 | 0.112 | 0.123 |
| F-test (first stage regression) | 224.79 | 27.31 | 20.84 | 23.06 |
| CHF 1,000 banknote | | | | |
| immigrant group | Germans | Italians | Serbians | Portuguese |
| Immigrant/Natives | -0.864 (3.944) | -80.994* (47.887) | 1.020 (161.464) | -6.368 (15.985) |
| Number of observations | 1859 | 1859 | 1859 | 1859 |
| Number of cities | 243 | 243 | 243 | 243 |
| R-square (first stage within) | 0.582 | 0.144 | 0.115 | 0.125 |
| F-test (first stage regression) | 223.33 | 27.10 | 20.84 | 22.94 |

Notes: Only the estimates of the immigrant-to-native ratio from an IV regression with fixed effects at the city time level (that includes ln population, unemployment/ population, and time effects) are shown.

F-Test(10, Observations-cities-10) is from the first stage regression that includes the instrument (see equation 2). Sample is from 2006:Q1 to 2007:Q4. *, **, *** denotes significance at the 10%, 5%, and 1% level. Standard errors are in parentheses.

Table 7: City Characteristics, Immigrant-to-Native Ratio, and Banknote Orders

| CHF Banknotes | 200 | 200 | 1,000 | 1,000 |
|--------------------------------------|-----------------------|-----------------------|---------------------|-----------------------|
| A: City population < 10000 | yes | no | yes | no |
| Immigrant/Natives | -22.799** (8.965) | -11.592 (8.375) | -5.454 (6.459) | -9.052* (4.796) |
| Number of observations | 1096 | 815 | 1060 | 799 |
| Number of cities | 143 | 107 | 139 | 105 |
| R-square (first stage within) | 0.144 | 0.224 | 0.143 | 0.234 |
| F-test (first stage regression) | 15.79 | 20.10 | 15.21 | 20.91 |
| B. Special Tax Treatment | yes | no | yes | no |
| Immigrant/Natives | -132.339 (363.628) | -18.146*** (6.302) | 91.544 (126.117) | -10.533*** (3.970) |
| Number of observations | 343 | 1569 | 333 | 1526 |
| Number of cities | 43 | 206 | 42 | 201 |
| R-square (first stage within) | 0.050 | 0.186 | 0.046 | 0.188 |
| F-test (first stage regression) | 1.50 | 30.94 | 1.34 | 30.44 |

Notes: Only the estimates of the immigrant-to-native ratio from an IV regression with fixed effects at the city time level (that includes ln population, unemployment/ population, and time effects) are shown. F-Test(10, Observations-cities-10) is from the first stage regression that includes the instrument (see equation 2). Sample is from 2006:Q1 to 2007:Q4. *, **, *** denotes significance at the 10%, 5%, and 1% level. Standard errors are in parentheses.

Table 8: Geographical Characteristics, Immigrant-to-Native Ratio, and Banknote Orders

| CHF Banknotes | 200 | 200 | 1,000 | 1,000 |
|---------------------------------|---------------------|-----------------------|--------------------|-----------------------|
| A: Rural area | yes | no | yes | no |
| Immigrant/Native | -63.301 (68.018) | -15.416** (6.239) | 12.297 (20.009) | -10.075*** (3.881) |
| Number of observations | 608 | 1303 | 595 | 1264 |
| Number of cities | 79 | 170 | 77 | 166 |
| R-square (first-stage within) | 0.128 | 0.211 | 0.129 | 0.211 |
| F-test (first stage regression) | 7.64 | 30.04 | 7.50 | 29.13 |
| B: Alp - mountain area | yes | no | yes | no |
| Immigrant/Native | -10.658 (7.338) | -20.098*** (7.814) | 4.961 (6.638) | -11.760** (4.762) |
| Number of observations | 762 | 1149 | 760 | 1099 |
| Number of cities | 98 | 151 | 98 | 145 |
| R-square (first-stage within) | 0.220 | 0.169 | 0.222 | 0.174 |
| F-test (first stage regression) | 18.46 | 20.09 | 18.57 | 19.85 |

Notes: Only the estimates of the immigrant-to-native ratio from an IV regression with fixed effects at the city time level (that includes ln population, unemployment/ population, and time effects) are shown. F-Test(10, Observations-cities-10) is from the first stage regression that includes the instrument (see equation 2). Sample is from 2006:Q1 to 2007:Q4. *, **, *** denotes significance at the 10%, 5%, and 1% level. Standard errors are in parentheses.

Table 9: Seasonal Characteristics, Immigrant-to-Native Ratio, and Banknote Orders

| CHF 200 Banknotes | Q1 | Q2 | Q3 | Q4 |
|---------------------------------|-------------------|---------------------|-----------------------|---------------------|
| Immigrant/Native | -7.836 (9.856) | -52.52* (30.052) | -200.791 (807.577) | -12.734* (7.219) |
| Number of observations | 486 | 476 | 475 | 474 |
| Number of cities | 246 | 246 | 249 | 247 |
| R-square (first stage within) | 0.093 | 0.078 | 0.225 | 0.392 |
| F-test (first stage regression) | 6.01 | 4.80 | 16.10 | 35.72 |
| CHF 1,000 Banknotes | Q1 | Q2 | Q3 | Q4 |
| Immigrant/Native | -4.740 (6.021) | -7.527 (11.351) | 48.306 (132.139) | -9.425* (5.610) |
| Number of observations | 471 | 463 | 461 | 464 |
| Number of cities | 241 | 241 | 240 | 242 |
| R-square (first stage within) | 0.118 | 0.074 | 0.211 | 0.393 |
| F-test (first stage regression) | 7.54 | 4.34 | 14.67 | 35.28 |

Notes: Only the estimates of the immigrant-to-native ratio from an IV regression with fixed effects at the city time level (that includes ln population, unemployment/ population, and time effects) are shown. F-Test(10, Observations-cities-10) is from the first stage regression that includes the instrument (see equation 2). Sample is from 2006:Q1 to 2007:Q4. *, **, *** denotes significance at the 10%, 5%, and 1% level. Standard errors are in parentheses.

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