The Residential Integration of Transnational Regional Economies: Evidence from the 2015 Swiss Franc Appreciation*

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Abstract

This paper investigates how exchange rate policies impact migration and residential decisions, and their consequences on the labour and housing markets in the Swiss and Eurozone transnational economy. We construct an extensive dataset comprehending Switzerland, Italy and Germany and we use as a case study the 2015 Swiss Franc appreciation, which caused an increase in the purchasing power of a Swiss salary spent in the Eurozone. After the shock, Swiss border areas experienced an outflow of residents and an inflow of cross-border workers but no change in employment. We explain this pattern through residential relocation of Eurozone residents precedently living and working in Switzerland, that now turn into cross border workers. The relocation caused a reduction in housing demand in Swiss border municipalities which translated into lower housing prices. We find heterogeneous responses at the regional level: in Italian and French-speaking municipalities the relocation prevails, while in German-speaking ones there has been a labor-leisure time effect. The results on the other side of the border (Italy and Germany) are coherent with our effects in Switzerland. Our findings suggest that, economic incentives in the origin country within a transnational economy impact migration and residential decisions with important implication on the employment structure and housing prices.

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1 Introduction

Transnational macro-economies are regions that span across national borders, where economic activities are integrated between neighboring countries, creating unique opportunities for labor and housing markets. One significant feature of these regions is cross-border employment, a form of temporary migration in these areas involving workers living in one country and commuting to work in a neighboring country (Kondoh, 1999; Tassinopoulos and Werner, 1999).[1] This phenomenon is prevalent in regions like the US-Mexico border and, notably, between Switzerland and neighboring Eurozone countries. For example, in the fourth quarter of 2022 in Switzerland there were 380'000 cross-border workers (roughly 7.5% of the workforce) of whom 56.3% resided in France, 23.5% in Italy, and 17.1% in Germany. Despite the growing political and economic significance of cross-border employment, the implications of cross border work for residential choice remain understudied.

Exchange rate shocks have strong effect on one country international competitiveness. In particular, one country import and export's will be expected to expand or contract with a depreciation or an appreciation of the national currency, with effects on production and employment. A currency shock also affect the competitiveness of wages. For example, when one country experiences an appreciation, wages become relatively higher than the wages of its neighbouring country, with bearing on labour migration patterns (Dustmann et al., 2023; Nekoei, 2013). While effects of currency changes on prices, wages and competitiveness has been largely investigated, little is known on how exogenous exchange rate shocks impact cross-border work and, because the real wage gains are tightly dependent with a residential decision, how the the real estate markets in both the host and native country are affected.

This paper examines transnational relocation, defined as the choice to live in one country while commuting to work in a neighboring country within the same transnational economic region—areas that function as unified economic areas due to shared labor markets, languages, and climates despite national borders.[2] Specifically, we analyze how macroeconomic policies impact transnational relocation and its implications for labor market outcomes and housing. A case in point is the Swiss National Bank's (SNB) removal of the EUR/CHF exchange rate floor in January 2015, which triggered a sharp CHF appreciation, increasing the value of Swiss wages relative to those in the Eurozone. To explore these effects, we construct an innovative dataset that integrates data from Switzerland, Italy, and Germany analyzing areas within 20Km of the Swiss border, where cross-border employment is feasible (see Figure B.3 in Appendix) and using more distant areas as our control group. We find that this economic incentive impacted transnational residential relocation as Eurozone residents sought to capitalize on higher Swiss wages by living in more affordable neighboring countries and work across the border, with important implication on housing prices, and the employment structure.

We construct a new dataset containing information on Switzerland, Italy and Germany over the period 2012–2019. We gather data on cross border workers, employment and demographic composition at municipality level and we merge these data with house prices and characteristics at individual level for Switzerland. We then collect population, migration flows between Switzerland and Italy, and house prices at municipality level for Italy. Finally we complement these data with house prices in German municipalities. We then geolocalize each Swiss border offices and create treatment indicator using euclidean distances from each municipality and the nearest border office and classify

[1] Cross-border employment differs from standard commuting because it entails crossing international borders between residence and workplace.

[2] See section B.1 of the Appendix for a full list of the European transnational areas.

municipalities as border and non border, identifying the transnational economy between Switzerland, Italy and Germany as all border municipalities within 20Km from the border office.

Using a dynamic difference-in-differences (DiD) approach, we analyze the impact of the 2015 CHF appreciation on employment, cross-border work, nationality structure, and housing prices between areas within 20Km from the Swiss border and those further away. Swiss municipalities within 20km saw a significant increase in CBWs of about 5% while total employment did not change. In these border areas, we also observed a 1.5% decrease in foreign working-age resident and a 1.7% reduction in housing prices per squared meter, consistent with the relocation of these workers to their home country, maintaining their jobs on the Swiss side. Panel A of Table B.2 provides lower-bound estimates for the direct impact of relocation on house prices, specifically, a 1% decrease in the share of EZ residents in Swiss border areas resulted in a 1.7 percentage point reduction in housing prices. This trend is particularly pronounced in Italian- and French-speaking municipalities, where the CBW-resident substitution and the decrease in housing prices were more significant. By contrast, German-speaking municipalities did not show the same effects, while experiencing a reduction of -1.49% in the number of total full-time equivalents workers. To validate these different spatial results we estimate the impact of the policy in Italy and Germany. In one hand, italian municipalities within 20km from the Swiss border experienced an increase in immigration from Switzerland of more than 5% and a 3% increase in housing prices. Panel B of Table B.2 suggest that a 1% increase in immigration from Switzerland to Italy led to a 1.8 percentage point rise in housing prices. On the other hand, the German real estate market remains unaffected. These results suggests that in Italian and French-speaking regions, the adjustment in housing and labor markets following the CHF appreciation is driven by residential relocation. Conversely, in German-speaking municipalities, there is a different mechanism in place, possibly due to workers reducing their hours rather than relocating, exploiting the 2015 wage gains trading labor with leisure time. We complete the analysis with an empirical transnational Bid-Rent model, adapting the classical framework proposed by Alonso (1964), Mills (1967) and Muth (1969). The model shows that housing price per square meter varies with the distance to the border in both Switzerland and Italy, with a more pronounced effect closer to the border.

This study contributes to the literature on exchange rate shocks by highlighting the labor market and real estate impacts in border regions. While much of the existing research focuses on the effects of currency fluctuations on labor demand and tradable goods (Auer et al., 2019; 2021; Cavallo et al., 2020; Colella, 2022; Kaufmann and Renkin, 2017), less attention has been given to the employment's demographics and the housing markets reactions. For example, Auer et al. (2019) and Auer et al. (2021) document that the 2015 CHF appreciation led to partial pass-through effects on prices of tradable goods, leading to a real price shock in Switzerland. However, the consequences for housing prices, particularly influenced by shifts in workforce composition in border regions, are still unclear. Our study fills this gap by showing how stronger Swiss wages, following the CHF appreciation, attracted cross-border workers, leading to a change in housing demand and their prices in border municipalities. Unlike previous research, such as Kaufmann and Renkin (2017) who identified a negative impact on employment due to shifts in labor demand in manufacturing, and Colella (2022), who found a change in skill requirements in high substitutability jobs, we instead explore workforce composition and their real estate impacts. We find that the CHF appreciation had no differential effect on employment, also when comparing import/export concentrated industries, between border and non border municipalities. We also contribute to this literature by identifying changes in cross-border workers employment, as stronger swiss wages are now more attractive to them. We then extend this literature by looking at the effect of the CHF appreciation on the housing prices and we analyze how these effects correlate with the effects on cross-border work and workforce composition, suggesting scope for transnational relocation. Finally, while studies like Burstein et al. (2022) explored cross-border shopping dynamics, showing welfare improvements due to cost-of-living adjustments in border regions, our study identifies additional spatial differences that should inform structural economic models.

We also contribute to the broader literature on the determinants of workers' migration (Beerli et al., 2021; Dustmann, 2003; Dustmann and Görlach, 2016; Dustmann et al., 2023). For example, Beerli et al. (2021) find that the free movement of persons between Switzerland and the EU led to an increase in cross-border workers without affecting Swiss employment at the border. Similarly, our analysis of the 2015 Swiss franc appreciation shows that cross-border workers did not alter employment in border regions. We also build on a smaller yet growing strand of migration literature that explores how exchange rate shocks shape migration decisions (Bello, 2020; Nekoei, 2013; Nguyen and Duncan, 2017). The closest study to ours is Bello (2020), which finds that CHF appreciation increased cross-border employment at the Swiss-Italian border, interpreted as a labor supply increase. Our findings are consistent with the increase in cross-border employment, although total employment remained unchanged, which suggests a substitution effect between resident and cross-border workers.

This research expands the existing body of literature on the economic effects of migration on housing markets by investigating the impact of transnational relocation on house prices. Previous studies consistently identify a positive relationship between migration and housing prices. For example, in the United States, Saiz (2007) finds that a 1% increase in a city's population due to immigration corresponds to approximately a 1% rise in both average rents and housing values. Similarly, Degen and Fischer (2017) observe in Switzerland that a 1% increase in immigration leads to a 2.7% increase in the prices of single-family homes. In Spain, Sanchis-Guarner (2023) demonstrates that a 1% rise in immigration rates results in an increase of about 3.2% in house prices. Our study contributes to this literature by focusing on the effects of migration driven by the transnational relocation driven by CBWs employment.

Finally, we also contribute to the literature on place attachment, which refers to the behavioral relationship between individuals and places that can influence residential choices. Recent studies have highlighted the relation between between an individual's social network and their residential mobility (Büchel et al., 2020), and between improvements in the urban environment and a heightened sense of place attachment (Bazrafshan et al., 2014; Benson, 2014; von Wirth et al., 2016). Moreover, place attachment is found to be an important component of re-migration in the home country (Chabé-Ferret et al., 2018). For example, (Nguyen et al., 2017) finds that improving living conditions in the place of origin increases the probability of returning home to rural areas. Our findings suggest that also in advanced economies improving conditions in the place of origin determines re-migration.

The remainder of the paper proceeds as follows. The first section presents some background information on the 2015 EUR/CHF cap's removal and its economic implications. The second section introduces the data used in the empirics and the research design. The third section presents the main results of the paper and the conclusions.

2 Background

2.1 The SNB Policy

On January 15th, 2015, the Swiss National Bank (SNB) unexpectedly removed the EUR/CHF exchange rate's floor (Mirkov et al., 2016) previously fixed at 1.20, establishing a completely flexible regime. The subsequent sharp appreciation of the Swiss Franc occurred because of this sudden monetary policy intervention.

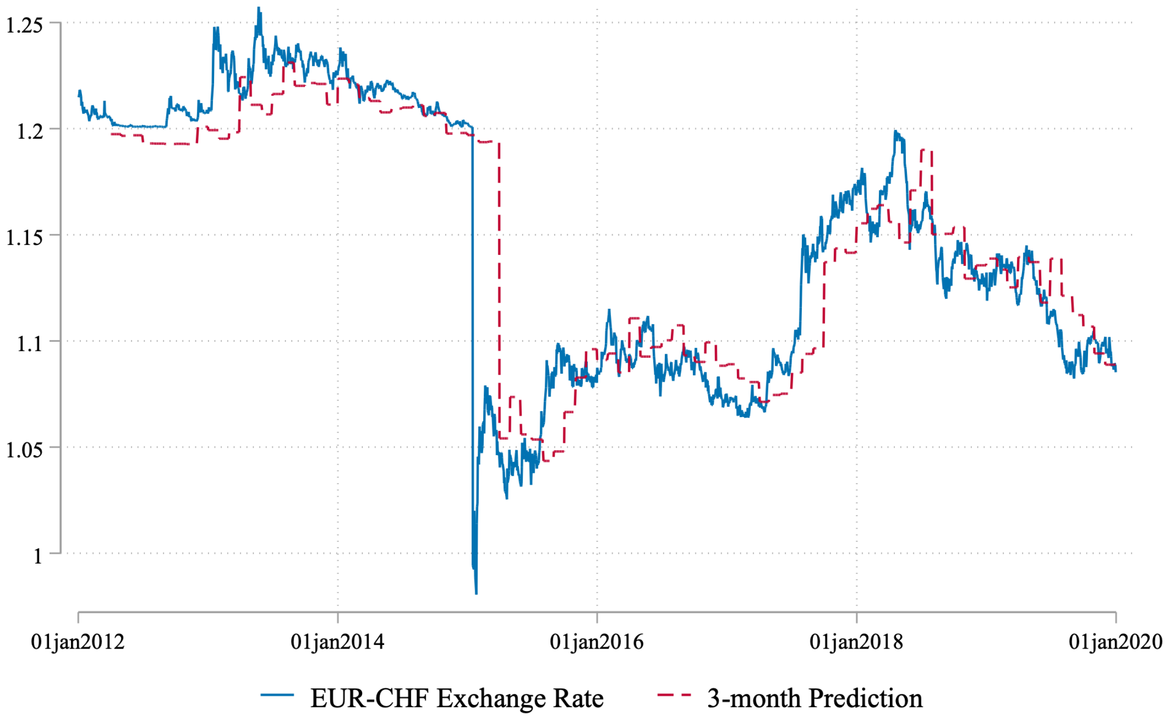
After the 2008 financial crisis, the Swiss Franc went through a phase of marked appreciation. Thus, the SNB introduced the exchange rate cap in September 2011 to mitigate the risk of erosion of the Swiss competitiveness on the foreign markets and of a deflationary development of the economy. As a result, between 2012 and 2015, the EUR/CHF exchange rate stabilized at around 1.20. After four years of steadiness, the SNB removed the lower bound, announcing that it would no longer artificially keep the Swiss Franc low. Overnight, the exchange rate with the Euro plummeted from 1.20 to 0.99; then, it fluctuated between 1.05 and 1.15 until 2019.

Researchers have become growingly interested in the Swiss exchange rate shock as a source of exogenous variation to study a variety of economic results. Indeed, being unexpected and perceived as persistent, the SNB intervention represents an ideal framework to conduct a natural experiment. Figure 1 represents the daily evolution of the EUR/CHF exchange rate along with its 3-month prediction computed with a distributed lag model (more details in Section B.3 of the Appendix). The forecast substantially deviates from the actual value only at the beginning of 2015. Figure B.1 in the Appendix plots the error of the forecast: both before and after the intervention in 2015, the error fluctuated around zero; while, immediately after the SNB policy, the prediction was overestimating the actual value by 20%.[3] There are two main takeaways from these figures. First, we demonstrate empirically that the 2015 appreciation is a source of exogenous variation. Second, the SNB intervention was persistent.[4]

[3] For forecast's error we refer to the difference between the daily actual EUR/CHF exchange rate and its 3-month prediction.

[4] Another supporting evidence is offered by Colella (2022), which reports that one month before the shock in the KOF Consensus Forecast (a regular survey administered to a panel of 20 economists quarterly, asking them to forecast the EUR/CHF exchange rate), the average prediction of the interviewed economists was 1.2 Swiss Francs per Euro for the following 12 months; after the intervention, the expectation adjusted immediately to the updated level.

Figure 1: EUR/CHF Exchange Rate and 3-month Prediction



Notes: The Figure shows the evolution of the actual EUR/CHF exchange rate and its 3-month prediction. The 3-month forecast is computed with a distributed lag model, where the closing value of the EUR/CHF exchange rate is regressed against itself three months prior, along with month-fixed effects.

To summarize, after the shock, relative to 2014, the exchange rate decreased by 12.02% in 2015, by 10.25% in 2016, 8.5% in 2017, 4.9% in 2018, and by 8.4% in 2019. Thus, after the SNB policy, the yearly exchange rate was permanently lower than its value in 2014. Figure B.2 in the Appendix plots the yearly average of the EUR/CHF exchange rate.

2.2 Implications of the Policy

As a consequence of the shock, there has been an increase in the purchasing power of a Swiss salary (expressed in Euro) spent in the Eurozone's consumption market; this corresponds to a reduction of the consumption prices expressed in Swiss Franc on the other side of the border (Auer et al., 2021).

There are multiple consequences to this shock, which might be interdependent: increase of Swiss imports and decrease of Swiss export quantities (Auer et al., 2019; 2021), increase of cross-border shopping (Burstein et al., 2022), increase in Swiss labor supply and changes in labor demand (Colella, 2022; Gatti, 2023), and residential relocation.[5] In this paper we try to understand the potential consequences of the 2015 exchange rate shock on this last component: first, because it is a typically neglected driver in the literature; second, because by focusing on the residential relocation channel

[5] According to the change in labor demand, evidence has shown an increase in labor demand for export-driven firms and a decrease for import-driven ones (Gatti, 2023).

we can determine potential consequences on the real estate markets of the CH-EZ transnational region.

The purchasing power improvement should determine an incentive to relocate residentially from the Swiss to the Eurozone border: while maintaining their Swiss jobs, workers consume their wages abroad. This applies especially to the Swiss labor market, where 7.3% of the labor force (and more than 30% in border municipalities) is composed of cross-border workers (Swiss Federal Office of Statistics, 2015), which have residence and workplace displaced across the border. The relocation causes a drop in housing demand, thus housing prices at the Swiss border decrease, while in the Eurozone countries rise. This occurs if residents turn *de facto* into cross-border workers.

However, from a theoretical perspective, residents should not have the same incentive to relocate to the other side of the border in EZ countries. Since we are considering an international relocation, the bond between a person and her country of origin can influence her residence choice; given all other things equal, the average utility of residing in the place of origin should be higher. In different fields of the literature, this is known as place attachment (Bazrafshan et al., 2014; Benson, 2014; Büchel et al., 2020; Chabé-Ferret et al., 2018; Kimpton et al., 2014; Nguyen et al., 2017; Sen and Guchhait, 2023; von Wirth et al., 2016). Thus, it is plausible that those who relocate are residents born in a Eurozone border country.

The relocation incentive is also more important the closer the resident's workplace is to the border. In equilibrium, the marginal worker is indifferent between earning a Swiss salary while living in Switzerland and receiving a Swiss salary but commuting from abroad. The condition of the marginal worker is (on average) weaker the closer we are to the border, because, the commuting costs are lower (given the same location choice outside Switzerland). In other words, the closer the workplace is to the border, the more likely the resident can maintain her job while changing residence.[6]

This mechanism applies to countries sharing a common border and with homogeneous economic or cultural backgrounds, i.e. in a transnational economy. In this perspective, Switzerland (along with its neighboring countries) provides a well-suited experimental background: residents on both sides of the border speak the same language, and have similar cultures.

3 Data

We collect data on Switzerland, Italy, and Germany over the period 2012–2019. This results in five different datasets. First, we gather data on cross border worker from the Federal Statistical Office (2012–2019a) as well as employment and demographic data from the Federal Statistical Office (2012–2019b) at the municipal level in Switzerland. Second, sales housing prices in Switzerland are provided by Meta-Sys AG (2012–2019). Third, we access the population and migration data of Italian municipalities from the Italian National Institute of Statistics (2012–2019). Fourth, Italian housing price data are provided by the Italian Revenue Agency (2012–2019). The unit of observation is at the OMI level, which is an area having a homogeneous real estate market and that is a minor portion of the Italian municipalities. Prices for OMI areas are constructed from real estate postings. Finally,

[6] Since we do not observe the precise workplace of our residents, throughout this paper we assume that the workplace and the residence in Switzerland coincide.

we collect housing price data in German municipalities from 21st Real Estate (2012–2019). Table 1 displays summary statistics of the different data used.[7]

Panel A and B present the summary statistics for the Swiss datasets. Panel A displays employment and demographic data at the municipal level. For each Swiss municipality, we have information on the number of workers, full-time equivalents, cross-border workers, population, and Eurozone and other European working-age residents, whereas for working age we consider inhabitants from 20 to 64 years old. Panel B shows statistics on the real estate dataset: for each house posting, we observe the housing price in CHF, the living surface, number of rooms, floor level, the presence of a view, heating system, balcony, garden, winter-garden, elevator, architectural barriers, laundry, standard Minergie, private parking, the residence type, the housing category and the year of construction.[8] When housing characteristics are not available we assume they are absent. For each posting, we know its geolocalization, thus we match the house postings dataset with their municipalities by using the coordinates of each house. Notice that, posted sales prices and transaction prices may ultimately differ by the extent of the individual bargain on the house price. Yet, a constant difference in the bargaining power would not bias the result of our estimation strategy. However, there is still a small change for bias driven by changes in bargaining power between pre-post period across treatment areas, which unfortunately we cannot test.

Panels C and D display the summary statistics of the Italian datasets. Panel C shows the statistics for the data at the municipal level: for each Italian municipality, we have the population and the number of immigrants and migrants from and to Switzerland. Panel D displays the housing market data at the OMI district level: for each OMI district, we know the average house price per squared meter in Euros for different housing categories (economic, civils, luxury, villas, and typical houses).

Panel E shows the housing price data for German municipalities. For each German municipality, we have the average house price per squared meter in Euros and the degree of urbanization of the municipality.

[7] We focus on Switzerland, Germany and Italy because there is no available data on France and Austria that is comparable with our current dataset.

[8] Minergie is a Swiss certification provided to ecological housing.

Table 1: Summary Statistics

	Observations	Mean	SD	Min	Max
Panel A: Swiss Data by Municipality					
Workers	16’992	2’391.57	13’435.56	6	499’346
Total full-time equivalents	16’992	1’860.26	10’390.88	4.62	382’731.2
Cross-border workers share	16’992	0.056	0.108	0	0.835
Population	16’992	3’893.33	12’526.89	30	420’217
Eurozone working-age population (20-64 y.o.)	16’992	440.7	2’085.4	0	72’985
Eurozone working-age population share	16’992	0.084	0.0456	0	0.388
Other European working-age population (20-64 y.o.)	16’992	1.35	10.051	0	437
Other European working-age share	16’992	0.0002	0.0005	0	0.013
Degree of Urbanization	16’992	2.29	0.8079	1	3
Altitude (m.a.s.l.)	16’992	799.31	403.47	197	3’434.8
Distance to Border	16’992	25.05	17.7	0.268	76.7
Panel B: Swiss Data by Housing Posting					
Sales house prices (CHF)	501’025	965’901.7	690’445.4	105’000	$2.00e^7$
Sales house prices per squared meter (CHF)	501’025	6’639.74	2’709.38	302.85	15’000
Living surface (m^2)	501’025	145.51	76.108	12	5’600
Rooms	501’025	5	1.884	0.5	30
Floor	501’025	0.596	1.193	0	16
View	501’025	0.392	0.488	0	1
Heating system	501’025	0.248	0.432	0	1
Balcony	501’025	0.688	0.463	0	1
Garden	501’025	0.159	0.366	0	1
Winter-garden	501’025	0.038	0.191	0	1
Elevator	501’025	0.299	0.458	0	1
Wheelchair ramp	501’025	0.098	0.297	0	1
Laundry	501,025	0.050	0.218	0	1
Standard Minergie	501’025	0.067	0.251	0	1
Private parking	501’025	0.491	0.499	0	1
Residence type	501’025	0.54	0.498	0	1
Housing category	501’025	9.8	6.415	1	24
Posting quality	501’025	17.899	40.74	0	310
Panel C: Italian Data by Municipality					
Population	9’790	6’879.53	39’848.56	31	$1.3e^5$
Immigrations from Switzerland	9’790	0.878	6.439	0	296
Share of immigrants from Switzerland	9’790	0.0002	0.0008	0	0.032
Distance to Border	9’790	39.92	21.02	0.652	74.9
Panel D: Italian Data by OMI Districts					
House prices per squared meter (EUR)	140’196	1’288.9	680.02	207.5	13’000
House category	140’196	3.346	1.226	1	5
Housing condition	140’196	2.182	0.484	1	3
Panel E: German Data by Municipality					
House prices per squared meter (EUR)	14’560	2’103.6	671.88	827.9	5’090.5
Degree of Urbanization	14’560	2.617	0.521	1	3
Distance to Border	14’560	40.25	20.76	0.979	74.9

4 Research Design

To study the residential relocation between Switzerland and its neighboring countries, we propose a set of dynamic difference-in-differences regressions in which we regress each outcome against pre-post 2015 shock year dummies interacted with our treatment identifier, along with individual fixed effect and time-varying controls. The main treatment group is composed of all municipalities of each country in the 0–20km bandwidth to the national border (border municipalities), while the main control group is represented by all municipalities in the 20–75km bandwidth (non-border or inner municipalities). More details on the distance bandwidths are provided in section 4.1.

We estimate the effect of the 2015 CHF appreciation on cross-border workers and the equilibrium level of employment in Switzerland, on the residential composition and housing prices across border municipalities in Switzerland, Italy, and Germany. We explain the results through residential relocation from Switzerland to Eurozone border countries. We provide numerous robustness to rule out alternative explanations of our mechanism.

4.1 Treatment Selection

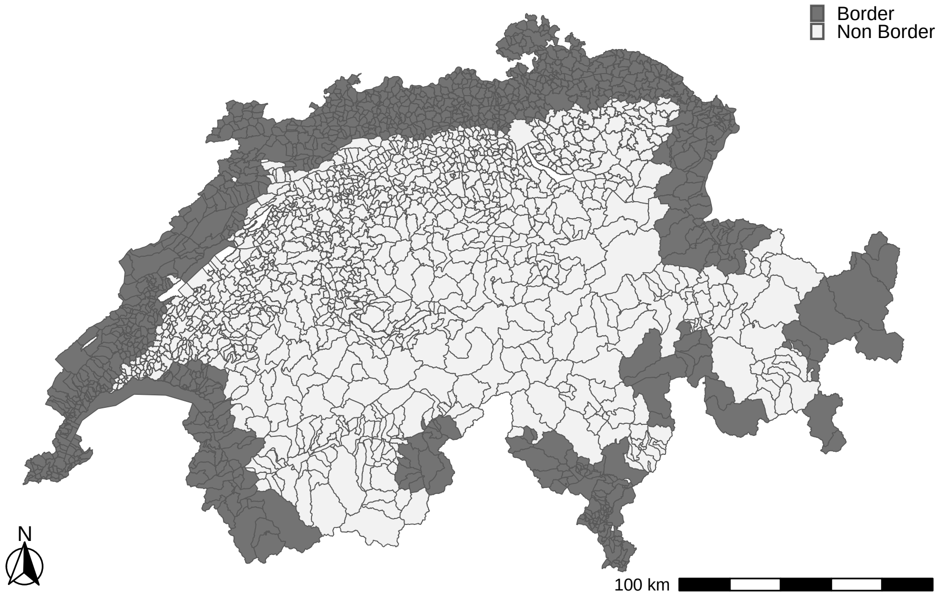
In Switzerland, we identify as the treatment group the Swiss municipalities within 20km from a customs border office (border municipalities), while as the control group those further away (Non-border municipalities), between 20km and 75km from the nearest border office over a straight line.

The threshold of 20km is plausible for at least two reasons. First, 20km is the official distance bandwidth used in the bilateral agreement between Switzerland and the European Union to define cross-border workers with fiscal privileges.[9] Second, a simple calculation shows that 20km is the distance from the border which makes a resident indifferent by turning into a cross-border worker given the 2015 shock. This computation is presented in Section B.4 of the Appendix.

We compute the Euclidean distance between the center of each municipality and the nearest border Office (see Figure B.4 in Appendix), considering as "treated" the municipalities in the 0–20km bandwidth. This results in 45.6% treated municipalities out of $2'133$ municipalities in our sample. Figure 2 depicts the results of our selection criterion in Switzerland. The distance can be defined with measures other than the Euclidean distance, such as the commuting distance. However, our definition of border municipalities that arise using Euclidean distances is highly comparable with the definition of border municipalities that arise using commuting distances as in Beerli et al. (2021).

[9] Fiscal privileges refer to wages and other work incomes that can be taxed only in the country of work (Switzerland) which are partly rebated from the Federation to border municipalities of the origin countries. Note that Switzerland is in the top five OECD countries with the lowest tax rates. More information is available at https://www.fedlex.admin.ch/eli/cc/1979/457_457_457/it

Figure 2: Treatment Municipalities in Switzerland



In Italy, we apply the same treatment selection to define border and non-border municipalities, focusing on the provinces of Piedmont and Lombardy which are the two neighboring regions of Italy with Canton of Ticino and Valais in Switzerland. In Italy, the 20km bandwidth rule to define border municipalities is also supported by national law. The resolution N.38/E of 2017 of the Italian Revenue Agency identifies as border regions the Italian municipalities within 20km from the border with Canton of Ticino or Valais.[10] For coherence with the Swiss selection, in which the furthest control areas lie at 75km distance from the border, also in Italy we define as non-border regions the municipalities at 20–75km distance from the nearest border office. This gives rise to roughly 27.3% treated municipalities out of $1'244$ municipalities in the sample. The selection in Italy is displayed in Figure B.5 of the Appendix. Finally, we apply the same treatment selection in Germany, coherently with the Italian and Swiss framework. This results in 20.2% treated municipalities out of 455 municipalities in our sample. Figure B.6 of the Appendix displays the selection for the German case.[11]

4.2 The estimating equation

To estimate the causal effect of the Swiss Franc appreciation on the labor market, migration, and real estate outcomes across borders, we employ a dynamic difference-in-differences design with location and time-fixed effects. Formally we estimate the following equation:

[10] The document recites: "...la qualificazione di "frontaliero" svizzero, delineata a livello convenzionale, è da riconoscersi ai lavoratori che siano residenti in un Comune il cui territorio sia compreso, in tutto o in parte, nella fascia di 20 Km dal confine con uno dei Cantoni del Ticino, dei Grigioni e del Vallese, ove si recano per svolgere l'attività di lavoro dipendente."

[11] We trim the data at 75km due to consistency with the Swiss framework: the longest distance for non-border municipalities in Switzerland is approximately 75km, therefore, we use this threshold also for Italy and Germany.

$$Y_{it} = \theta_i + \theta_t + \sum_k \gamma^k B_i^c \cdot \tau_i^k + \delta X_{it} + \varepsilon_{it} \tag{1}$$

The outcome Y_{it} represents the labor market, migration, or real estate outcomes for location i at time t, B_i^c is an indicator for location i being within the 20 kilometers or in the 20–75 kilometers from the border in country $c \in \{Switzerland, Italy, Germany\}$, τ_i^k is an indicator for year k, where $k \in \{2012, \ldots, 2019\}$ and $k \neq 2014$. The coefficients of interest are the γ^ks, which represent the interaction between years from the shock and the border indicator: they should be interpreted as the differential effect between border and non-border municipalities in each year compared to 2014. Equation (1) also includes location and time fixed effects, θ_i and θ_t respectively, as well as other time-varying characteristics X_{it} (as reported in table 1). The standard errors are clustered at the location level to account for possible within-location correlation over time. To study heterogeneities, we use subsample regressions where we implement a static difference-in-differences design, binning years before and after the shock.

Testing the effects of residential relocation directly poses several challenges. For example, a regression of the house prices on the Eurozone citizens' share at the border would not yield the causal effect of residential relocation on housing prices for at least two identification issues. First, unobserved economic, political, or demographic confounders at the local level may affect residential mobility over the years, implying an omitted variable bias. Second, the specification could suffer from reverse causality, for example, Eurozone citizens may prefer to reside in areas at lower house prices. Alternatively, instrumenting the share of Eurozone residents with the exchange rate would result in a violation of the exclusion restriction: the instrument can affect the outcome through other potential drivers different from residential relocation. Another estimation consists in constructing an exogenous exposure index to exchange rate shocks (Gatti, 2023), however, it is difficult to identify a reliable index based on measures other than the distance to the border when studying housing markets, which essentially implies using our identification strategy.

The standard identifying assumptions for difference-in-differences models are usually two: (i) Parallel trends; (ii) No anticipation effect (Angrist and Krueger, 1991; Ashenfelter and Card, 1985; Bertrand et al., 2004; Card and Krueger, 1994). In this specific context, the assumptions imply that in the absence of the currency shock, our units would have followed parallel trajectories and that the SNB policy was unexpected. While there exists no perfect method to validate the parallel trend assumption, we exploit the dynamic difference-in-differences to provide statistical evidence on the validity of (i) by showing the γ^k coefficients in the pre-period for all main results. We provide empirical evidence on the satisfaction of assumption (ii) through the simple distributed lag model presented in Section 2 Figure 1, as well as consensus in the literature on the unexpectedness of the SNB intervention (Colella, 2022; Mirkov et al., 2016).

5 Results

In this section, we discuss the effect of the Swiss Franc appreciation in Switzerland, Italy, and Germany. First, we establish how the 2015 CHF appreciation affected the Swiss labor market. We find that, after the shock, border municipalities experienced a higher increase in the number of CBWs relative to the control, while we observe no changes in total employment. This is suggestive of a potential residential relocation driver of the CBWs increase. Second, we test residential relocation in Switzerland by looking at the effect on working-age Eurozone native residents and house prices per meter squared, investigating heterogeneous effects according to the language region. Third, we assess the coherence between the outcomes in the Italian and German-speaking parts of Switzerland with the respective border countries, Italy and Germany. In particular, we study the migration flows from Switzerland to Italy, and the house prices per meter squared in Italy and Germany. Fourth, we investigate the gradient of the effect relative to the distance to the border, and we integrate the result into an empirical transnational bid-rent model.

5.1 Labor Market Outcomes

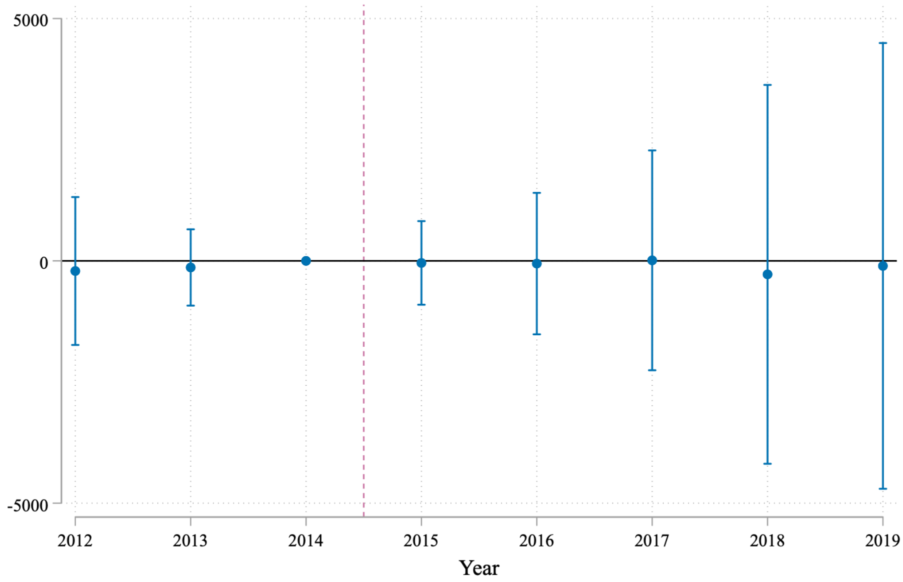
Following the exchange rate shock of 2015, Swiss wages expressed in Euros grew of about 15% relatively to 2014 (see figure B.7), including cross border worker wages, which are typically spent outside Switzerland.[12] In the overall economy, the exchange rate determined a boom and boost of the Swiss economy. However, we show that, in the comparison between border and non border.... we first show that total employment did not change between treatment and control however that CBWs increased more at the border.

In Figure 3 we test the difference in total employment (measured as the number of employees at the municipal level) between border and non-border municipalities. We find no statistically significant effect on the event study's coefficients after the shock. In Figure B.8 in Appendix we also show that there is no differential effect on employment in import or export sectors. In Figure B.9 of the Appendix, using income as a proxy for wages, show that also the average income pro capite at municipality level did not change in the comparison between inner and border municipalities.[13] This suggests the absence of a pre-post change in the labor supply between treatment and control jurisdictions.

[12] In Switzerland, between 2014 and 2016 nominal wages increased 0.8% for natives and 0.7% for cross-border workers.

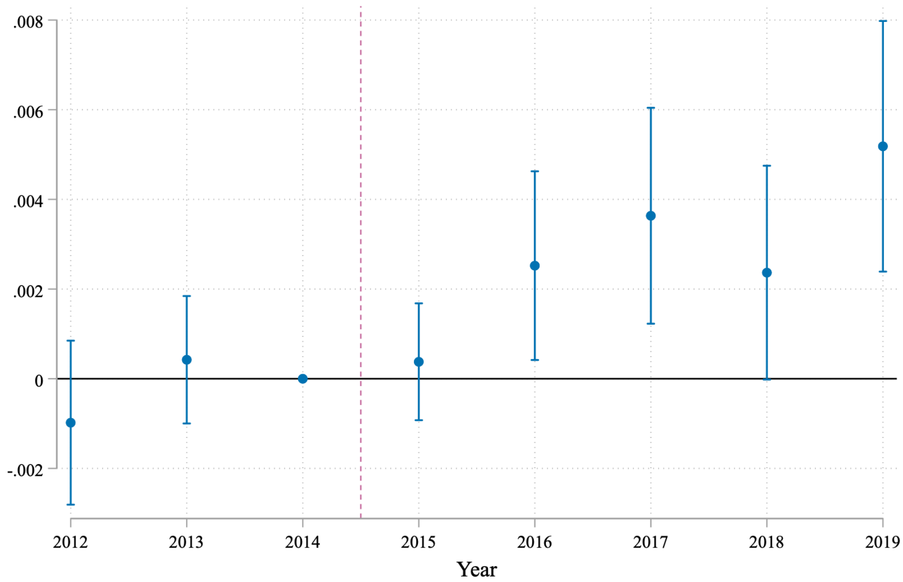
[13] Data on the average wages at Swiss municipality level is not available. This approximation is reasonable assuming that, on average, the majority of the income comes from wages.

Figure 3: The Effect on the Total Employment



Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the number of workers (i.e. the total employment) between border and non-border Swiss municipalities at the shock. The total number of observations is $17'032$. We control for municipality and year-fixed effects. We use municipal population analytic weights. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure 4: The Effect on CBWs



Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the share of cross-border workers per full time equivalent worker between border and non-border Swiss municipalities at the shock. The total number of observations is $16'992$. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure 4 plots the share of crossborder workers in full time equivalent over total full time employment. We find that, after a period of relative stability, the market for cross border workers in border municipalities kept expanding after the 2015 CHF appreciation. On average, the effect after 2015 corresponds to an increase of about 6% in the share of crossborder workers. Figure B.19 in the Appendix shows the overall effect in Switzerland after 2015, Figure B.10 shows the parallel trend condition for border and non border municipalities. This result is aligned with Bello (2020), who shows that following other exchange rate shocks, CBWs increase more intensely at the Swiss border.

The results in Figures 3 and 4 suggest that the increase in CBWs at the border is due to the residential relocation in EZ countries of residents precedently living and working in Switzerland, and now only working there. The reasoning is that in border municipalities there is both a total employment and a residential relocation effect, while in control municipalities there exists only a total employment effect. This is because relocation is only possible at the border.[14] Hence, we hypothesize that the 2015 CHF appreciation affected only the relocation component within Switzerland and it did not change the labor supply response. We test this statement in the following sections.

5.2 Residential Outcomes

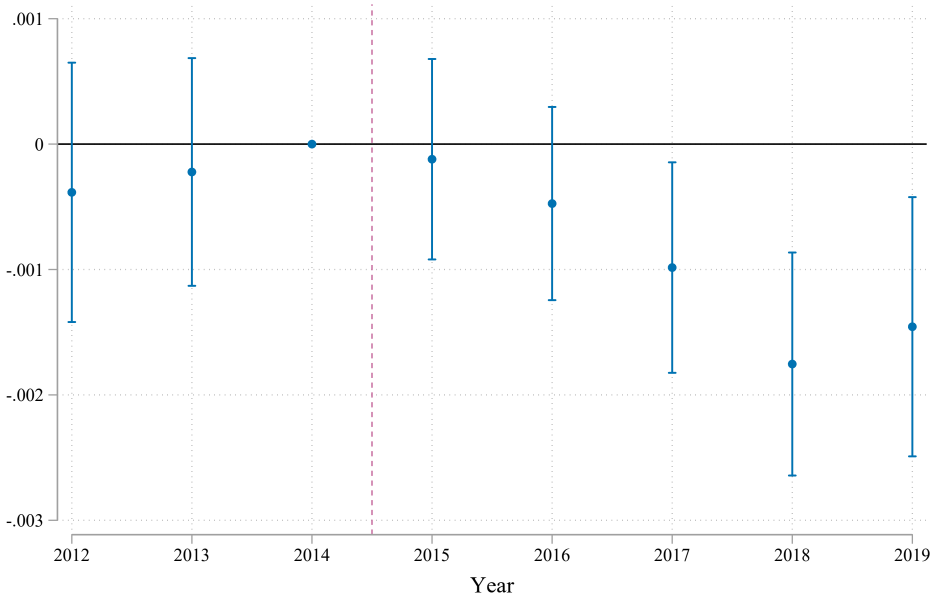
In this section, we analyze the residential relocation consequences of the 2015 CHF appreciation. As previously explained, after the shock, border municipalities experienced a more intense increase in CBWs, but at the same time, nothing has changed in terms of labor supply. We assess that this can be explained through a mechanism of residential relocation, where individuals previously living and working in Switzerland turned into CBWs.

5.2.1 Switzerland

Figure 5 represents the γ^k-coefficients of Regression (1) on the number of working-age EZ residents over the total population by municipality and year. After the 2015 Swiss Franc appreciation, the municipalities within 20km from the border experienced a significant decrease in the EZ residents' share relative to non-border municipalities over almost all years following the shock. In relative terms, the effect corresponds to an average reduction of 1.5%.

[14] This is related to the trade-off between transportation costs and exchange rate gains, explained in Section B.4 of the Appendix

Figure 5: The Effect on the EZ Working-age Residents' Share



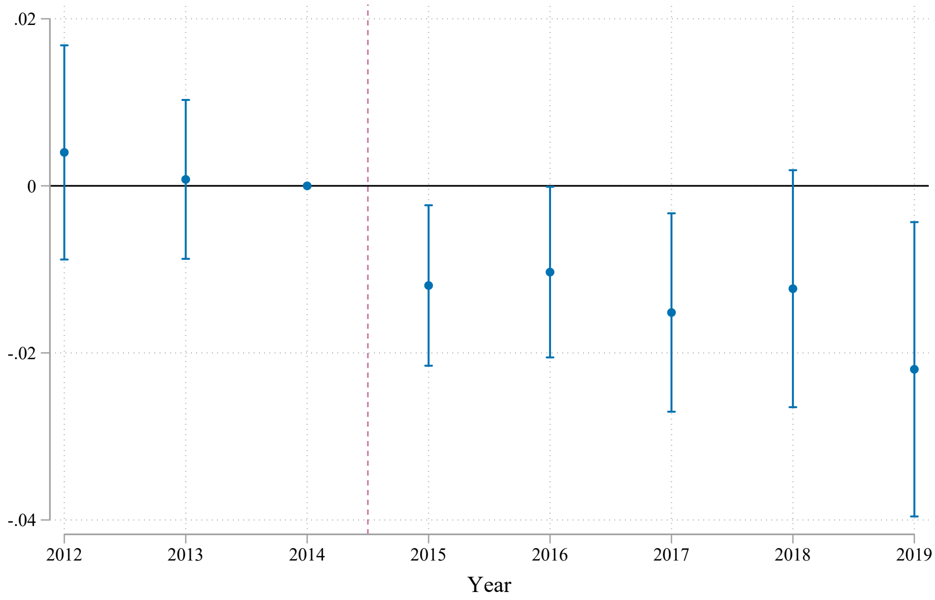
Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in Eurozone working-age citizens' share between border and non-border Swiss municipalities at the shock. The total number of observations is $17'064$. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

To ensure that the parallel trend assumption for the identification is satisfied, in Figure B.11 of the Appendix, we show that the difference in trends in the EZ workers' share for treatment and control municipalities was constant across all years.

The results on the EZ residents' share identify a drop in the housing demand at the border. We corroborate this finding by investigating the impact on the real estate market. Figure 6 presents the results of Regression (1) on house prices per squared meter. The graph shows that after the 2015 CHF Appreciation, the house prices per squared meter in the treated municipalities decreased by roughly 1.7% over all the years following the shock. Considering the average surface size in our sample (145.04 m^2), this corresponds to a reduction of 15'000 CHF.

Figure B.12 in the Appendix presents the differences in house prices per squared meter in treatment and control municipalities. Once again, we find no significant differences in the trends before the shock, thereby confirming that the identifying assumption is satisfied.

Figure 6: The Effect on Swiss House Prices per m^2



Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the log of housing prices per meter squared between border and non-border Swiss municipalities at the shock. The total number of observations is 503′743. We control for municipality, year-fixed effects, and housing characteristics. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Meta-Sys AG data.

The drop in EZ residents in Figure 5 and the drop in housing prices in Figure 6 together suggest that following the shock there was a drop in housing demand with a detrimental impact on the real estate market in border municipalities. The drop in residents in Switzerland is a first piece of evidence consistent with a residential relocation of EZ residents: with an evaluation of the exchange rate, exports of tradable goods would decrease and imports increase, but being houses a non-tradable good, the residents end up exporting themselves. In the following sections we will investigate more deeply the evidence on residential relocation.

But why do the housing prices seem to anticipate the reduction in the housing demand? We furnish three explanations on the timing of the effects. First, there is a growing literature in real estate economics that explains the stringent role of financial intermediaries in influencing housing prices. More precisely, banks have more rational and precise expectations concerning macroeconomic events' consequences, which directly impact bank evaluations of housing mortgages (Adelino et al., 2015; Braun et al., 2019; Fostel and Geanakoplos, 2012; Geanakoplos, 2010; Hott, 2009; Zurbrügg, 2021). In Switzerland, most of the housing transactions happen through loans, thus greatly exposing the Swiss real estate market to the financial intermediaries' expectations. Second, there are time discrepancies between the decision on relocating and the actual residential relocation, and housing transactions need sufficient time to be finalized: in our sample, it takes around six months for the homeowner to sell the house. Moreover, to formalize the housing transaction and change permit type with the local migration offices may a few months. Third, there may be other time discrepancies in recording the residential flows at the municipal level due to delays in the administrative process, which cannot occur with house price data.

There may also be concerns about the role of foreign investment in the change of housing prices after the shock in 2015. However, in the Swiss legal context, foreigners cannot buy houses, estates, or properties for investment purposes according to the Federal Act on the Acquisition of Immovable Property in Switzerland by Foreign Non-Residents (ANRA; also known as the Lex Koller). In addition, foreigners cannot buy shares of companies managing residential estates or houses. As a result, the change in the house prices after the 2015 shock cannot be associated to foreign investment motives.

Given the territorial diversities within Switzerland, we investigate potential heterogeneous effects across the three main Swiss language regions: German-speaking, French-speaking, and Italian-speaking municipalities. Panel A of Table 2 represents the DiD coefficients for the change in CBWs by Swiss language region. Notice that the effect of the 2015 CHF appreciation on CBWs is consistent only for Italian and French-speaking municipalities, while in German-speaking municipalities there the CBW decreased. After the shock, French and Italian-speaking regions experienced a statistically significant increase in CBWs share of respectively 0.9% and 1.4%, while in German-speaking municipalities we observe a decrease of 0.6%. Panel B reports the DiD coefficients for the change in EZ working-age residents for the three different language-speaking regions. Again, we see that the Italian and French-speaking jurisdictions drive our results on the share of EZ working-age residents, while the effect in German border municipalities is in the opposite direction and only a half of the other effects. In relative terms, EZ working-age residents' shares decreased by 2.96% and 3.13% in French and Italian-speaking municipalities but increased by 1.41% in German-speaking ones. The results are coherent with changes in the log of house prices per squared meter, as presented in Panel C: French and Italian-speaking regions experienced a relative decrease in house prices per squared meter of 5% and 3.8%, while in German-speaking jurisdictions there has been an increase of 3.26%. The effects in Table 2 give a second piece of evidence on our relocation hypothesis: the effects on CBWs, EZ residents and housing prices are coherent geographically within Switzerland.

In the following section we investigate these findings, presenting the impact of the 2015 CHF appreciation on the other sides of the border (i.e. in Italy and Germany). Our aim is to validate our hypothesis and understand other potential mechanisms explaining the effects on the German border.

Table 2: DiD Results in Switzerland by Language Region

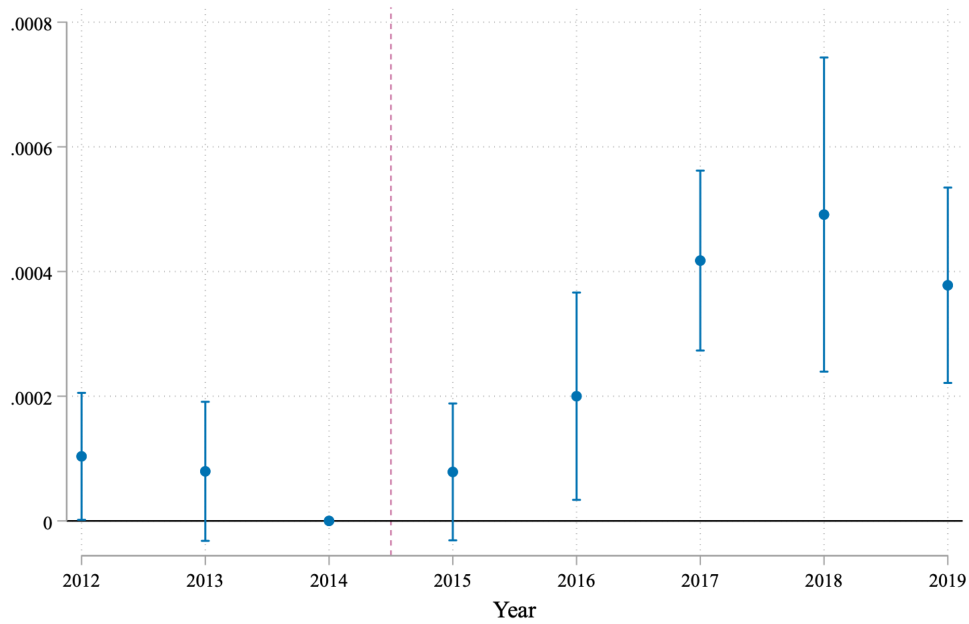
	German-speaking	French-speaking	Italian-speaking
Panel A: Employment			
Treat × Post	186.99	−354.2	−225.78
	(1766.64)	(1689.74)	(1684.15)
R-Squared	0.998	0.998	0.998
N	13'696	11'976	9'992
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel B: CBWs' Share			
Treat × Post	0.0015	0.003*	0.016***
	(0.00126)	(0.00152)	(0.0051)
R-Squared	0.962	0.944	0.973
N	13'736	12'032	10'024
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel C: EZ Residents' Share			
Treat × Post	0.00117**	−0.00282***	−0.00387***
	(0.000496)	(0.000681)	(0.001134)
R-Squared	0.975	0.977	0.976
N	13'544	12'224	10'064
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel D: Log House Prices m^2			
Treat × Post	0.0326***	−0.0517***	−0.0376***
	(0.0051)	(0.0067)	(0.0086)
R-Squared	0.512	0.562	0.498
N	344'070	359'994	301'965
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
House Characteristics	Yes	Yes	Yes

Notes: Panel A of the Table displays the DiD effect for German-speaking (column 1), French-speaking (column 2), and Italian-speaking municipalities after the 2015 CHF appreciation. Panel A displays the effect on the total number of employees weighted by municipality population. Panel B reports the effect on the share of full time equivalent CBW on total full time employees. Panel C displays the estimated difference in the share of EZ workers. Panel D reports the logarithm of house prices. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Swiss Federal Office of Statistics and Meta-Sys AG data.

5.2.2 Italy

In this section, we estimate the impact of the 2015 CHF appreciation in Italy. First, we analyze the effect of the shock on immigration flows from Switzerland to Italian municipalities. As we can see from Figure 7, after the CHF appreciation, the number of immigrants from Switzerland to border Italian municipalities increased relatively to the control group. Interestingly, the timing of the effect is symmetric to the one on the outflow of EZ from treated municipalities in Switzerland as in Figure 5.

Figure 7: The Effect on Immigrations from Switzerland to Italy

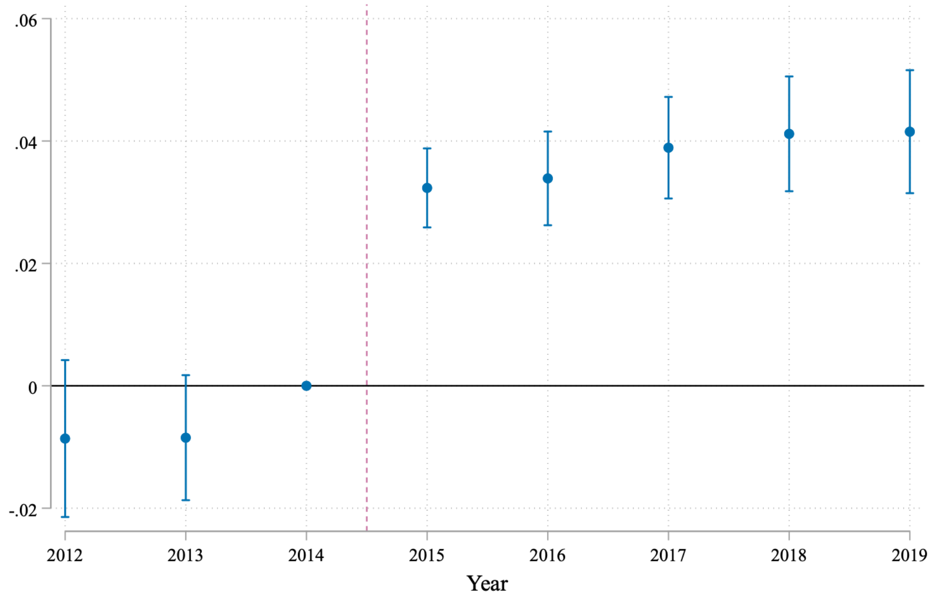


Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the share of immigrants from Switzerland between border and non-border Italian municipalities at the shock. The total number of observations is $9'788$. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on ISTAT data.

Figure 8 presents the results of Regression (1) on the log of house prices per squared meter at the OMI district level in the border regions of Italy. The figure shows that after the 2015 Swiss Franc appreciation, the log of house prices per square meter in the border municipalities increased between 3% and 4% over all the years following the shock.

The increase in immigration flows in border municipalities in Italy in Figure 7 and the increase in housing prices in Figure 8 present a third piece of evidence consistent with residential relocation: housing demand is imported in Italy increasing the housing prices.

Figure 8: The Effect on Italian House Prices per m^2



Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the log of housing prices per meter squared between border and non-border Italian municipalities at the shock. The total number of observations is 140′171. We control for OMI, year-fixed effects, and housing characteristics. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Italian Revenue Agency data.

Notice that overall the relative effect on the house prices in Italy is relatively higher to the one in Switzerland. In reality, in Table 2 we show that the effect in the Italian part of Switzerland is about 4%, which is approximately the same magnitude as the effect in Italy. Moreover, the magnitude of the housing prices increase in Italy after the shock in 2015 can be explained with the legislation on cross-border employment, which redistributes part of CBWs income taxes to their Italian municipalities of residence.[15] Thus, an increase in tax revenue in Italy can lead to improved public services and amenities, which also impacts housing values. As a result, the relative effect in Italy of around 3-4% can be influenced by the composition of the two mechanisms. Firstly, the positive demand shock from EZ residents from Switzerland. Secondly, the improvement in amenities related to the compensation schemes of fiscal revenues between Swiss and Italian authorities.

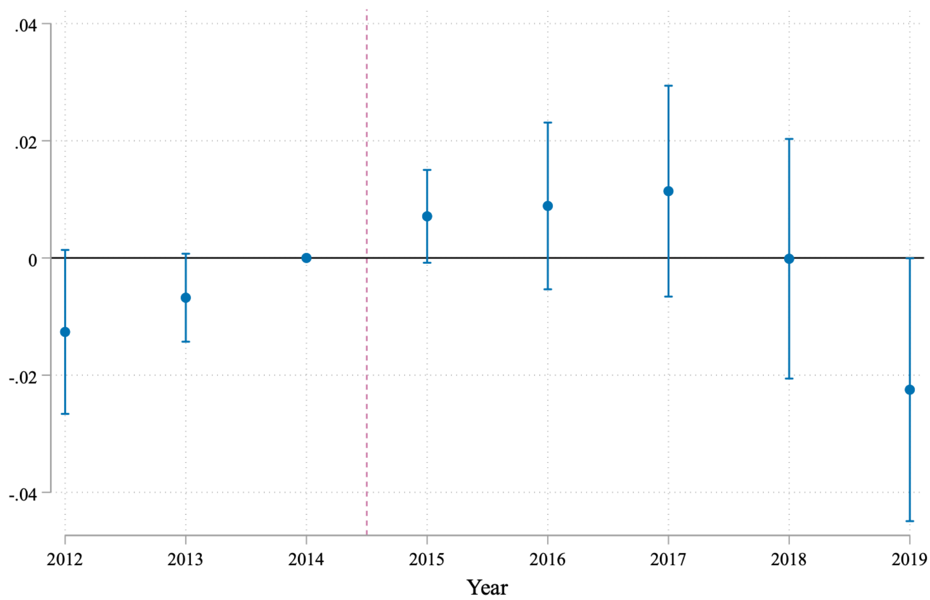
A potential threat to the identification in Italy lies in the higher real estate demand in border areas driven by the Italian residents in control municipalities attracted by the higher salary in EUR terms. For instance, more people from the province of Milan might decide to come closer to the Swiss border to live in the municipality of Como or Varese and work in CH. In Figure B.24 of Appendix B.6 we show that this is not the case: there has been no significant migration to the border areas from both the control group and all of Italy itself.

[15] According to the bilateral agreement, taxes on the salary of cross-border workers (Italian residents working in Switzerland) are directly collected in Switzerland and then partially transferred to the Italian municipality where the worker resides. If there is an increase in cross-border workers living in a given municipality, this corresponds to a positive shock for the tax revenue for the Italian jurisdiction; more precisely, being Swiss salaries relatively higher than the ones in Italy, the municipality increases its revenue with an extra resident working in Switzerland.

5.2.3 Germany

In this section, we analyze the effect of the 2015 CHF Appreciation on the German real estate market. Using the average housing price per squared meter data at the municipal level from *21st Real Estate* we compute the event study as in the Swiss and Italian cases. Figure 9 shows the effect on the log of German House Prices per squared meter; after 2015 there has been no increase in house prices at the border.[16]

Figure 9: The Effect on German House Prices per m^2



Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the log of housing prices per meter squared between border and non-border German municipalities at the shock. The total number of observations is $14'560$. We control for municipality, year-fixed effects, and housing characteristics. We detrend the effect by the pre period increase in house prices at the border. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on 21st Real Estate data.

This is a fourth piece of evidence of residential relocation: the effect on housing prices in Germany is remarkably coherent with our findings for German-speaking Swiss municipalities in Table 2 of Section 5.2.1.

But why was there a different effect in Germany and in Italy? First of all, in the sales housing market there is a well-known cultural division between Italy, and Germany. As shown in Figure B.14 of the Appendix, Germany has the lowest homeownership rate. It is possible that the German culture in German-speaking Swiss municipalities may affect the decision/type of relocation (renting vs owning) and consequently the house prices.

In addition to this cultural divide, there are also economic differences between Italy and Germany. As shown in Figure B.15 of the Appendix, Germany offers substantially higher hourly wages in the Swiss neighboring areas in contrast to Italy. Being the German wages higher, the economic gains

[16] The estimated effect was detrended by the pre-period average increase shown in Figure B.13 of the Appendix.

from residential relocation in German-speaking municipalities are potentially lower with respect to Italian-speaking ones. In other words, since the differential between Swiss and German wages is lower, the degree of substitutability between the two labor markets is higher in Germany than in Italy, making residential relocation less convenient.

Based on the previous considerations, the increase in the purchasing power of the Swiss salary after 2015 can be exploited through another channel: reducing labor time. Indeed, considering that residents at the border can engage in cross-border shopping, the higher Swiss salary in euros can be spent in the EZ bordering region without relocating. If this is the case, it might be that in Italian municipalities, the reaction is channeled through residential relocation, while in German-speaking ones through a labor-leisure time trade-off. We provide suggesting evidence by estimating the effect of the 2015 CHF appreciation on the log of total full-time equivalent workers at the municipal level. As shown in Table 3, we observe a reduction of -1.49% in total full-time equivalents only in Swiss German-speaking border municipalities.

In addition, cross-border shopping is particularly diffused at the German-speaking border, being many German stores located close to it and the travelling distances exceptionally contained.[17] Figure B.16 of the Appendix shows the fraction of vehicles entering and leaving Switzerland by purpose of travel: the percentage of Swiss vehicles moving across the German border for cross-border shopping is the highest, while the percentage of foreign vehicles for commuting is the lowest. This confirms that cross-border shopping is relatively more important in German-speaking municipalities than in other language areas, and also with respect to cross-border commuting, which is instead more intense in the Italian-speaking regions.

Table 3: Effect on Total Full-Time Equivalents by Language Region

Log Total Full-Time Equivalents	German-speaking	French-speaking	Italian-speaking
Treat × Post	-0.0149^{**} (0.0059)	0.0117 (0.0078)	-0.0096 (0.0123)
R-Squared	0.997	0.997	0.997
N	13’384	12’256	10’056
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes: The Table displays the estimated difference in the log of total full-time equivalents by language region between border and non-border Swiss municipalities after the removal of the EUR/CHF exchange rate floor in 2015. We compute the DiD effect for German-speaking (column 1), French-speaking (column 2), and Italian-speaking municipalities. We control for municipality and year fixed-effects. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Swiss Federal Office of Statistics data.

[17] Evidence can be found in Kluser (2023), Figure 1.

5.3 Transnational Bid-Rent Model

In Table B.3 of the Appendix, we find that the effect on housing prices is mainly driven by municipalities closer to the border, namely municipalities in the 0-5km, those displayed in Figure B.17 of the Appendix. In Switzerland, municipalities within 5km from the border experienced a -2.7% decrease in house prices per squared meter, while those further away, -1.16%. In Italy, in the 0-5km house prices increased by 5.49% and 3.96% in the 6-20km one. In Table B.4 of the Appendix we also show that comebacks from Switzerland were more intense at the Italian border. This spatial gradient exists for at least two reasons. First, there are cheaper transaction and relocation costs the lower the distance between provenience and destination. Second, the agent has the incentive to minimize the distance between the residence in the EZ country and the workplace in Switzerland, containing commuting costs.

To investigate deeper this gradient effect, we attempt to summarize our findings for Switzerland and Italy with an empirical transnational Bid-Rent model. Inspired by the classical urban models of Alonso (1964), Mills (1967) and Muth (1969), we essentially replace the Central Business District with the border separating the two national regions of the transnational economy: the Swiss (Canton Ticino and Vallese) and the Italian (Lombardy and Piedmont) side. We design an integrated model where on the left-hand side of the border, there is the Swiss bid-rent curve while on the right, the Italian one.[18]

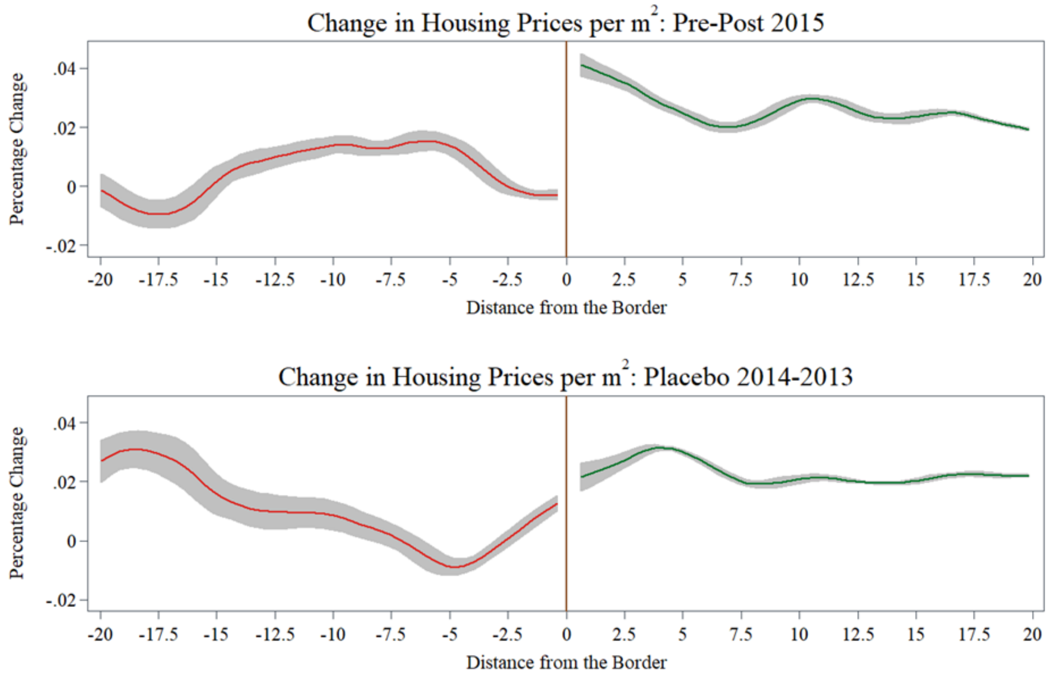
In Figure B.26 of the Appendix, we plot the bid rent curves of our empirical model. To do so, we compute the average house price at each units of distance, and we represent their values for the pre- (2012–2014) and post-treatment (2015–2019) periods. For the sake of comparability, for Switzerland, we use only Ticino, which is the neighboring canton of Piedmont and Lombardy. Due to Ticino's geographical conformation, Swiss data are sparse after a 10km distance. We convert prices in the same unit of account using the EUR/CHF exchange rate in 2014. To represent the change in the bid-rent curves after the policy, we fit a polynomial function of degree 1 to the data, and we compute the percentage changes in the polynomial values between the pre (2012–2014) and post (2015–2019) period by unit of distance.[19]

In the top graph of Figure 10, we represent the percentage changes in house prices between pre-post for municipalities in Ticino (on the negative axis) and Piedmont and Lombardy (on the positive axis). In addition, in the bottom graph of Figure 10, we perform a placebo test on the change in the bid-rent curves from 2013 to 2014. We find that between 2014 and 2013 there were no changes in the square meter house prices at the border, while in the pre-post analysis, we observe a significant discontinuity: Italian prices grew significantly more than Swiss prices, mirroring our findings on the housing market on the two sides of the border.

[18] Figure B.25 of the Appendix depicts a stylized representation of our transnational bid-rent model. Section B.7 describes the empirics behind these graphs.

[19] Section B.7 describes the empirics behind these graphs.

Figure 10: Percentage Change in Transnational Bid-Rent Curves and Placebo Test



Notes: The Figure displays the percentage change in the transnational bid-rent curves between municipalities in Switzerland (Ticino, in red) and Italy (Piedmont and Lombardy, in green) by distance in kilometers from the border. We also report 95% confidence intervals. Source: Our elaboration on Metasys AG and Italian Revenue Agency data.

6 Conclusions

In this paper, we investigate the existence of a transnational residential relocation due to a change in economic incentives, and how it may affect labor market outcomes and non-tradable goods (housing) in the Swiss and EZ transnational economy. We contribute to various fields of economic literature. First, we enrich the literature on workers' migration and exchange rate shocks, finding that following the increase CBW employment at the border there was no total employment effect, suggesting that workers change residence status, a mechanism typically neglected in the literature. Second, we enlarge the literature on place attachment, observing that improving living conditions in the place of origin increases the probability of returning home also in advanced economies: we find that the increase in the purchasing power of a Swiss salary spent in the EZ consumption market, following the 2015 currency shock, has been exploited through relocation in EZ only by residents living in Switzerland but native of EZ. This economic improvement has incentivized residents to re-migrate to their country of origin. Finally, this paper extends the results concerning the effect of exchange rate shocks on goods and services: we provide the first contribution on the consequences of the 2015 EUR/CHF lower-bound remotion on the real estate markets due to the residential relocation within the economic regions exposed to the shock. We find that similar to goods, individuals react to exchange rate policies by "exporting themselves" (i.e. relocating), therefore affecting housing prices.

In detail, we propose a theoretical model for residential location choices in a transnational regional economy with an integrated labor market but with heterogeneous preferences for consumption, housing, and amenities. Then, we test this model with the 2015 CHF appreciation, which caused an increase in the purchasing power of a Swiss salary spent in the EZ consumption market. In detail, the CHF appreciation led to a reduction of consumption prices (expressed in CHF) in the EZ, incentivizing workers located in Switzerland to spatially relocate to the other side of the border, while maintaining their Swiss jobs.

In the analysis, we use a dynamic difference-in-differences (DiD) approach to the empirical setting provided by the 2015 CHF appreciation. The treatment group is composed of the Swiss municipalities at the 0-20km bandwidth (the same treatment selection has been applied to Italy and Germany). In this context, we find that, in reaction to the CHF/EUR exchange rate shocks, cross-border workers have increased in all the Swiss territories and that the increase was more intense at the border. However, at the same time, the total employment and the average income did not follow the same pattern. These results are suggestive that labor supply did not change between border and inner municipalities after the shock, and that the higher inflow of CBWs in the treatment might be due to the residential relocation in EZ of residents precedently working and leaving in Switzerland. Moreover, in the same jurisdictions, there has been a 1.5% decrease in EZ working-age resident share and a 1.7% reduction in housing prices per squared meter. As a result, EZ residents relocate to the EZ counterpart of the transnational economy while maintaining their jobs on the Swiss side; in other words, some EZ residents turn into CBWs. The fact that only EZ residents relocate is consistent with the theory on place attachment: given all other things equal, the average utility of residing in the place of origin should be higher; thus, for an economic improvement in the EZ bordering region, EZ resident should be more likely to relocate in their country of origin. Putting together labor market and residential outcomes, we find that while in control municipalities there exists only an increase in total employment (new CBWs that before the shock lived and worked in EZ border regions) in municipalities at the border there is by design both a total employment and a residential relocation effect. This happens because relocation is only possible at the border due to the trade-off between transportation costs and exchange rate gains. Hence, the greater inflows of cross-border workers in border areas after CHF appreciations are overestimated in the literature and should be adjusted for the component of residential relocation. Furthermore, implementing various heterogeneities tests, we find that the effects on CBWs, EZ working-age residents, and housing prices are consistent only in Italian and French-speaking municipalities, while we observe the reverse pattern in German-speaking ones. To validate these different spatial results we estimate the impact in Italy and Germany. On the one hand, we find that Italian municipalities in the 0-20km bandwidth from the Swiss border experienced a rise in immigration from Switzerland and a 3% increase in housing prices. On the other hand, the 2015 CHF appreciation did not influence the German real estate market. To understand other potential mechanisms explaining the effects on the German border, we study possible changes in hours worked, finding a reduction of -1.49% in the number of total full-time equivalents only in Swiss German-speaking treated municipalities. Thus, there are heterogeneous responses at the regional level: in Italian and French-speaking municipalities the relocation effect prevails, while in German-speaking ones it seems more a matter of labor-leisure time trade-off. The results on the other side of the border (Italy and Germany) are coherent with our effects in Switzerland.

In conclusion, we find differentiated distributional effects of exchange rate policies within and across countries, potentially leading to discriminating regional housing effects. Across countries, the Swiss intervention has determined an opposing effect between the Swiss and the EZ side of the transnational economy. Additionally, there have been different impacts within each country between border and inner areas.

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A The Residential Location Model

We now describe the residential location model that explains the mechanism of relocation after an exchange rate shock. Consider a transnational Regional Economy (*RE*) embedded within a wider economy. The Regional Economy consists of a set of discrete residential locations indexed by $r = 1, \ldots, s, \ldots R$. The *RE* is populated by a fixed measure of N workers, which earn an exogenous income level y, which is constant across workplaces w. We assume that within the *RE* there is an official border that divides it into two national sub-regions called Ch and Ez:

$$Ch = \{1^{Ch}, \ldots, s^{Ch}, \ldots, R^{Ch}\}; \quad Ez = \{1^{Ez}, \ldots, s^{Ez}, \ldots, R^{Ez}\}$$

Thus, the discrete locations of the Regional Economy are derived from the union of the two sub-regions:

$$RE = Ch \cup Ez = \{1, \ldots, s, \ldots, R\}$$

The workplace is restricted to one sub-region, Ch. In other words, in Ch the agents can both reside and work, while in Ez can only reside. Agents face commuting costs T_{rw}, which are equal to the distance between residence and workplace d times the transportation costs per kilometer t. The distance function, d, is differentiated on the two sides of the border; thus:

$$T_{rw} = \begin{cases} t d_{rw} & \text{if } r, w \in Ch \\ t(d_{rb} + d_{wb}) & \text{if } r \in Ez \text{ and } w \in Ch \end{cases}$$

where b is the nearest border office to the residence location.

Each location has a resident population stock N_r. The sum of all the households in the regional economy coming from the different locations gives us the resident population of the area:

$$N = \sum_r N_r$$

The discrete locations are characterized by an exogenous level of amenities B_r and a location-specific idiosyncratic shock z_{ir} that captures the idea that individual i can have heterogeneous reasons to live in different parts of the Regional Economy; the idiosyncratic shock z_{ir} also captures place attachment: individuals should have a weak preference to live in the place of origin. As it is standard in the literature, we assume that the idiosyncratic shock is Fréchet distributed. Individuals consume a basket of goods c_r in the place of residence, a numéraire set of goods c_w in the workplace, and they have an individual housing demand h_r. The housing prices are an implicit function of the distance from the border d_{rb}:

$$Q_r(d) = q_r(d_{rb}); \qquad r \in Ch \ \vee \ r \in Ez$$

The housing price decreases with the distance from the border in Ez because, being the workplace restricted in Ch, the closer to the border the agent resides, the lower transportation costs are. Thus, the housing prices adjust to compensate for the higher transportation expenditures. On the other hand, in Ch the housing costs can either increase or decrease with the distance.

We now describe agents' residence choices, deriving the residential choice probability equation; then we present the housing market equilibrium and the general equilibrium of the model. Finally, we explain how a currency appreciation, assimilated by a shock in consumption prices in one sub-region affects the equilibrium. In the section A.5 of the Appendix, we present a two-location model which specifically describes the mechanism in our empirical setting.

A.1 Residence Choice Clearing Conditions

Individuals' preferences are described by a Cobb-Douglas utility function. The utility increase with amenities B_r, the idiosyncratic shock z_{ir}, the consumption of goods c_r and c_w, and the consumption of housing h_r in the chosen residential location r:

$$U_{irw} = B_r z_{ir} \left(\frac{c_r}{\alpha}\right)^{\alpha} \left(\frac{c_w}{\beta}\right)^{\beta} \left(\frac{h_r}{1-\alpha-\beta}\right)^{1-\alpha-\beta}$$

Each individual faces the following budget constraint, where the price of the workplace consumption is set as numéraire:

$$c_r p_r + c_w + h_r Q_r(d) + T_{rw} = y$$

We model the heterogeneity in the utility that workers derive from living in different parts of the city following McFadden (1974) and Eaton and Kortum (2002). For each agent i and living in location r, there is an idiosyncratic component of utility z_{ir}, drawn from an independent Fréchet distribution:

$$F(z_{ir}) = e^{-A_r z_{ir}^{-\varepsilon}}; \qquad A_r > 0, \quad \varepsilon > 1$$

with A_{or} being the average utility derived from living in location r, while ε is the Fréchet shape parameter. We derive the individual demands for housing and consumption goods, obtaining the indirect utility of living in location r and working in location w. Notice that the shock in consumption prices affects only the residence choice but not the workplace. Therefore, we can omit the subscript w, to make notation coincise:

$$V_{iwr} = \frac{B_r z_{ir}(y - T_{rw})}{p_r^{\alpha}[Q_r(d)]^{1-\alpha-\beta}} = \frac{B_r z_{ir}(y - T_r)}{p_r^{\alpha}[Q_r(d)]^{1-\alpha-\beta}} \tag{2}$$

Since the indirect utility is a monotonic function of the idiosyncratic shock z_{ir}, which has a Fréchet distribution, it immediately follows that the indirect utility also has a Fréchet distribution. After observing the realizations for idiosyncratic utility, each agent chooses her location of residence to maximize her utility, taking as given residential amenities, goods' prices, and the location decisions of other individuals.

Given that each individual can decide to live either in the Regional Economy or outside, in the wider economy, the expected utility of living in one of the locations of the Regional Economy must be equal to the reservation utility of living elsewhere in the wider economy $\bar{U}$:

$$\mathbb{E}[u] = \gamma\phi^{1/\varepsilon} = \gamma\left\{\sum_{r=1}^{R} A_r \left[p_r^{\alpha}[Q_r(d)]^{1-\alpha-\beta}\right]^{-\varepsilon} [B_r(y - T_r)]^{\varepsilon}\right\}^{1/\varepsilon} = \bar{U}$$

The probability that an individual decides to live in location r out of all possible locations s, derived through the maximization process of the Fréchet distribution, and where the maximum of a Fréchet distribution is itself Fréchet distributed, is given by:

$$\pi_r = \frac{A_r \left(p_r^{\alpha} [Q_r(d)]^{1-\alpha-\beta} \right)^{-\varepsilon} [B_r (y - T_r)]^{\varepsilon}}{\sum_{s=1}^{R} A_s \left(p_s^{\alpha} [Q_s(d)]^{1-\alpha-\beta} \right)^{-\varepsilon} [B_s (y - T_s)]^{\varepsilon}} = \frac{\phi_r}{\phi}$$

The probability that an individual chooses to live in location r positively depends on the location's amenities (B_r) and on the average utility derived from living in the residence r (A_r), while it negatively depends on the consumption price in the residence (p_r) and on the housing prices (Q_r). Equating the share of residents in location r with the probability of living in location r we obtain the residential location clearing condition:

$$\frac{N_r}{N} = \frac{\phi_r}{\phi} = \pi_r$$

A.2 Housing Market Clearing Condition

The aggregated demand of housing in residence r is given by the individual optimal housing demand (derived from the individuals' utility maximization) multiplied by the number of residents in location r:

$$H_r^D = h_r^* N_r \tag{3}$$

We model housing supply as a homogeneous good produced with constant returns to scale using non-land capital and land. Housing is supplied by land developers at increasing marginal cost and sold to atomistic landlords who then reside there. The total dwelling stock of sub-district r is equal to:

$$H_r^S = \gamma [Q_r(d)]^{\eta_r^{S,Q}} \tag{4}$$

where $\eta_r^{S,Q}$ is the housing supply elasticity with respect to housing prices and γ is a positive constant. Housing supply is allowed to vary across locations according to the tightness of topographical and administrative constraints on construction (Brülhart et al., 2021; Hilber and Vermeulen, 2016; Saiz, 2010). The housing market equilibrium is determined by the equality of H_s^D and H_s^S.

A.3 The General Equilibrium

In this section, we formalize the definition of equilibrium under the assumption of strictly positive, finite, and exogenous location characteristics: $B_r \in (0, \infty)$ and $A_r \in (0, \infty)$.

Definition 1 *Given the parameters of the model $\{\alpha, \beta, \varepsilon, \gamma, \eta\}$, the reservation level of utility in the wider economy $\bar{U}$, an exogenous income level y, the exogenous locations' characteristics $\{B_r, A_r\}$, the general equilibrium is defined by the vector $\{p, Q, N_r, \pi_r\}$ if it satisfies:*

1. *The indifference condition,*

$$\gamma\left\{\sum_{r=1}^{R} A_r\left(p_r^{\alpha}[Q_r(d)]^{1-\alpha-\beta}\right)^{-\varepsilon}[B_r(y-T_r)]^{\varepsilon}\right\}^{1/\varepsilon}=\bar{U} \tag{5}$$

2. *The residential choice probability equation,*

$$\pi_r=\frac{A_r\left(p_r^{\alpha}[Q_r(d)]^{1-\alpha-\beta}\right)^{-\varepsilon}[B_r(y-T_r)]^{\varepsilon}}{\sum_{s=1}^{R} A_s\left(p_s^{\alpha}[Q_s(d)]^{1-\alpha-\beta}\right)^{-\varepsilon}[B_s(y-T_s)]^{\varepsilon}} \tag{6}$$

3. *The housing market equilibrium equation,*

$$H_r^D=H_r^S, \qquad \forall r\in R \tag{7}$$

Thus, the general equilibrium result is given by the population composition of the residential location:

$$N_r=\pi_r N \tag{8}$$

A.4 Comparative Statics

In this section, we explain the comparative statics on the main equilibrium parameters for a given change in consumption prices.[20] Log-differentiating the residential choice probability equation and the housing market equilibrium equation, we obtain a relation between the change rate of the population residing in r with a change rate of the consumption goods' price in r:

$$\widehat{N}_r=-\frac{\varepsilon\alpha\left(1+\eta_r^{S,Q}\right)}{\varepsilon(1-\alpha-\beta)+1+\eta_r^{S,Q}}\cdot\widehat{p}_r=\vartheta_r\widehat{p}_r$$

Now, since $\vartheta_r<0$, a negative shock in the consumption goods' price in r, p_r, will cause an increase of the population in r, N_r. In turn, from the log-differentiation of the housing market equilibrium equation, a positive shock in N_r will cause an increase in $Q_r(d)$:

$$\widehat{Q}_r(d)=\frac{1}{1+\eta_r^{S,Q}}\cdot\widehat{N}_r=\xi_r\widehat{N}_r$$

[20] Notice the following notation rule; for a generic variable x_r, we define $\widehat{x}_r$ as the change rate in x_r after a given shock in the economy:

$$\widehat{x}_r=\frac{d\ln x_r}{x_r}$$

where $\xi_r > 0$. Finally, by rearranging the equations of the equilibrium we obtain the model-based change in housing prices for a given change in consumption goods' price:

$$\widehat{Q}_r(d) = -\frac{\varepsilon\alpha}{\varepsilon(1-\alpha-\beta)+1+\eta_r^{S,Q}} \cdot \widehat{p}_r = \eta_r^{Q,p}\widehat{p}_r$$

Since $\eta_r^{Q,p} < 0$, a negative shock in p_r will cause an increase of the housing price $Q_r(d)$.

A.5 Two-locations Model

Assume that there are only two locations in the transnational Regional Economy, $R = 2$, one on each side of the border. In one of the two sides, Ch, residence and workplace coincide:

$$w = r = Ch$$

while on the other side, in Ez, being the workplace w fixed in Ch, it is only possible to reside:

$$w = Ch; \qquad r = Ez$$

All the prices are expressed in the unit of account of Ch. Thus, an appreciation of the unit of account in Ch, which determines a reduction of the consumption goods price in Ez, will cause an increase in the population residing in Ez. Since the total population of the regional economy is fixed, the appreciation will cause a reduction of residents in Ch:

$$\widehat{p}_{Ez} < 0 \quad \Rightarrow \quad \widehat{N}_{Ez} > 0 \quad \wedge \quad \widehat{N}_{Ch} < 0$$

The shock in the population stock will be such that the housing prices decrease in Ch and increase in Ez:

$$\widehat{N}_{Ez} > 0 \quad \Rightarrow \quad \widehat{Q}_{Ez}(d) > 0; \qquad \widehat{N}_{Ch} < 0 \quad \Rightarrow \quad \widehat{Q}_{Ch}(d) < 0$$

The idiosyncratic shock $z_{i,Ch}$ ensures that only agents with specific heterogeneous preferences will move to Ez. In particular, this parameter captures heterogeneous reasons for the agents' residence choice such as the weak preference to reside in the place of origin (i.e. place attachment).

Notice that the change in housing prices in Ez and Ch relative to the distance from the border between these two regions is such that:

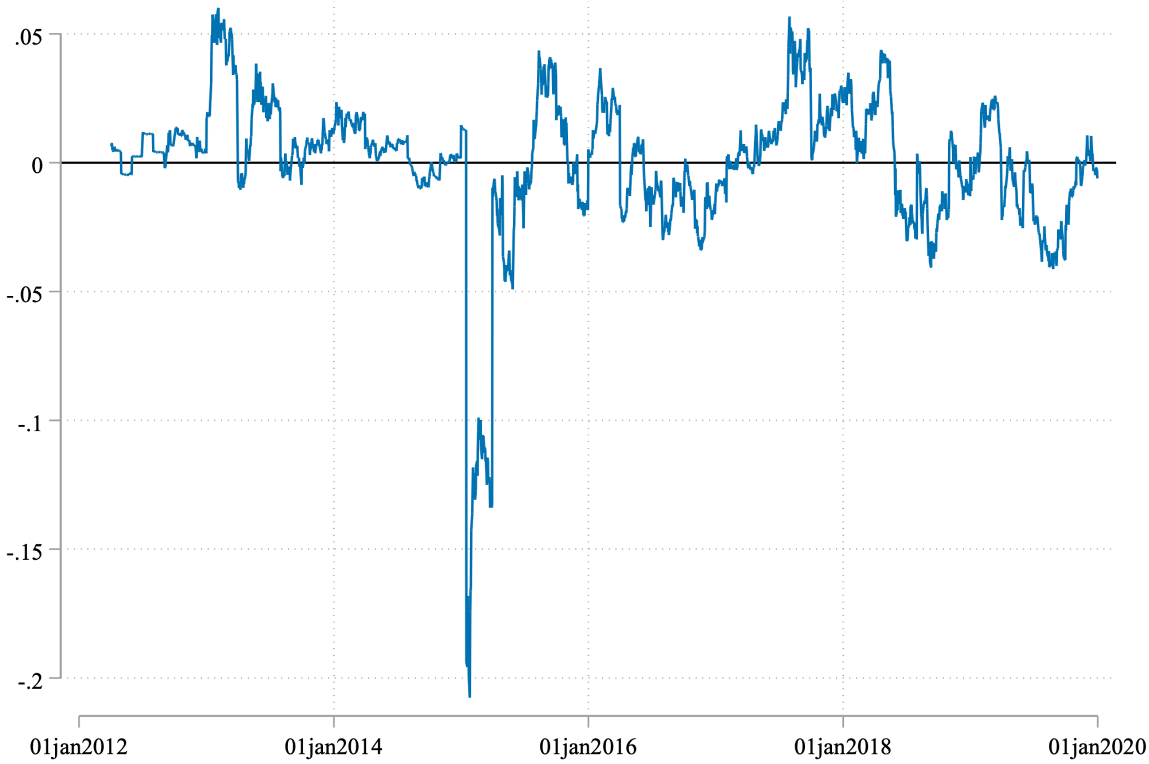
$$\frac{\partial\widehat{Q}_{Ez}(d)}{\partial d} < 0 \qquad\qquad \frac{\partial\widehat{Q}_{Ch}(d)}{\partial d} > 0$$

The increase in housing prices diminishes with the distance to the border in Ez because, being the workplace restricted in Ch, the closer to the border the agent resides, the lower transportation costs are. Thus, agents prefer to relocate to the other side (in Ez) in proximity to their workplace in Ch. On the contrary, the decrease in housing prices in Ch is higher (in absolute terms) nearer to the border since the probability of relocation is higher; this relates to the fact that the transaction costs (moving, legal, consulting costs, ...) are lower for municipalities in Ch nearer to Ez.

B Appendix

B.1 Additional Figures

Figure B.1: Difference between EUR/CHF Exchange Rate and 3-month Prediction



Notes: The Figure shows the difference between the actual exchange rate and the 3-month prediction for each day. The 3-month forecast is computed with a distributed lag model, where the closing value of the EUR/CHF exchange rate is regressed against itself three months prior, along with month-fixed effects.

Figure B.2: Yearly Average EUR/CHF Exchange Rate

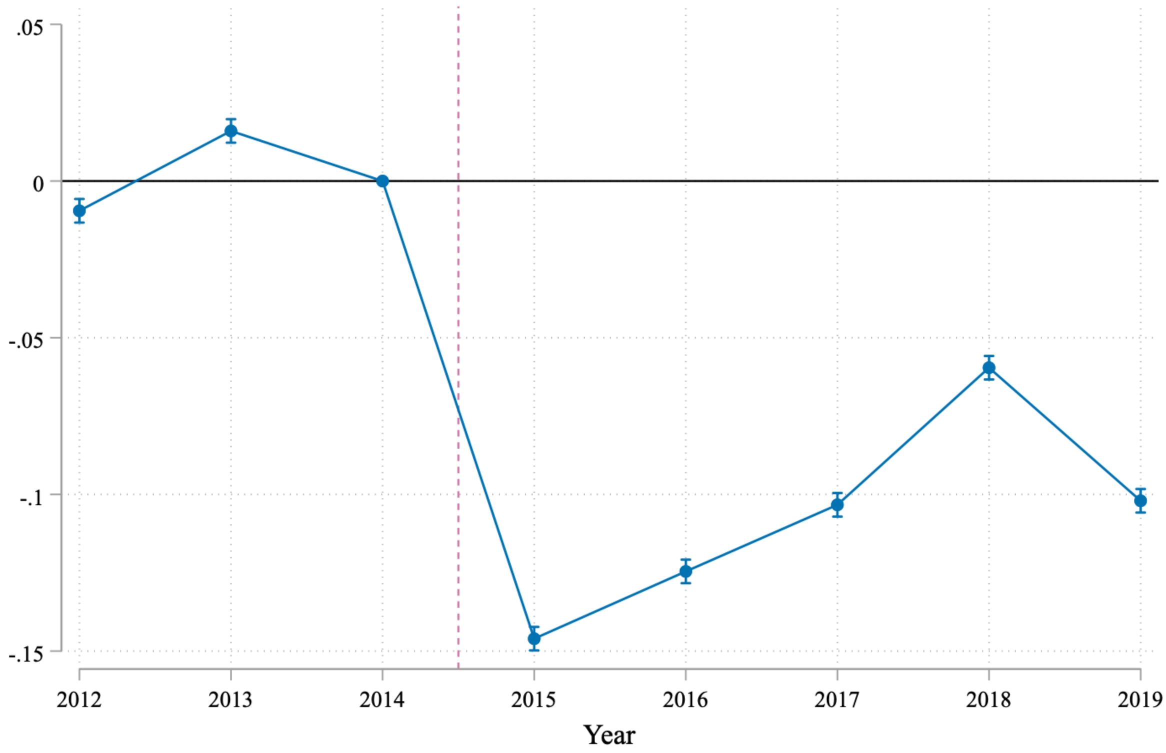
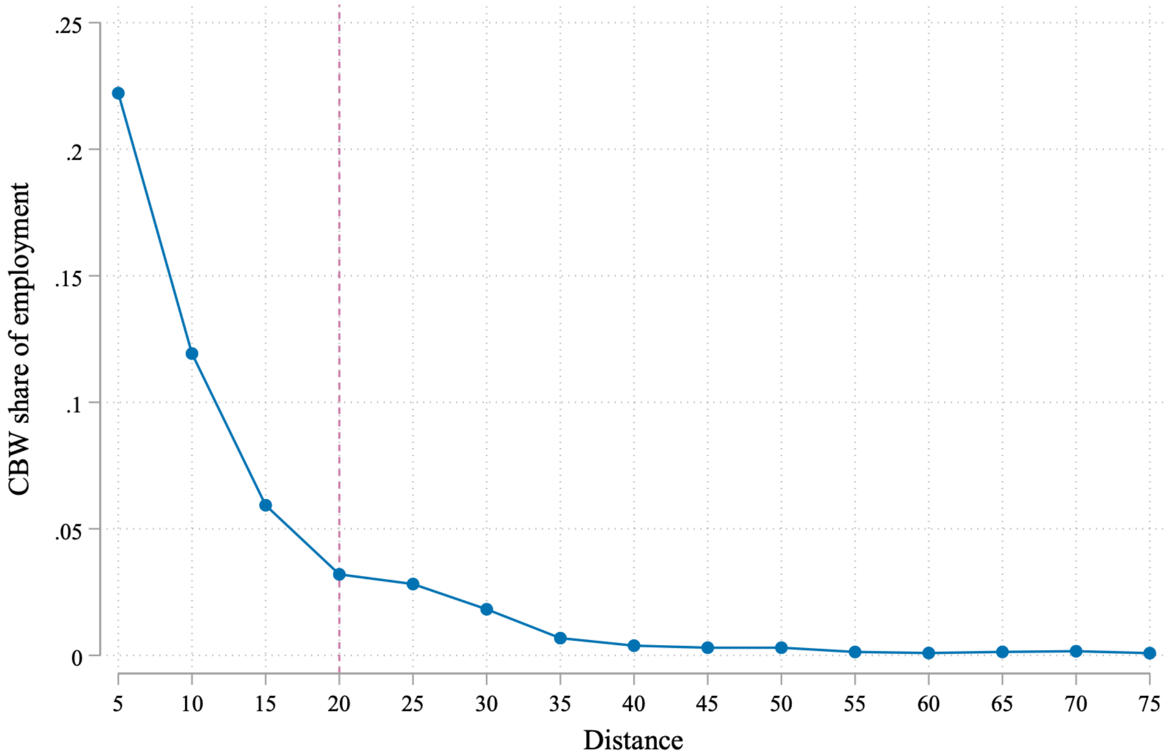
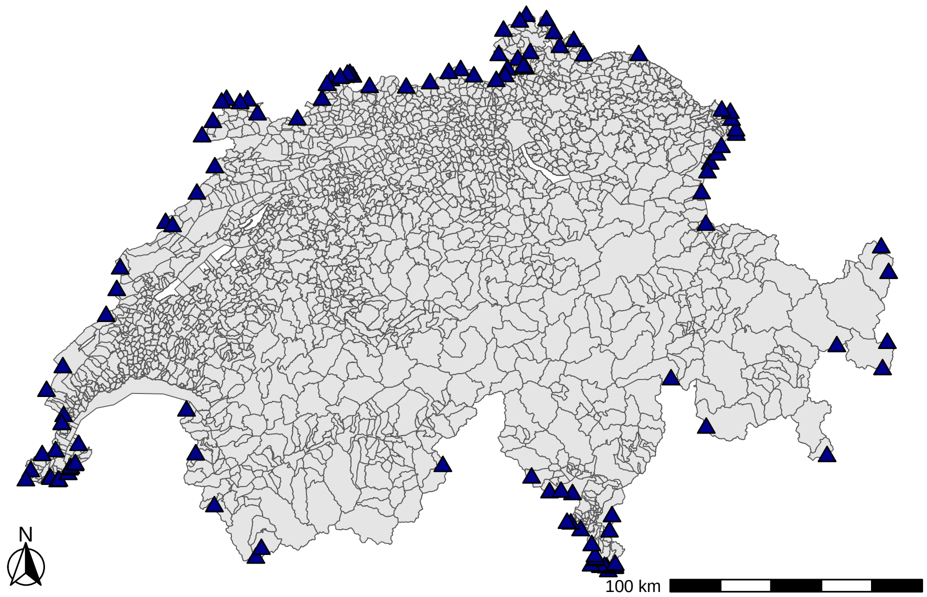


Figure B.3: Cross Border Workers by Distance



Notes: The Figure shows the share of FTE crossborder workers over total FTE employment by 5 Km distance bin from the national border. The red vertical line identifies treatment and control areas. Source: our elaboration on Swiss Federal Office of Statistics data.

Figure B.4: border Offices



Notes: The map displays the location of Swiss border offices. Gaps along the Swiss borders are due to the presence of water basins or mountains.

Figure B.5: Treatment Municipalities in Italy

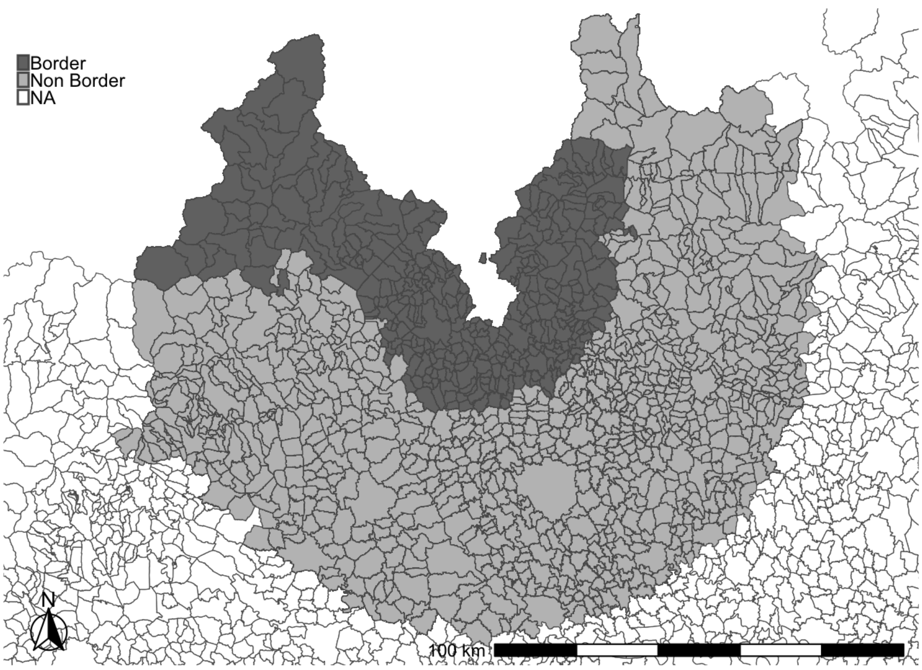


Figure B.6: Treatment Municipalities in Germany

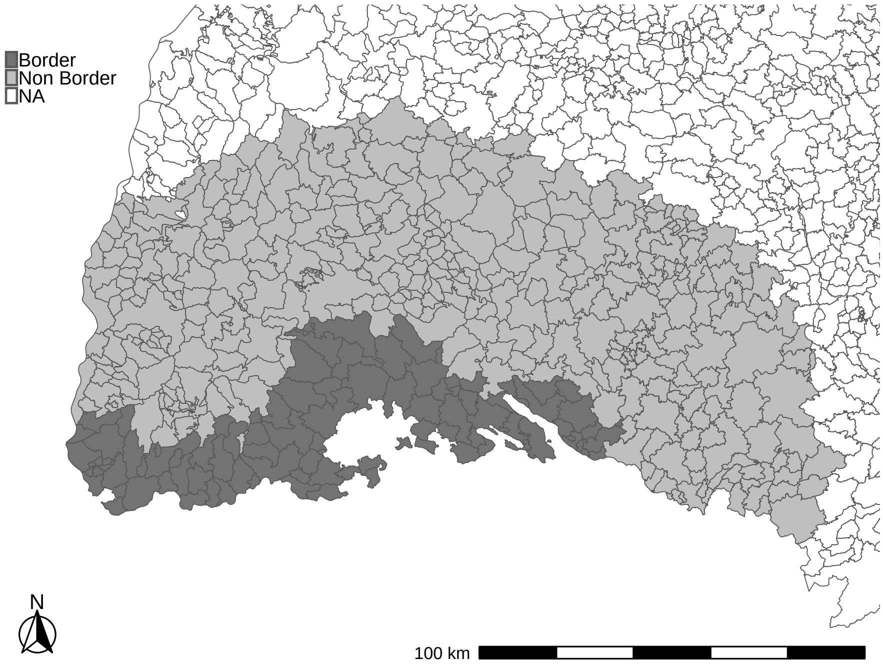


Figure B.7: Yearly Average Swiss Nominal Wages in Euros

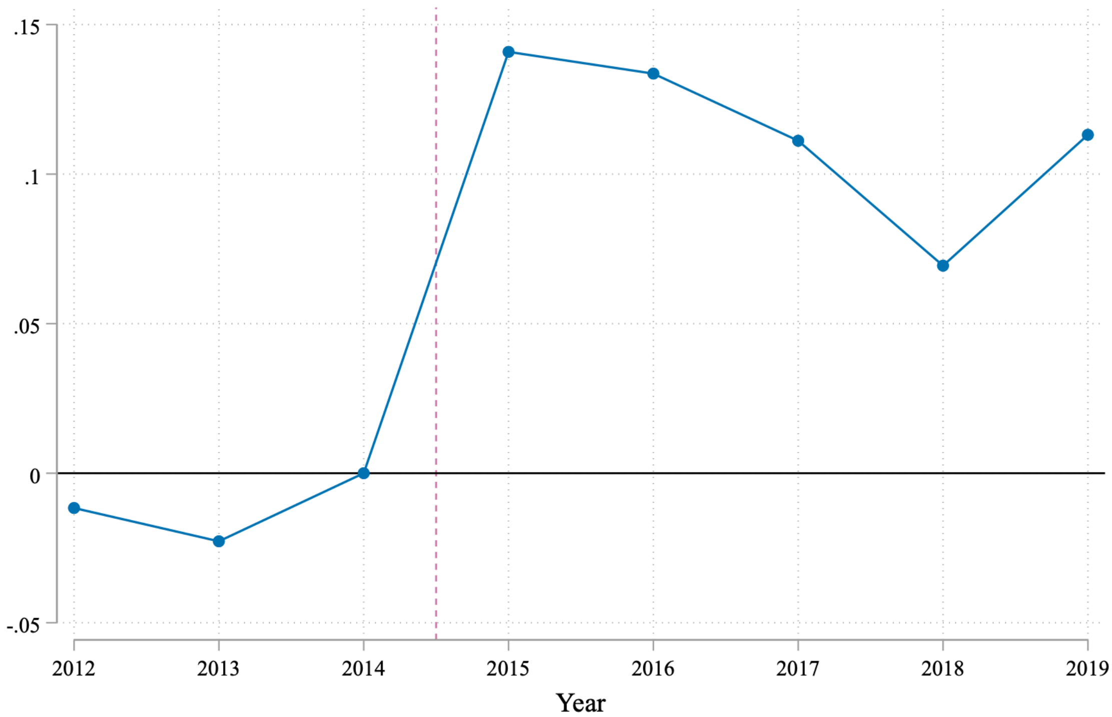
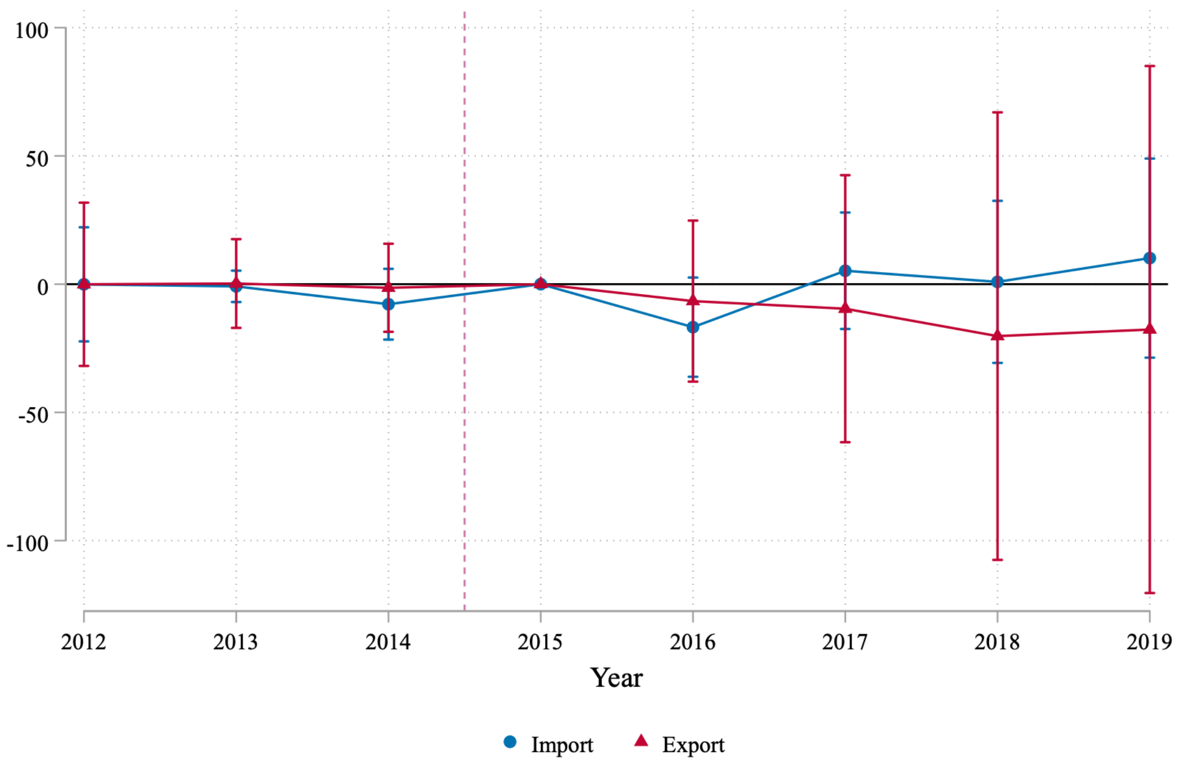
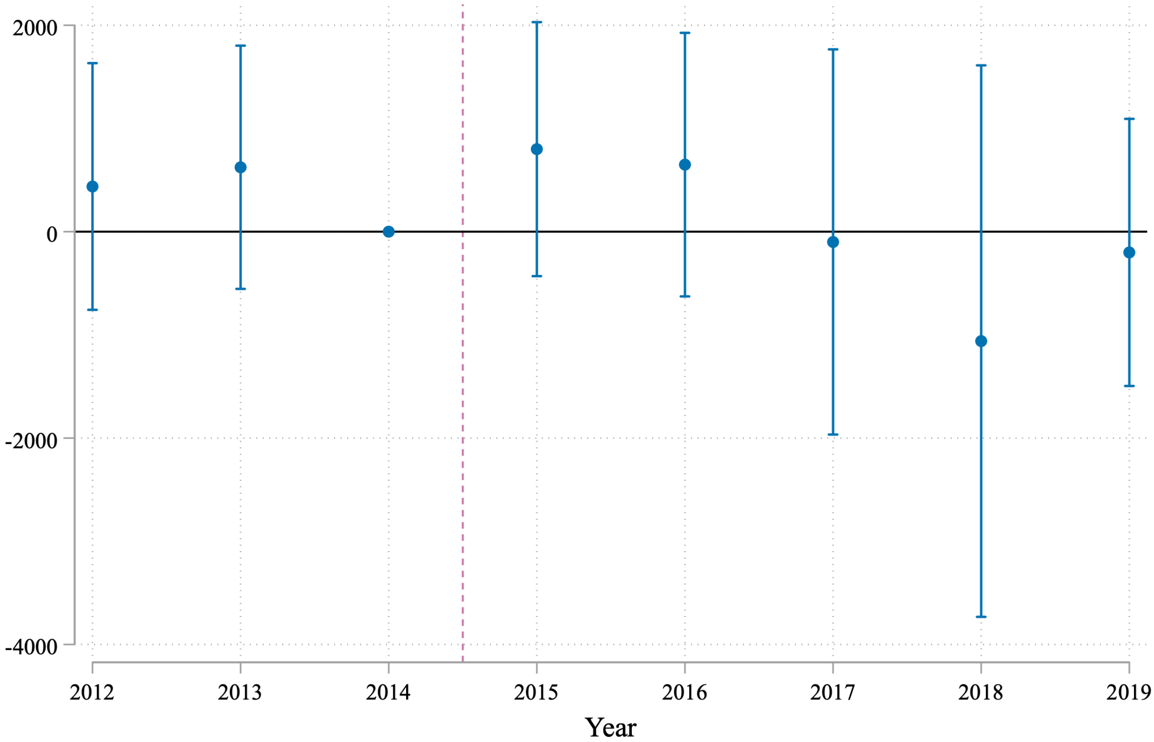


Figure B.8: The Effect on Import and Exports



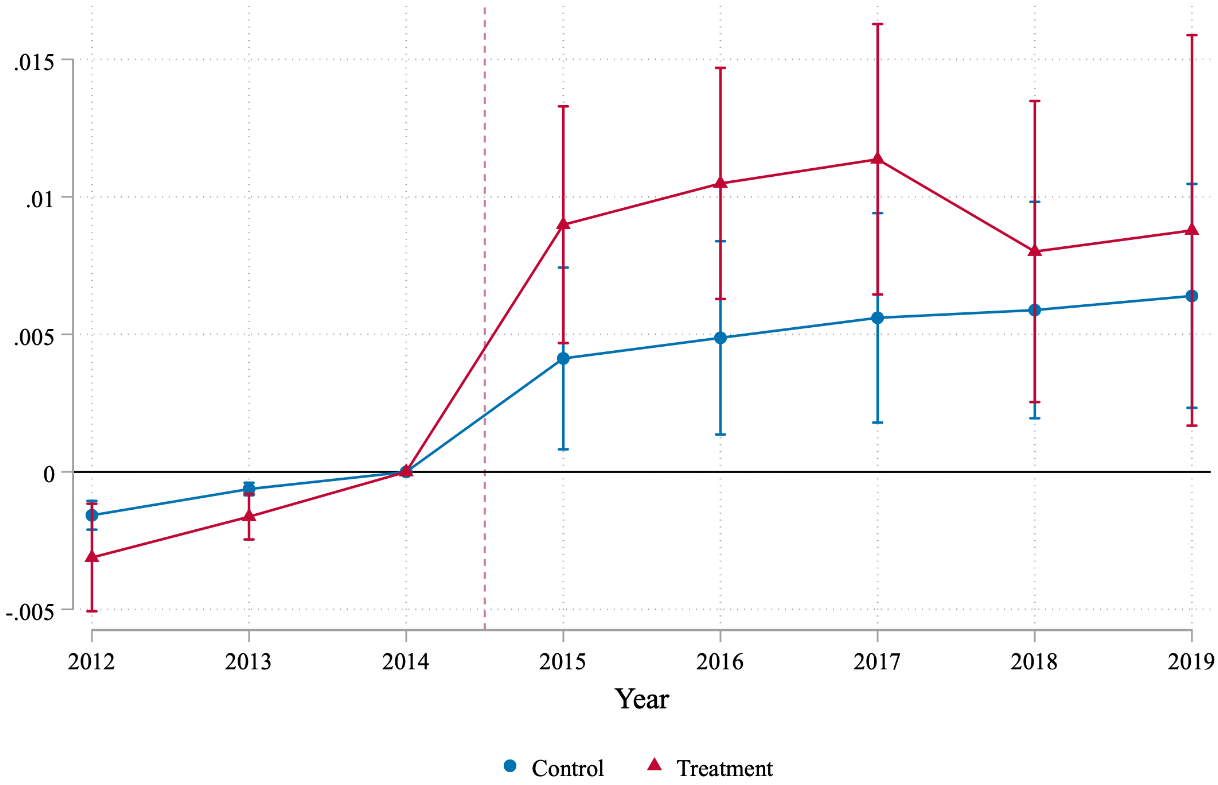
Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in employment in import and export sectors between border and non-border municipalities at the shock. The total number of observations is $4'431'104$. We control for municipality, year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure B.9: The Effect on Equilibrium Income



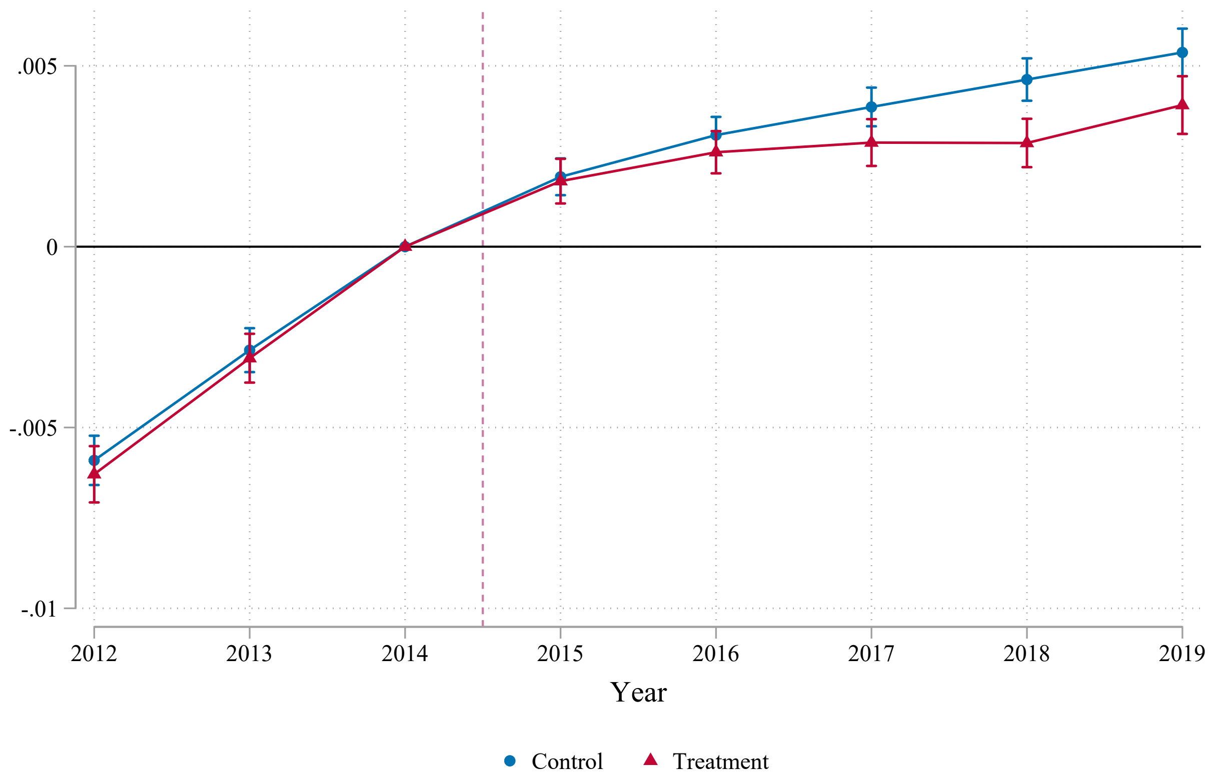
Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the income levels between border and non-border municipalities at the shock. The total number of observations is $16'867$. We control for municipality, year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure B.10: The Effect on CBW Share by Treatment



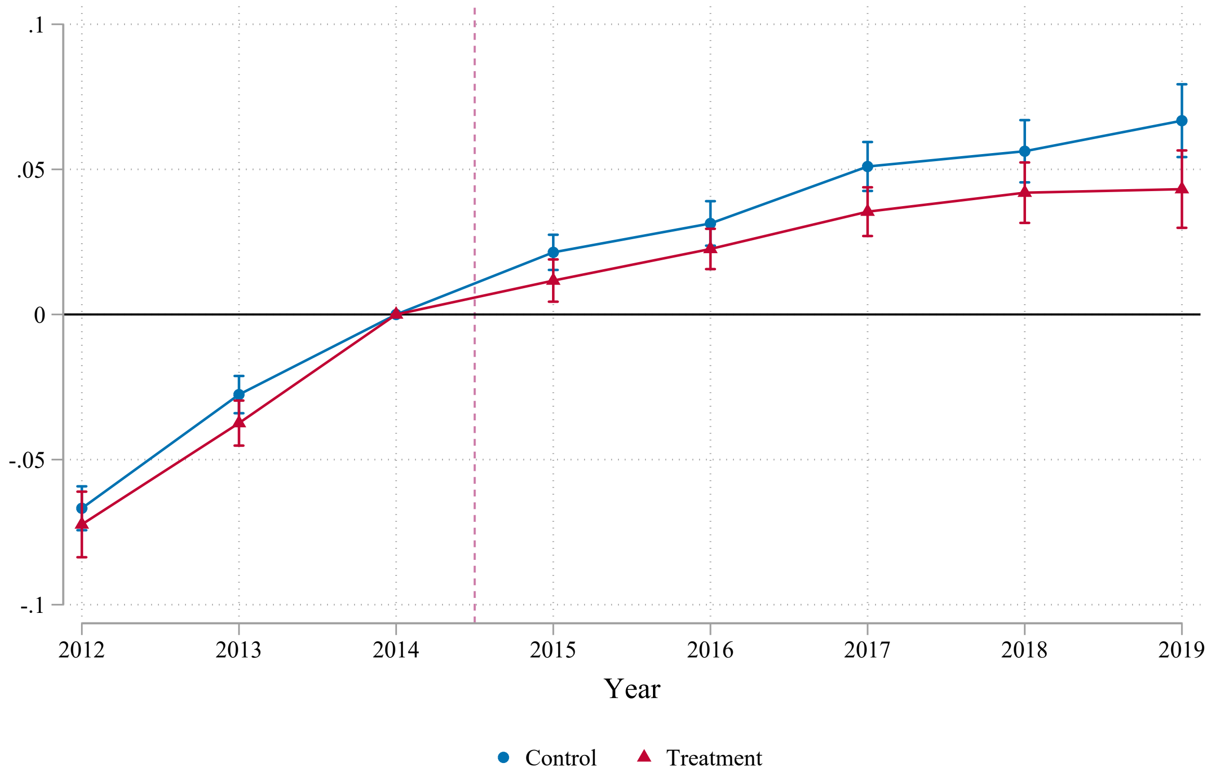
Notes: For each year, the Figure displays the estimated difference in CBW share at the shock for border (treatment group) and non-border Swiss municipalities (control group). The total number of observations is 50′994. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure B.11: The Effect on the EZ Working-age Residents' Share by Treatment



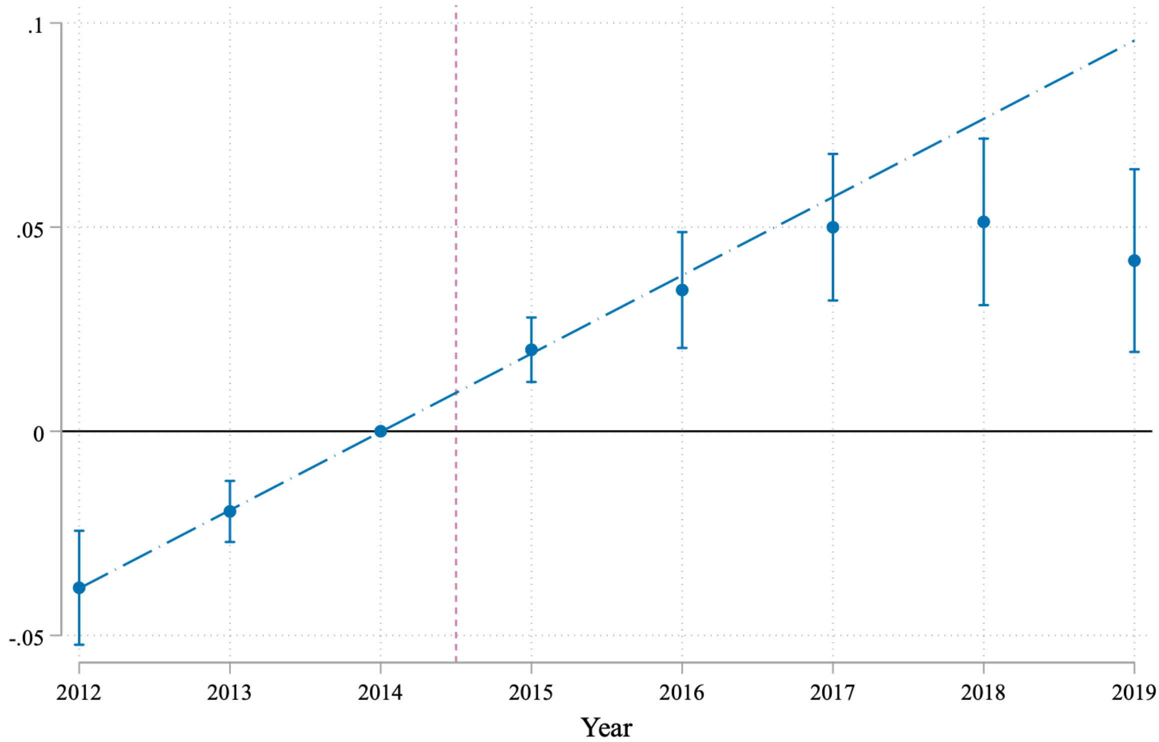
Notes: For each year, the Figure displays the estimated difference in Eurozone working-age citizens' share at the shock for border (treatment group) and non-border Swiss municipalities (control group). The total number of observations is 17′064. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure B.12: The Effect on Swiss House Prices per m^2 by Treatment



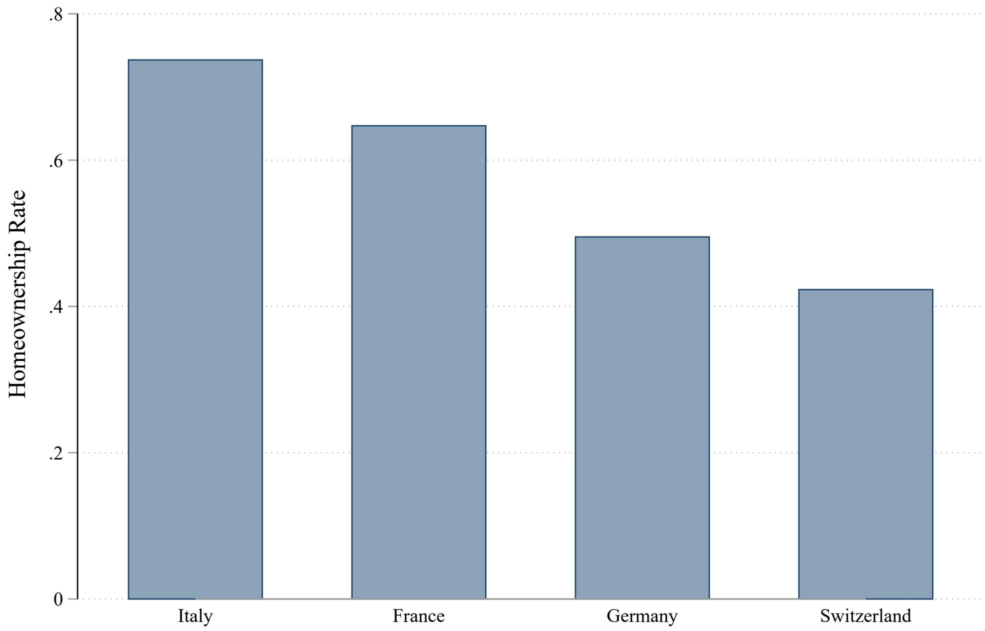
Notes: For each year, the Figure displays the estimated difference in the log of house prices per meter squared at the shock for border (treatment group) and non-border Swiss municipalities (control group). The total number of observations is 503′743. We control for municipality, year-fixed effects, and housing characteristics. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Meta-Sys AG data.

Figure B.13: The Effect on German House Prices per m^2



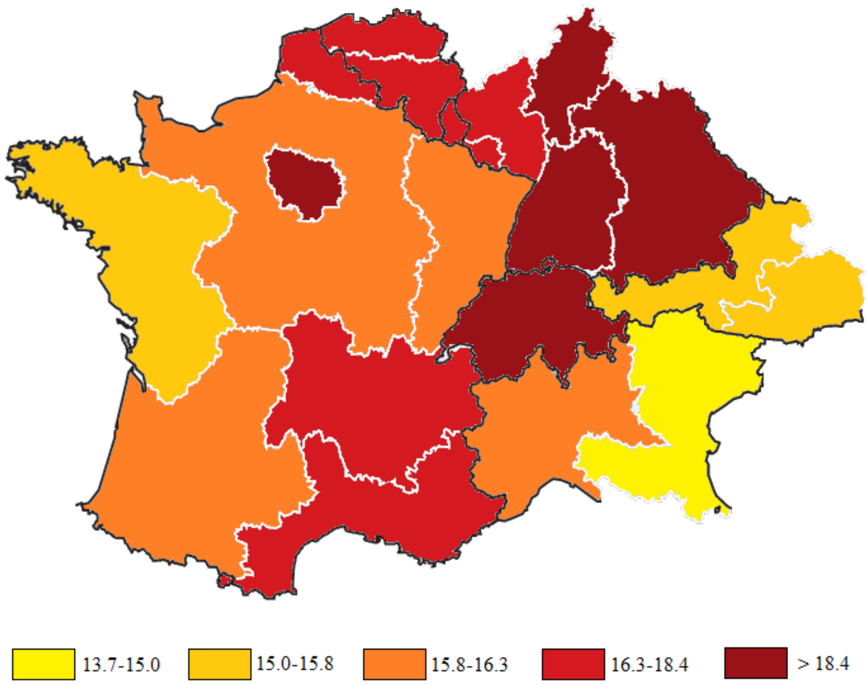
Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the log of house prices per squared meter between border and non-border German municipalities at the shock along with the pre-trend in house prices (dashed line). The total number of observations is 14′560. We control for municipality, year-fixed effects, and housing characteristics. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure B.14: Homeownership Rates



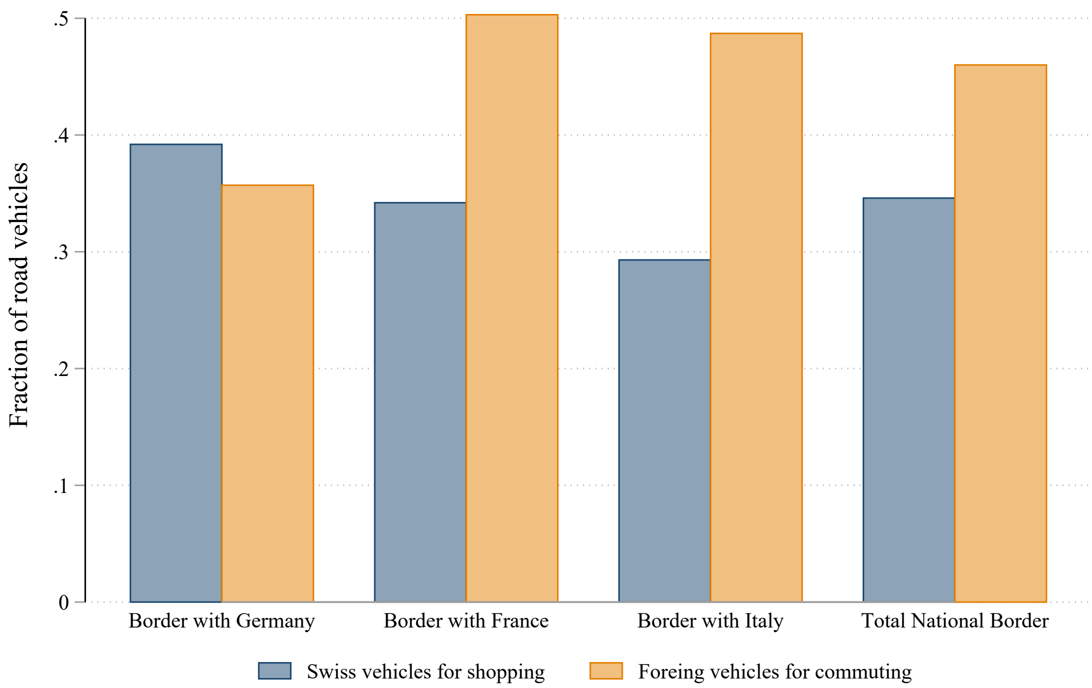
Notes: The Figure displays the homeownership Rates of Italy, France, Germany, and Switzerland. Source: Our elaboration on Various National Statistics Data.

Figure B.15: 2014 Gross Hourly Wages in Euros



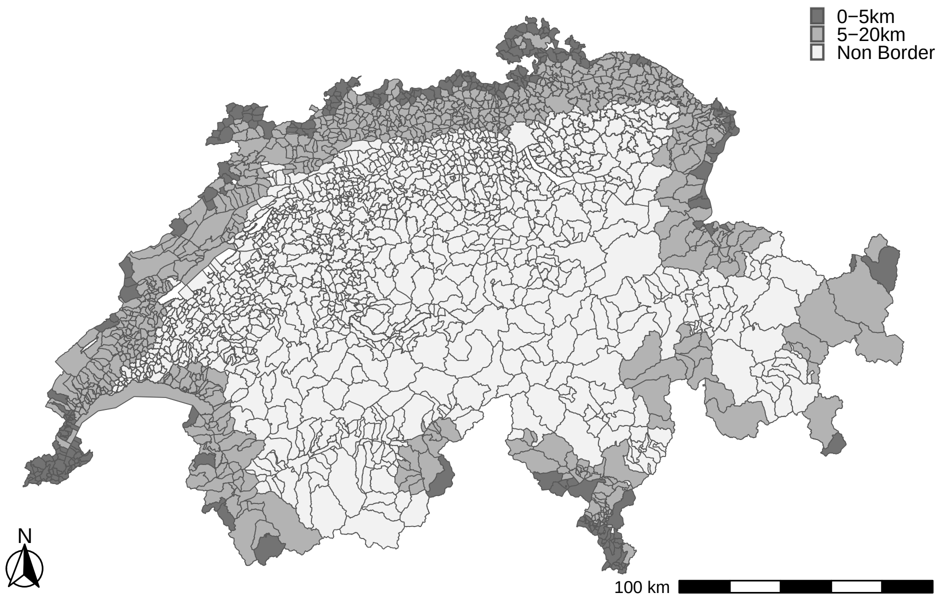
Notes: The Figure displays the 2014 hourly wages in Euros by selected regions of the Transnational area of Italy, France, Germany, and Switzerland. Source: Our elaboration on Eurostat Data.

Figure B.16: Fraction of Vehicles Entering and Leaving CH by Purpose of Travel



Notes: The Figure displays the fraction of vehicles entering and leaving CH by purpose of travel. Source: Our elaboration on Transalpine and cross-border passenger transport data (FSO).

Figure B.17: Treatment Selection: Proximity to the border



B.2 Additional Tables

Table B.1: European Transnational Areas

Alpine area	Switzerland, Liechtenstein, eastern France, southern Germany, northern Italy, Austria, and Slovenia
North Sea area	Norway, western Sweden, eastern United Kingdom, Denmark, Netherlands, northern Belgium, and northern Germany
North West Europe area	Ireland, United Kingdom, northern France, Belgium, Netherlands, western Germany, Luxembourg, and Switzerland
Northern Periphery area	Iceland, Norway, northern Sweden, northern Finland, northern United Kingdom, and northern Ireland
Baltic Sea area	Norway, Sweden, Finland, Estonia, Latvia, Lithuania, Belarus, western Russia, Poland, Denmark, and north-east Germany
Atlantic area	Ireland, western United Kingdom, western France, northern and western Spain, and Portugal
Danube area	Southern Germany, Czech Republic, Austria, Slovakia, Slovenia, Hungary, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Bulgaria, Romania, Moldova, and southern Ukraine
Central Europe area	Eastern Germany, Poland, Czech Republic, Slovakia, Hungary, Austria, Slovenia, northern Italy, Croatia
Adriatic-Ionian area	Eastern and southern Italy, Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Albania, and Greece
Balkan-Mediterranean	Albania, Macedonia, Bulgaria, Greece, and Cyprus
South West Europe area	Portugal, Spain, and south-west France
Mediterranean area	Southern Portugal, southern Spain, southern France, Italy, Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Albania, and Greece

Notes: Source: European Environment Agency (2020).

Table B.2: Effect of Migration on House Prices

	Log House Prices m^2
Panel A: Effect of EZ in Switzerland	
Treat $\times$ Post $\times$ EZ Share	-0.0178^{*}
	(0.01069)
R-Squared	0.539
N	493'511
Municipality FE	Yes
Year FE	Yes
House Characteristics	Yes
Panel B: Effect of Immigration in Italy	
Treat $\times$ Post $\times$ Immigration Share	0.0181^{*}
	(0.00939)
R-Squared	0.91
N	53'638
OMI District FE	Yes
Year FE	Yes
House Characteristics	Yes

Notes: The Table displays the estimated triple difference in the effect of migration (EZ resident share, Immigrations from Switzerland to Italy) on the log of housing prices per square meter between border and non border municipalities in Switzerland and Italy after the removal of the EUR/CHF exchange rate floor in 2015. We control for municipality, year fixed-effects, and housing characteristics. Panel A reports the triple difference coefficients for Switzerland. Panel B reports the triple difference coefficients from Italy. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Meta-Sys AG, Italian Revenue Agency data, and ISTAT.

Table B.3: Proximity to the border: house prices

Log House Prices m^2	0–5 km	6–20 km
Panel A: Gradient Effect in Switzerland		
Treat × Post	-0.0274^{***}	-0.0116^{**}
	(0.0073)	(0.0063)
R-Squared	0.541	0.513
N	337'776	417'110
Municipality FE	Yes	Yes
Year FE	Yes	Yes
House Characteristics	Yes	Yes
Panel B: Gradient Effect in Italy		
Treat × Post	0.0622^{***}	0.0469^{***}
	(0.0062)	(0.0034)
R-Squared	0.921	0.919
N	114'739	128'935
OMI District FE	Yes	Yes
Year FE	Yes	Yes
House Characteristics	Yes	Yes

Notes: Panel A of the Table displays the estimated difference in the log of housing prices per square meter in the 0-5km (column 1) and 6-20km bandwidth (column 2) between border and non-border Swiss municipalities after the removal of the EUR/CHF exchange rate floor in 2015. We control for municipality, year fixed-effects, and housing characteristics. Panel B of the Table displays the estimated difference in the log of housing prices per square meter in the 0-5km (column 1) and 6-20km bandwidth (column 2) between border and non-border Italian municipalities after the removal of the EUR/CHF exchange rate floor in 2015. We control for OMI, year fixed-effects, and housing characteristics. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Meta-Sys AG and Italian Revenue Agency data.

Table B.4: Proximity to the border: immigration

Immigration Share	0–5 km	6–20 km
Treat × Post	-0.0009^{***}	-0.0002^{***}
	(0.0002)	(0.00004)
R-Squared	0.437	0.278
N	7'492	9'000
Municipality FE	Yes	Yes
Year FE	Yes	Yes

Notes: The Table displays the estimated difference in the share of immigrants from Switzerland between border and non-border Italian municipalities at the shock. We control for municipality and year fixed-effects. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on ISTAT data.

B.3 Exchange Rate Expectations

To determine expectations on the exchange rate we follow the standard approach in the monetary macroeconomics literature, which detects random monetary shocks as the unexpected interest rate changes identifiable through large departures of the fitted values to the actual ones. In this context, we implement an AR(1) regressing the Exchange rate between CHF and EUR on the 3-month prior rate regression, along with time-fixed effects. More in detail, we estimate the following regression,

$$E_t = \alpha + \beta \cdot E_{t-3} + \tau + \varepsilon_t$$

where is E_t represents the exchange rate in month t and τ represents a month of the year fixed effect. Thus, the fitted values of this regression represent the 3-month prior expected exchange rate path for the period t.

B.4 Treatment Selection Definition

The threshold of 20km is plausible for at least two reasons. First, 20km is the official distance bandwidth used in the bilateral agreement between Switzerland and the European Union to define cross-border workers with fiscal privileges.[21] Second, a simple calculation shows that 20km is the distance from the border which makes an agent indifferent by turning into a cross-border worker given the 2015 shock. To see this, consider that the average salary in Swiss Cross-border Regions in 2014 was around 6'000 CHF (Swiss Federal Office of Statistics, 2015) and that the average transportation costs per kilometer in Switzerland were 0.80 CHF (Touring Club Suisse, 2015). Call $y_t^{€}$ the average swiss salary at time t in Euro, then:

$$y_{2014}^{€} = \frac{6'000}{1.20} = 5'000€ \qquad y_{2015}^{€} = \frac{6'000}{1.07} = 5'600€$$

Thus, the gains from the 2015 CHF appreciation for the representative agent (i.e. the one gaining the average salary) were 600€. Define $\tau^{€}(d)$ the total monthly transportation costs in Euro at the distance from the border d. Then, the transportation costs for an individual who commutes back and forth daily over 20km for 20 working days is:

$$\tau^{€}(20) = \frac{0.8}{1.07} \times 20\text{km} \times 2 \times 20 \text{ days} = 600€$$

The total monthly transportation costs that equalize the gains are at the 20km bandwidth. Therefore, 20km is the level of distance from the border which makes the agent indifferent by turning into a cross-border worker given the 2015 Swiss franc appreciation.

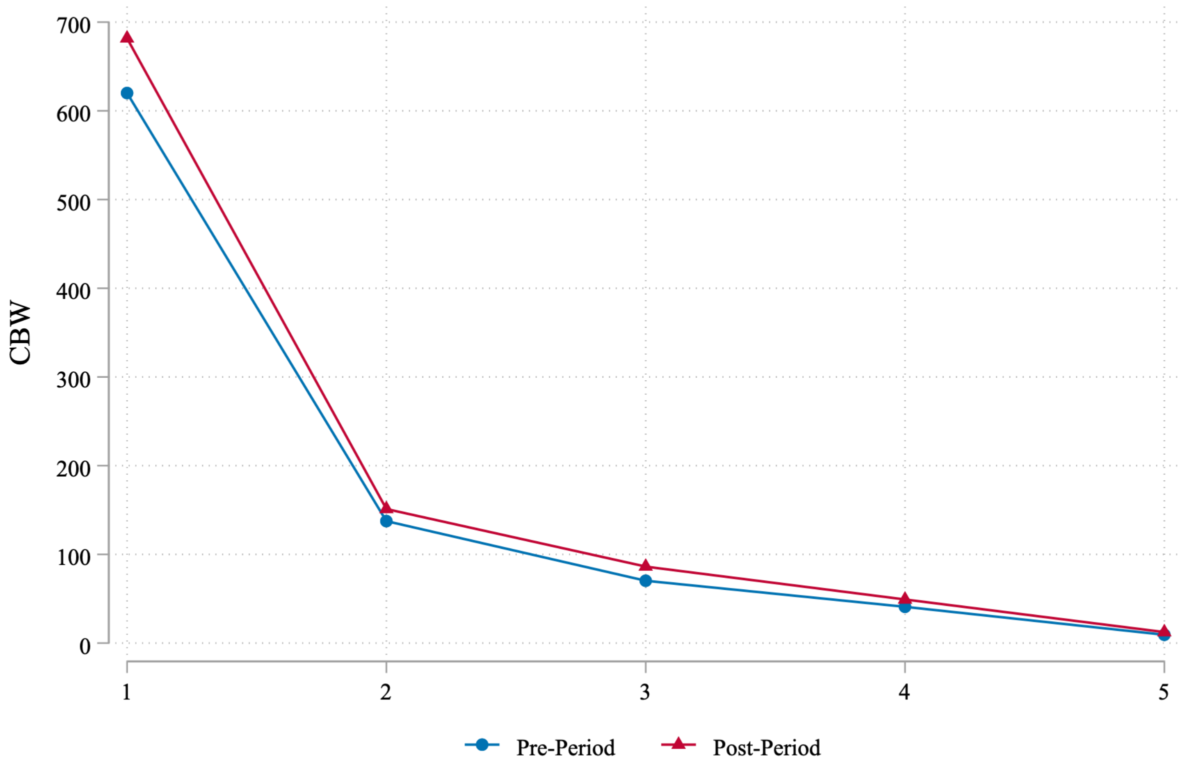
[21] Fiscal privileges refer to wages and other work incomes that can be taxed only in the country of work (Switzerland) which are partly rebated from the Federation to border municipalities of the origin countries. Note that Switzerland is in the top five OECD countries with the lowest tax rates. More information is available at https://www.fedlex.admin.ch/eli/cc/1979/457_457_457/it

B.5 The Effect on Cross-Border Workers

In this section of the Appendix, we deeply explain some methodological details regarding the estimation strategy adopted for the cross-border employment effect, which slightly differs from the general one used throughout the paper.

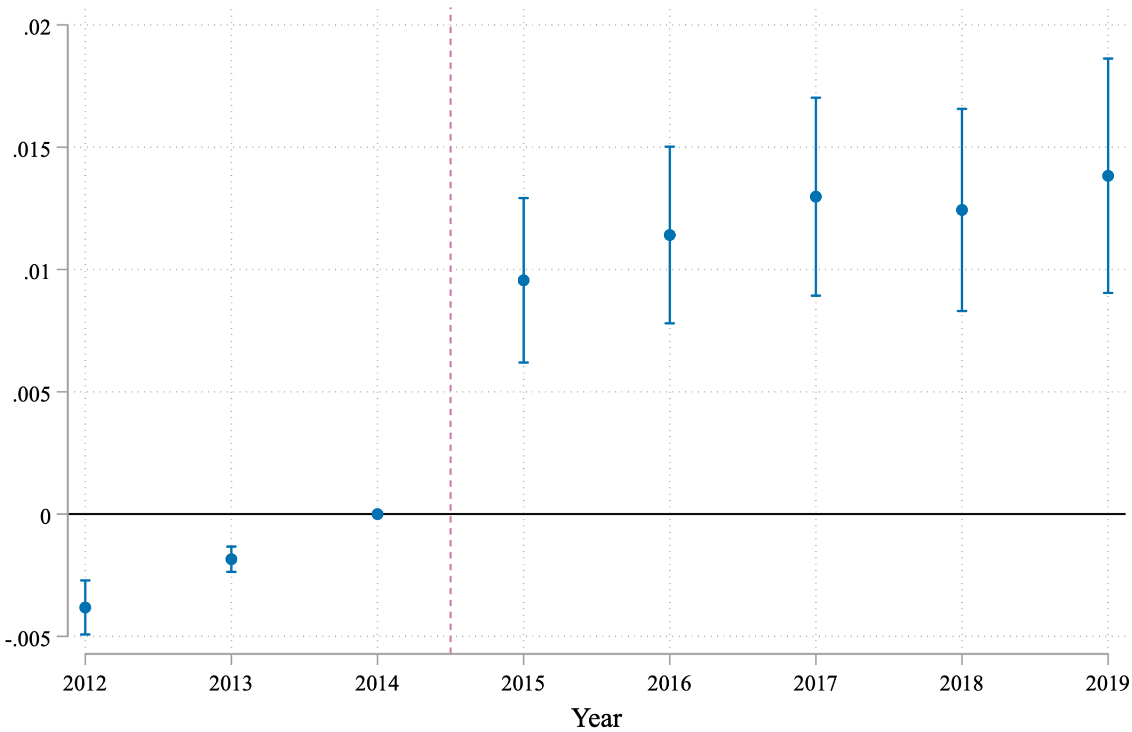
Figure B.18 shows the average number of CBWs before and after the 2015 CHF appreciation by quintiles of distance from municipalities to the nearest border office. It is clear from the figure that the level of CBWs differs wildly with the distance to the border, and that this heterogeneity is still present after the shock; that is, the trend of each line is the same. Moreover, notice that in the comparison between the periods pre and post-2015 CHF appreciation, at each quintile, the closer we are to the border, the higher the increase in CBWs. This evidence has two implications for our identification. First, the CBW growth rates would be extremely high in the control areas. Indeed, because the number of CBWs tends to zero approaching the center of Switzerland, even a unitary increase would yield extremely high growth rates; thus, without normalizing this would confound the result of our identification strategy. Second, the levels of CBWs at each km of distance to the border become less comparable as the relationship is monotonically decreasing. This implies a violation of parallel trends.

Figure B.18: Average Number of Cross Border Workers by Border Distance Quintiles Before and After 2015 CHF Appreciation



To solve these two issues, we change slightly our identification strategy. First, we look at the absolute number of CBWs and we use population weights to account for the size of municipalities. This solves the problem that arises when comparing shares or growth rates. Second, we allow for a linear distance effect in the regression, which makes treatment and control more similar because we are accounting for the monotonical reduction in CBWs at higher distances. This allows us to recover the parallel trend assumption. Figure 4 shows the effect of the 2015 CHF appreciation on CBWs using this empirical strategy. In Figure B.19 shows the year dummies of the specification represented in Figure 4. Notice that it is interesting that CBWs have been increasing everywhere (not only at the border), but rather, this was the usual yearly inflow. On the contrary, the comparison between treated and untreated finds exactly the increase in the treatment due to the policy.

Figure B.19: Year Dummies of the Effect on CBWs



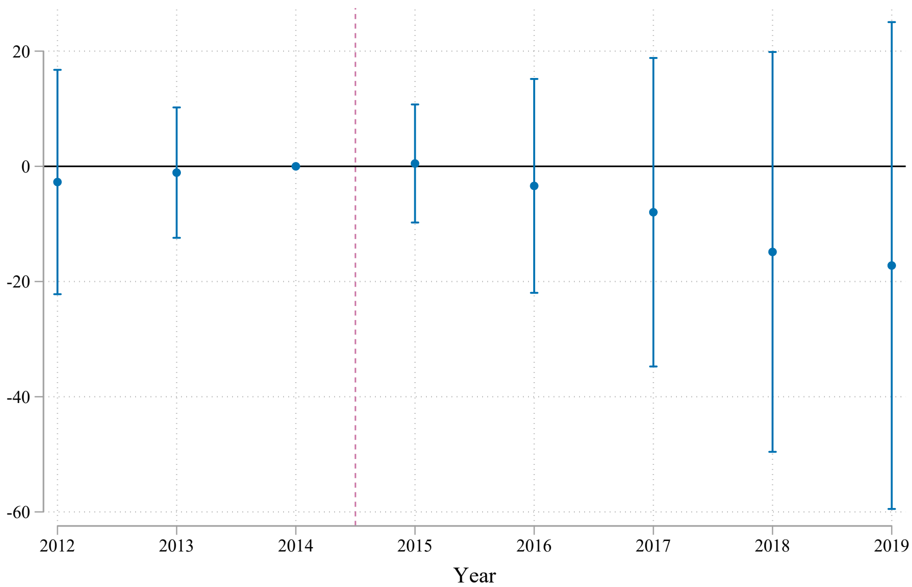
B.6 Robustness

In this section of the Appendix, we want to provide some robustness checks of our results and further heterogeneities tests to understand the empirical validity of the estimated effects. We present results on the effect of the 2015 CHF appreciation on the population composition of Swiss municipalities, EZ working-age residents' share by age category, housing supply, and on EZ working-age residents' share and house prices removing rural municipalities.

The first robustness check investigates the EZ-workers' changes' results. In particular, since we are showing the effect on the share of EZ workforce residents and taxpayers, we need to rule out changes in the denominator. Figure B.20 shows that there is no change in the total population between treated and control.

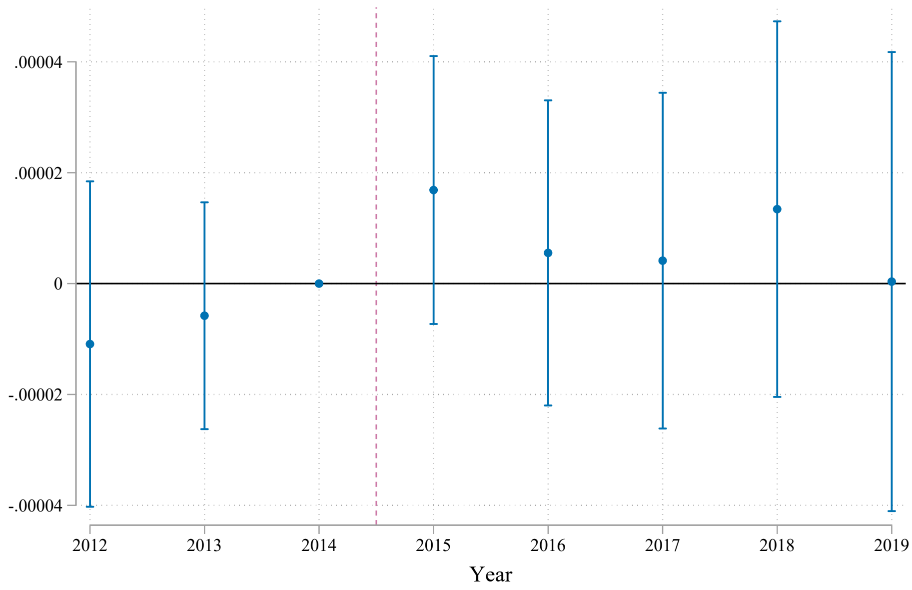
To validate the econometric and theoretic conclusions on the relocation of EZ workers, we would need to observe no differences in the shares of other foreign residents. Again, the idea is that relying on the place attachment theory, the EZ residents should be more inclined to relocate to European countries (with respect to non-EZ ones) since, given all other things equal, the average utility of residing in the place of origin should be higher. To demonstrate the above reasoning, we estimate the Difference-in-Differences coefficients for the change in European workers' share residing in Switzerland but coming from outside the Eurozone. The idea is that the 2015 EUR/CHF lower-bound remotion should not have altered the residential location preferences of individuals coming from non-EZ countries. The results are displayed in Figure B.21. As shown, we find no significant effect on the share of residents from other European countries between the border and non-border municipalities; this confirms that the 2015 Swiss Franc appreciation had an impact only on the Eurozone residents.

Figure B.20: The Effect on Total Working-age Residents



Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in total working-age residents between border and non-border Swiss municipalities at the shock. The total number of observations is $12'480$. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure B.21: The Effect on Other European Working-age Residents' Share



Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in other European working-age citizens' share between border and non-border Swiss municipalities at the shock. The total number of observations is 12′480. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Table B.5 reports the DiD coefficients for the EZ residents' working-age share decomposed by Young (20–39 y.o.) and Adult (40–64 y.o.). Interestingly, we find a higher relative effect for the younger workers, who are indeed those for which the incentive to relocate should be the highest: the relative decrease in the young EZ residents share is -4%, while for the adult, -3.11%.

Table B.5: Effect on EZ Working-age Share by Age-Group

EZ Share	Young Working-age Residents (20-39 y.o.)	Adult Working-age Residents (40-64 y.o.)
Treat × Post	-0.0016^{***} (0.00042)	-0.0014^{***} (0.00046)
Relative Change	-4.00%	-3.11%
R-Squared	0.944	0.962
N	12'904	12'904
Municipality FE	Yes	Yes
Year FE	Yes	Yes

Notes: The Table displays the estimated difference in the EZ working-age residents share by age between border and non-border Swiss municipalities after the removal of the EUR/CHF exchange rate floor in 2015. We compute the DiD effect considering only treated French-speaking, and Italian-speaking municipalities, given the consistency of the results. We control for municipality and year fixed-effects. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Swiss Federal Office of Statistics data.

To ensure that the impact on the housing price is determined by the demand shock discussed but not by a supply one, Table B.6 displays the DiD coefficient of the 2015 CHF appreciation's effect on the log of total housing stock at the municipal level in the comparison between treated and control municipalities. Concretely, the DiD estimator does not identify any significant differences in the housing supplied between treated and control municipalities, giving additional evidence that the main driver is indeed the demand.

Table B.6: Effect on the Housing Stock

Log m^2 of new postings	
Treat × Post	0.0035 (0.0201)
R-Squared	0.825
N	14'599
Municipality FE	Yes
Year FE	Yes

Notes: The Table displays the estimated difference in the log squared meters of new postings between border and non-border observations after the removal of the EUR/CHF exchange rate floor in 2015. We control for municipality and year fixed-effects. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Meta-Sys AG data.

In table B.7 we display the relationship between cross border workers and house prices. In particular, for an increase of CBW from the 5% to the 95% percentile of the distribution, the house prices reduce by -0.1%.

Table B.7: DiD Results - CBW and House Prices

	House Prices
CBW	-0.00128^{**} (0.00052)
R-Squared	0.523
N	468'910
Municipality FE	Yes
Year FE	Yes

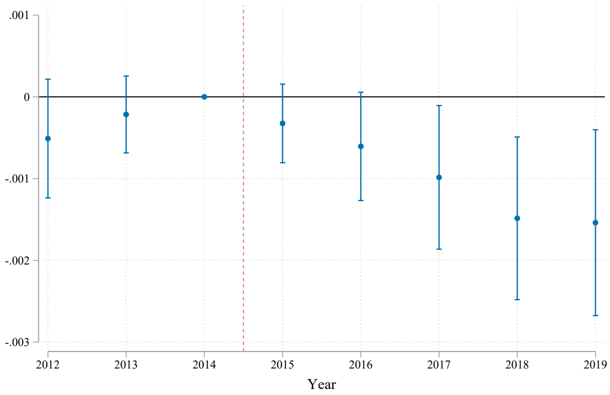
Notes: The table displays the estimated difference in house prices driven by the cross border workers. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Swiss Federal Office Statistics data.

Since in the central Swiss Cantons, there is a concentration of small rural municipalities (usually mountain municipalities), one can be concerned that we are comparing them with relatively big cities in the treatment group. Thus, to solve this issue, we propose a robustness check (for all the outcomes of interest) centered on removing small municipalities from the sample.

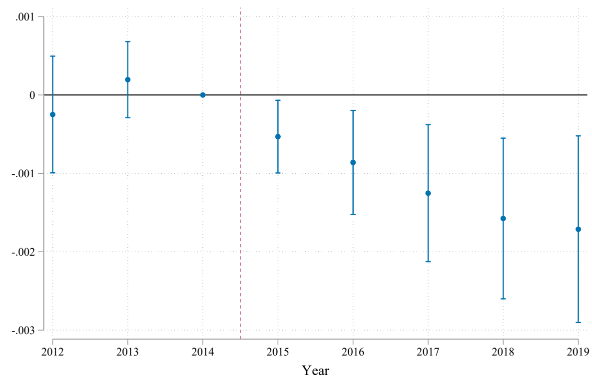
Figure B.22 shows the robustness check for the EZ-residents share. In sub-figure B.22a, we consider only municipalities with a number of residents higher or equal to 1'000, while in sub-figures B.22b, B.22c, and B.22d we respectively remove municipalities with a number of inhabitants lower or equal to 1’500, 2’000, and 2’500. As it can be denoted, the results remain robust to these modifications of the sample.

Figure B.23 shows the robustness check for the log of housing price per squared meter. Again, the results remain robust to modifications of the control group. We remove the rural municipalities in sub-figures B.23a, B.23b, B.23c, and B.23d as in Figure B.22.

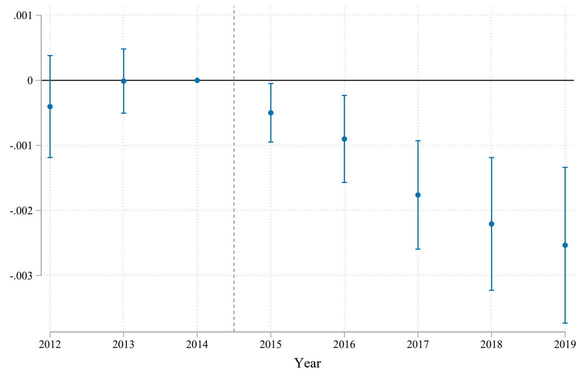
Figure B.22: Removing Rural Municipalities, Effect on EZ Working-age Residents’ Share



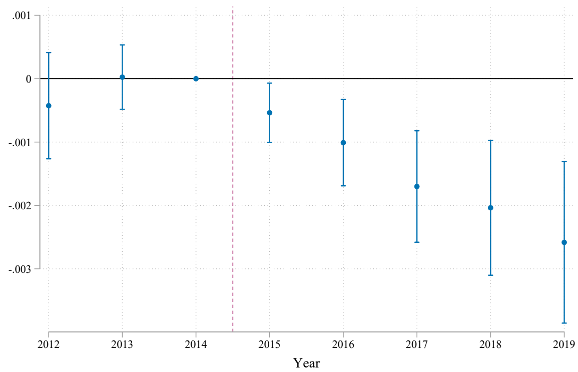
(a) Population $>$ 1’000 inhabitants



(b) Population $>$ 1’500 inhabitants



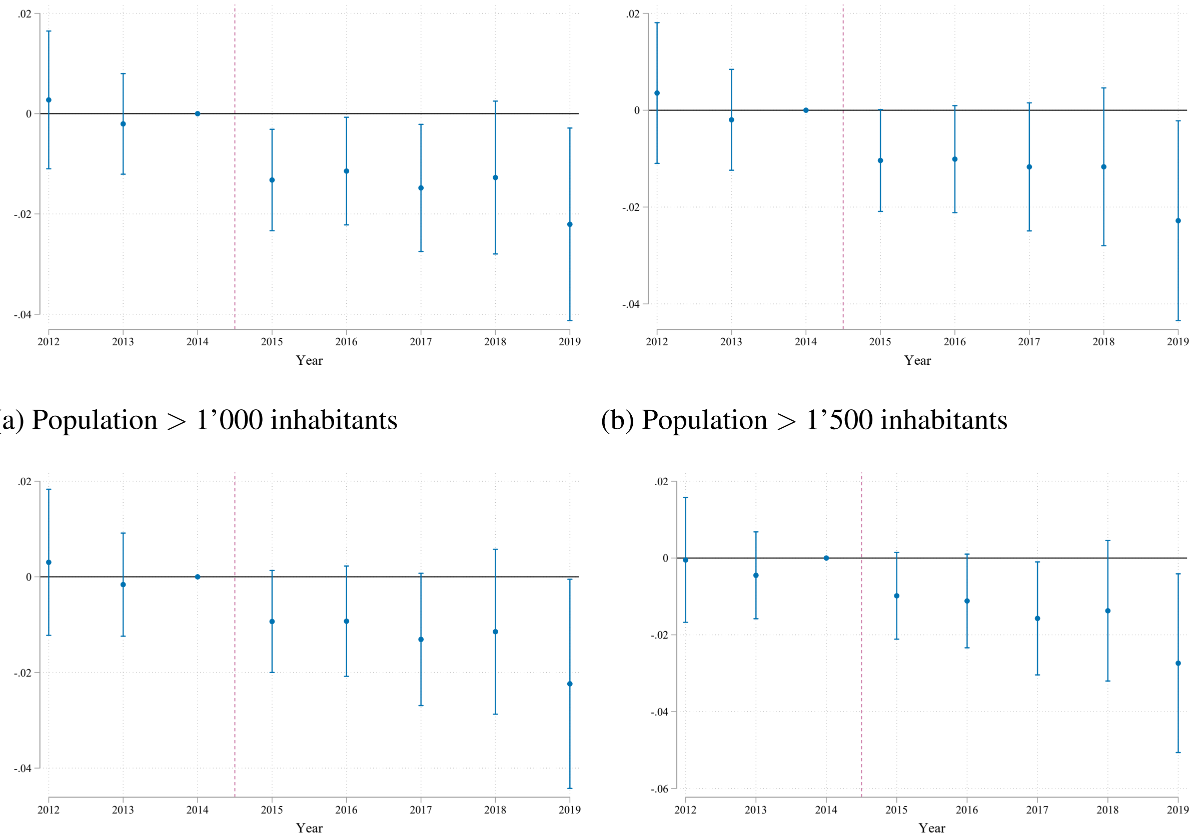
(c) Population $>$ 2’000 inhabitants



(d) Population $>$ 2’500 inhabitants

Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in Eurozone working-age citizens’ share between border and non-border Swiss municipalities at the shock. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. In sub-figure (a) we exclude Swiss municipalities with a population lower than 1’000 inhabitants; in (b) we exclude Swiss municipalities with a population lower than 1’500 inhabitants; in (c) we exclude Swiss municipalities with a population lower than 2’000 inhabitants; in (d) we exclude Swiss municipalities with a population lower than 2’500 inhabitants. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure B.23: Removing Rural Municipalities, Effect on Swiss House Prices per m^2



(a) Population $>$ 1'000 inhabitants

(b) Population $>$ 1'500 inhabitants

(c) Population $>$ 2'000 inhabitants

(d) Population $>$ 2'500 inhabitants

Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the log of housing prices per meter squared between border and non-border Swiss municipalities at the shock. We control for municipality, year-fixed effects, and housing characteristics. We also report 95% level confidence intervals clustered at the municipality level. In sub-figure (a) we exclude Swiss municipalities with a population lower than 1'000 inhabitants; in (b) we exclude Swiss municipalities with a population lower than 1'500 inhabitants; in (c) we exclude Swiss municipalities with a population lower than 2'000 inhabitants; in (d) we exclude Swiss municipalities with a population lower than 2'500 inhabitants. Source: Our elaboration on Meta-Sys AG data.

Table B.9 shows the pre-post coefficients for the log house prices in the three regions of the transnational economy. The table shows that the decrease in house prices in Swiss municipalities at the border corresponded with an increase in house prices in Italy with no effect on the detrended house prices in German municipalities at the border, as shown in the heterogeneity analysis. Table B.8 shows the pre-post coefficients for the residential mobility outcomes. The table shows that the decrease in EZ residents in Swiss municipalities at the border has corresponded both with comebacks in Italy and an increase in CBWs.

Figure B.24 reports the estimated year fixed-effects for the logarithm of migrations to the treatment group in Italy. The figure shows that the 2015 shock seems not to have changed the incentives of Italian workers residing in Italy further away from the border to relocate closer to the border to potentially work in Switzerland.

Table B.8: DiD Results - Residential Mobility

	EZ in CH	Immigrations in ITA	CBW in CH
Treat × Post	-0.0008^{*} (0.00045)	0.00025^{***} (0.00004)	49.37^{***} (17.552)
R-Squared	0.974	0.382	0.986
N	17’064	9’788	68’256

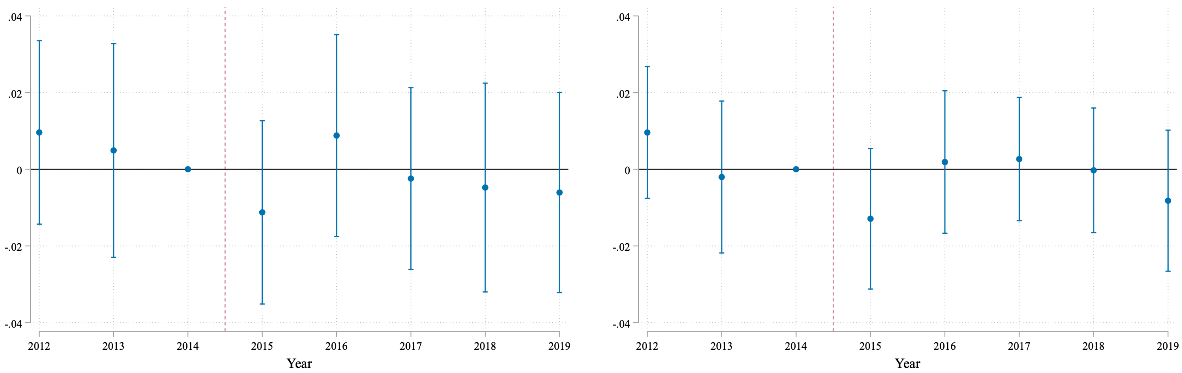
Notes: The table displays the estimated difference in eurozone working-age residents’ share in Switzerland (column 1), immigration flows from Switzerland to Italy (column 2), and share of cross-border workers in Switzerland (column 3) after the removal of the exchange rate floor between Euro and Swiss Franc in 2015, between border and non-border observations. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Swiss administrative data and ISTAT.

Table B.9: DiD Results - Log of House Prices per m^2

	Switzerland	Italy	Germany
Post	-0.0174^{***} (0.0055)	0.043^{***} (0.0029)	0.0074 (0.0088)
R-Squared	0.537	0.922	0.99
N	503’743	140’171	14’560

Notes: The table displays the estimated difference in the log house prices per squared meter in Switzerland (column 1), in Italy (column 2), and in Germany (column 3) after the removal of the exchange rate floor between Euro and Swiss Franc in 2015, between border and non-border observations. Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Metasys, Italian Revenue Agency, and 21st Real Estate’s data.

Figure B.24: Migration to Treatment Group in Italy



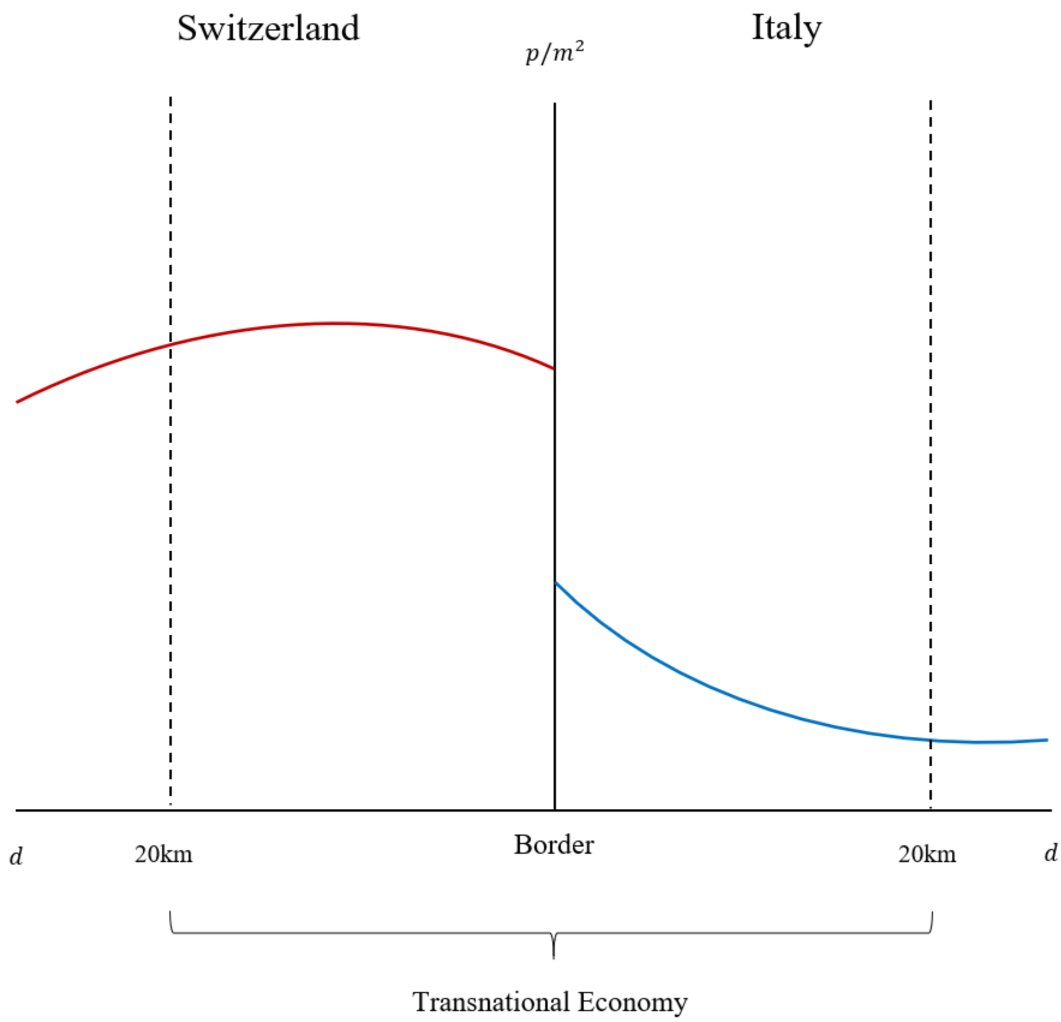
(a) Migration from Control to Treatment (b) Migration from all Italy to Treatment

Notes: For each year, the Figure displays the estimated year fixed effect from 2014 of the logarithm of migrations in Italy, controlling for municipality fixed effects. We also report 95% level confidence intervals clustered at the municipality level. In sub-figure (a) we focus on migrations between the control group to the treatment group in Italy and the total number of observations is 27’860; in (b) we focus on migrations between the all Italy to the treatment group and the total number of observations is 79’230. Source: Our elaboration on ISTAT data.

B.7 Empirical Transnational Bid-Rent Model

The y-axis of Figure B.25 represents the meter-squared housing prices (p/m^2), while the x-axis shows the distance of each residence to the border (d). The housing price decreases with the distance in Italy because, being the workplace restricted in Switzerland, the nearer to the border the agent resides, the lower transportation costs are. Thus, the housing prices adjust to compensate: the lower the transportation expenditures, the higher the housing prices. On the other hand, in Switzerland, housing costs can either increase or decrease with the distance (its structure mainly depends on which municipality the labor market is concentrated). Despite also, in this case, the bid-rent curve inherits a transportation-living costs trade-off, we cannot declare ex-ante its shape as in the Italian case.

Figure B.25: The Transnational Bid-Rent Model

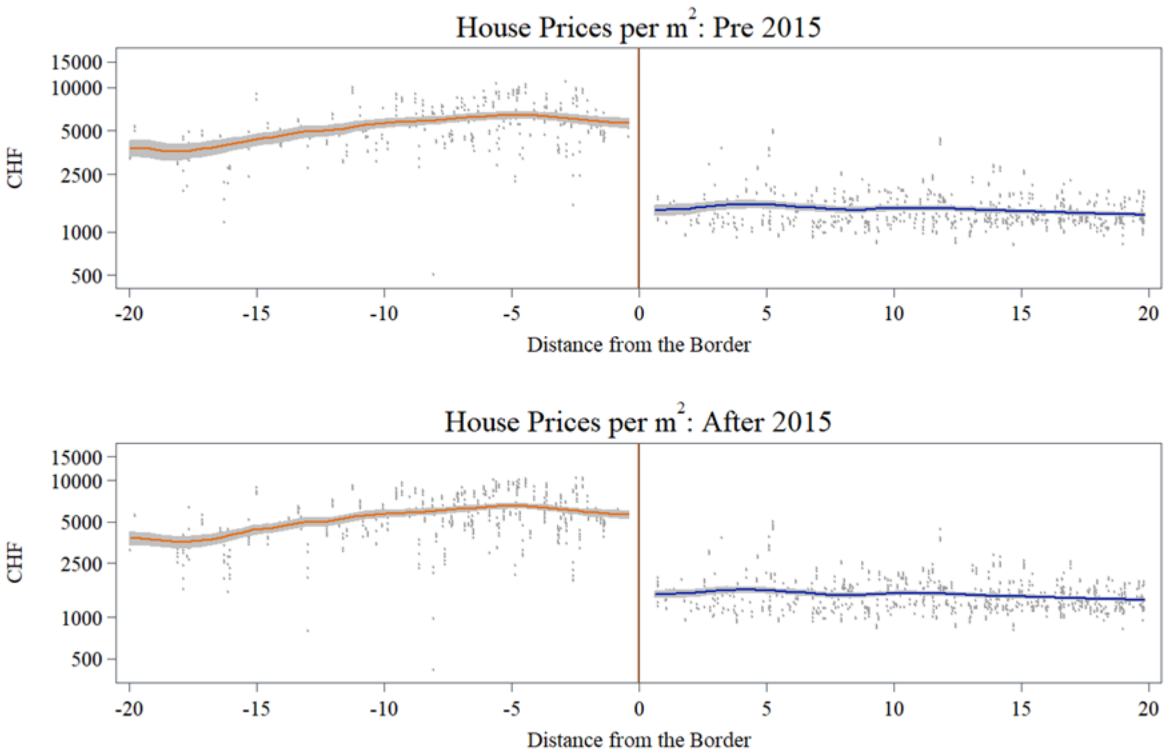


The polynomial of degree one in Figure B.26 is represented by the following Taylor expansion,

$$E[Y|X = x_0] = f(x_0) + f'(x_0) \cdot (x - x_0)$$

where f is the function approximated by the Epanechnikov kernel of the data, Y is the change in house prices in the pre or in the post period, X is the distance from the border and therefore x_0 represent each unit of distance.

Figure B.26: Transnational Bid-Rent Model Before and After 2015 CHF Appreciation



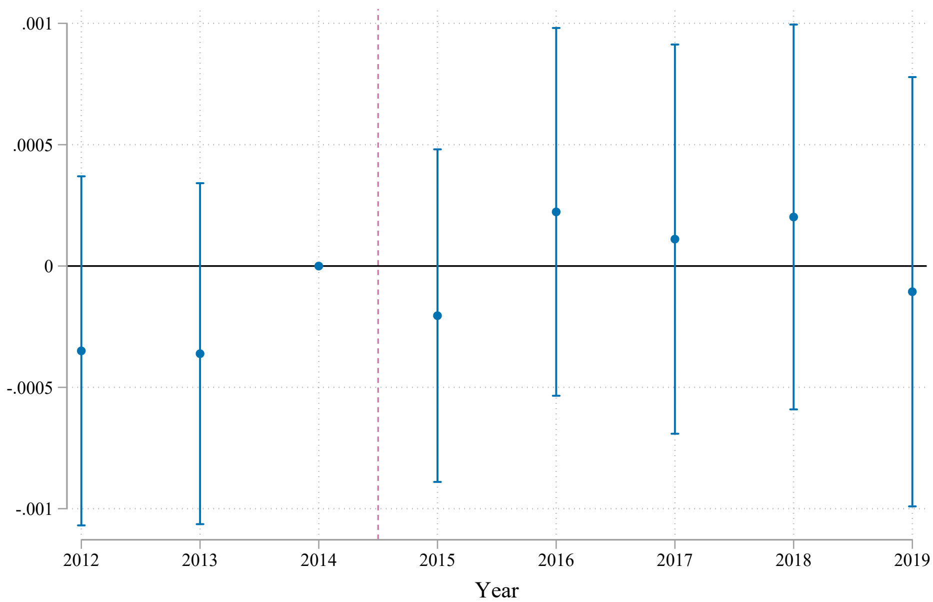
Notes: The Figure displays the local linear estimation of the bid-rent curves between municipalities in Switzerland (Ticino, in red) and Italy (Piedmont and Lombardy, in blue) by distance in kilometers from the border. Source: Our elaboration on Metasys AG and Italian Revenue Agency data.

B.8 Income Heterogeneities in Switzerland

In this section, we analyze the effect of the 2015 CHF appreciation by income classes. Consistently to what we have discussed in Section 4.1, the income gains from the shock (through the EUR conversion) come only for people with at least an average income of around 6'000 CHF. Indeed, we have to consider that residentially relocating on the other side of the border, and maintaining their Swiss job, increases the daily commuting costs; thus, a net increase in income is more likely if the individual earns at least the average salary. Additionally, this analysis allows us to comprehend some detailed heterogeneity effects of the agents interested in the residence change.

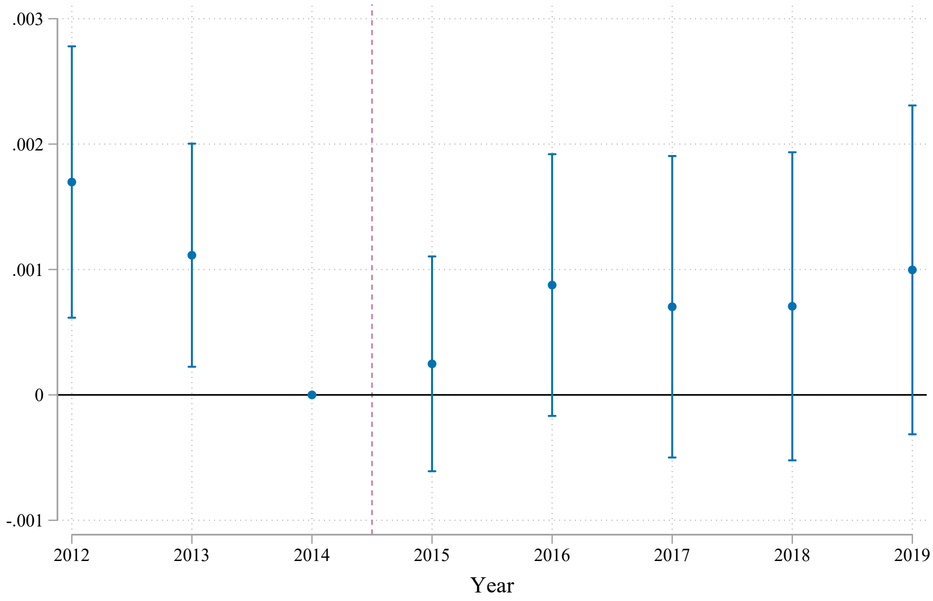
The following graphs depict the dynamic change in the shares of tax-payers by income classes over the total population between treatment and control municipalities before and after the shock. Figure B.27 represents the change in the share of low-income tax-payers; as it can be denoted, there is no effect. Moreover, Figure B.28 represents the change in the share of middle-income tax-payers; again, we cannot see any significant effect. Thus, the 2015 CHF appreciation did not cause any relocation of low and middle-income individuals. By contrast, in Figure B.29, we can see a significant impact on the share of high-income taxpayers in all the years after the shock. The relative effect in the difference between treatment and control municipalities is around 2%. This result confirms our hypothesis on the trade-off between exchange rate gains and commuting costs; in other words, after the 2015 CHF appreciation, only high-income taxpayers (here defined as individuals with an annual gross income higher than the average national one) relocate to the near EZ border countries because their earning allows them to obtain a real gain from the appreciation at the net of the higher transportation costs.

Figure B.27: The Effect on the Share of Low-income Taxpayers



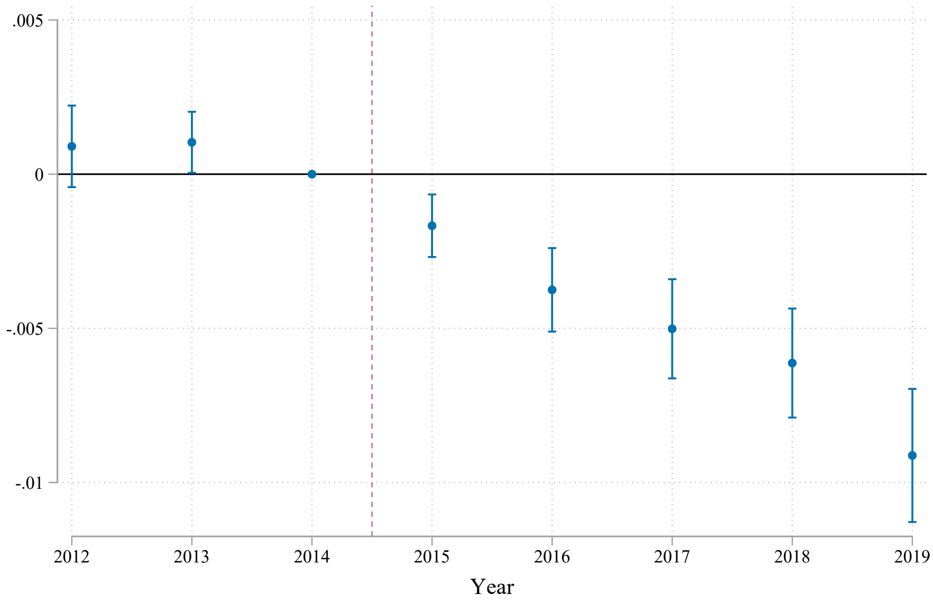
Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the share of low-income taxpayers between border and non-border Swiss municipalities at the shock. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure B.28: The Effect on the Share of Middle-income Taxpayers



Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the share of middle-income taxpayers between border and non-border Swiss municipalities at the shock. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Figure B.29: The Effect on the Share of High-income Taxpayers



Notes: For each year, the Figure displays the estimate of the γ^k coefficients reported in equation (1), namely the estimated difference in the share of high-income taxpayers between border and non-border Swiss municipalities at the shock. We control for municipality and year-fixed effects. We also report 95% level confidence intervals clustered at the municipality level. Source: Our elaboration on Swiss Federal Office of Statistics data.

Furthermore, we analyze the impact of the EUR/CHF cap removal on the log of housing prices relative to the average income per capita (defined as total income over the number of taxpayers) in treated and control jurisdictions. To do so, we implement a triple difference estimation (Olden and Møen, 2022; Wooldridge, 2020), where the log of house prices per squared meter is regressed against an interaction of the treatment and post-treatment period dummies and the average income per capita of the municipalities. The results are displayed in Table B.10. Formally, what we estimate is the effect of being in the ninetieth percentile versus the tenth percentile of the income distribution in border municipalities versus non-border municipalities by years away from 2015. In other words, this is the income intensity effect of our main specification. In column (1), we control for municipality fixed-effects, while in columns (2) and (3), we respectively add year fixed-effects and housing characteristics. Essentially, we find that the reduction in the log of housing prices in the treatment group is higher, in absolute terms, the higher the average income of the municipality. The effect is a reduction of around 150 CHF per meter squared in treated municipalities, and it is robust to housing controls and fixed effects. To conclude, putting together the results in Figure B.29 and in Table B.10, jurisdictions with a higher share of high-income taxpayers (those that are more likely to relocate) experienced a more intense drop in housing prices.

Table B.10: Triple DiD - Income Effect on House Prices per m^2

Log House Prices m^2	(1)	(2)	(3)
Treat $\times$ Post $\times$ Income per capita	-0.020^{**} (0.0081)	-0.016^{**} (0.0079)	-0.023^{***} (0.0076)
R-Squared	0.50	0.50	0.52
N	483'697	483'697	483'697
Municipality FE	Yes	Yes	Yes
Year FE	No	Yes	Yes
House Characteristics	No	No	Yes

Notes: The Table displays the estimated difference in the log of house prices per meter squared by a unit increase in the average income per capita between border and non-border observations after the removal of the EUR/CHF exchange rate floor in 2015. We control for municipality fixed-effects (col. 1, 2, 3), year fixed-effects (col. 2, 3), and housing characteristics (col. 3). Standard errors are clustered at the municipality level. Significance levels: *** $p < .01$, ** $.01 \leq p < .05$, * $.05 \leq p < .10$. Source: Our elaboration on Meta-Sys AG and Swiss Federal Office of Statistics Data.