

# Immigration and Prices: Quasi-Experimental Evidence from Syrian Refugees in Turkey\*

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March 2, 2015

## Abstract

We exploit the regional variation in the unexpected—or forced—inflow of Syrian refugees as a natural experiment to estimate the impact of immigration on consumer prices in Turkey. Using a difference-in-differences strategy and a comprehensive data set on the prices of CPI items, we find that the general level of consumer prices has declined by approximately 2.5 percent due to immigration. Prices of goods and services have declined in similar magnitudes. We find that the channel through which the price declines take place is the informal labor market. Syrian refugees supply inexpensive informal labor and, thus, substitute the informal native workers especially in informal labor intensive sectors. We document that prices in these sectors have fallen by around 4 percent, while the prices in the formal labor intensive sectors have almost remained unchanged. Increase in the supply of informal immigrant workers generates labor cost advantages in the informal labor intensive sectors, and, thus, leads to a reduction in the prices of the goods produced by these sectors.

*JEL codes:* C21; E31; J46; J61.

*Keywords:* Immigration; consumer prices; Syrian refugees; natural experiment; informal employment.

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\*The views expressed here are of our own and do not necessarily reflect those of the Central Bank of the Republic of Turkey. All errors are ours.

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# 1 Introduction

Following the outburst of civil war in Syria in March 2011, millions of Syrians have been forced to leave their homes. The civil conflict has initially generated a huge wave of internal migration within Syria—mostly toward the Turkish, Lebanese, and Jordanian borders. After the sharp increase in the intensity of conflict in late 2011, the internal migration wave has changed nature and transformed into a wave of refugees flowing into the neighboring countries. According to the United Nations (UN) figures, the total number of Syrian refugees in Turkey has reached to 1.6 millions as of September 2014. The unexpected arrival of a large number of refugees due to civil conflict in Syria resembles a natural experiment that generates an almost exogenous flow of immigrants, which offers a good opportunity to study the economic impacts of immigration on the host country. One particular channel through which the inflow of a large number of immigrants in a relatively short period of time can affect the host country is the purchasing power of the natives. Our main goal in this paper is to exploit this natural experiment to analyze the impact of Syrian immigrants on the level of consumer prices in Turkey.

The advantage of this natural experiment is that both the immigration decisions and the location choices within Turkey are mostly exogenous to the refugees. The immigration decision is driven by the violent civil conflict in Syria. The location choice is mostly driven by the location of accommodation camps constructed by the Turkish government in cities close to the Syrian border. Although some of the refugees have left Southeastern Turkey and moved toward the Western regions of the country, the refugee to native population ratios are minuscule in the regions, where there is no nearby accommodation camps. The refugees are not allowed to work formally (i.e., as a worker registered to the social security system). However, they supply cheap unskilled labor in the informal labor market. [Ceritoglu, Gurcihan Yunculer, Torun, and Tumen \(2015\)](#) show that the impact of Syrian refugees on the labor market operates through the informal employment channel. Informal native workers have been substituted by refugees. Specifically, they show that the informal employment-to-population ratio among natives has declined in the refugee-hosting area by 2.2 percentage points and most of the natives who left

their informal jobs have either left the workforce or remained unemployed. This finding will facilitate the interpretation of the results we document in this paper.

There are three different theories on the impact of immigration on the level of consumer prices. The first one says that immigration generates a jump in the level of aggregate demand; therefore, prices of goods and services should increase as a consequence of immigrant inflows. The second one says the opposite. Assuming that the labor market attachment levels of the immigrants are lower than those of natives, the immigrants will have less time constraints and, thus, they will search for lower prices more intensively. In other words, they will be more sensitive to price differentials (i.e., they will have higher price elasticities). Higher price elasticity, joined with higher search intensity, strengthens the competitive pressure over firms, which will eventually lead to price reductions in the regions hosting immigrants. Finally, if the labor market attachment levels of the immigrants are not so low and if immigrants have lower reservation wages than natives due to various well-known reasons listed in the literature, then the resulting cost advantage in the immigrant labor intensive sectors coupled with competitive pressures may lead to price reductions in these sectors relative to the native labor intensive sectors.

There are two important papers in the literature testing the relevance of these alternative theories. [Lach \(2007\)](#) uses massive immigrant flows from Russia to Israel in 1990 as a natural experiment to estimate the impact of immigration on prices. He finds that a one percentage point increase in the immigrant-to-native ratio leads to a 0.5 percentage point decrease in consumer prices. Based on the observation that the labor market involvement rates are low among immigrants, he interprets the decrease in prices as an evidence of higher price elasticities and lower search intensities among immigrants. [Cortes \(2008\)](#) exploits the variation in the flow of low-skill immigrants into several U.S. cities over time to estimate the impact of immigration on consumer prices from a long-term perspective. She finds that a 10 percent increase in the fraction of immigrants leads to 2 percent reduction in the prices of immigrant-intensive services such as housekeeping, gardening, babysitting, and dry cleaning. She argues that the increase in the supply of low-skill immigrants bids down the wages in the market for low-skill workers,

which generates a cost advantage in the immigrant-intensive sectors, and, thus, leads to a reduction in prices.

Using a difference-in-differences strategy, we find that the consumer prices have declined as a consequence of refugee inflows in the hosting region—which is consistent with the main consensus in the literature. The magnitude of this decline is approximately 2.5 percent. We document that prices of goods and services have declined in similar magnitudes. We find, on the other hand, significant differences across the prices of the items produced in formal labor intensive sectors versus those produced in informal labor intensive sectors. In particular, the decline in prices in the informal labor intensive sectors is around 4 percent, while the impact of immigration on prices is almost equal to zero in formal labor intensive sectors. We argue that informal labor market, which is large in Turkey, offers a mechanism through which the refugee inflows generate price declines in the hosting region. Increase in the supply of informal immigrant workers generates labor cost advantages in the informal labor intensive sectors, and, thus, leads to a reduction in the prices of the goods produced by these sectors. We perform two different empirical exercises and confirm that these results are robust.

Our paper is similar to [Lach \(2007\)](#) in the sense that we also rely on a natural experiment, which is generated by an unexpected arrival of a large volume of immigrants, while [Cortes \(2008\)](#) deals with a non-experimental data set. The main difference between our paper and [Lach \(2007\)](#) is that, in our paper, the impact of immigration on prices is more likely to operate through low labor costs, because Syrian refugees in Turkey have much lower skill levels than Russian immigrants in Israel; therefore, they are better candidates to be employed as low-wage workers. In this respect, our paper is similar to [Cortes \(2008\)](#); that is, we also focus on a mechanism through which the inflow of low-skill immigrants reduces consumer prices through cost advantages generated in the immigrant-intensive sectors. Our paper is different from both of these papers in the sense that the main underlying force is the existence of informal employment opportunities in Turkey. Although Syrian refugees are not permitted to work officially, the availability of a large informal labor market in Turkey allows them to work in low-wage jobs—in exchange for wages much lower than the average low-skill native worker

would accept.

The plan of the paper is as follows. Section 2 presents a broad overview of the related literature. Section 3 summarizes the main properties of our data set and provides a detailed description of the institutional setting for Syrian refugees in Turkey. Section 4 explains our identification strategy. Section 5 discusses the results. Section 6 performs robustness exercises. Section 7 concludes.

## 2 Related Literature

The most related papers to our work, i.e., [Lach \(2007\)](#) and [Cortes \(2008\)](#), are discussed above in depth. Other than these two papers, there are only a few papers directly estimating the link between immigration and price changes. [Alix-Garcia and Saah \(2009\)](#) investigate the impact of refugee inflows from Burundi and Rwanda in 1993 and 1994 on food prices in the hosting region in Western Tanzania. They show that prices of non-aid food have jumped significantly after immigration, while the change in the prices of aid food has only been negligible. Contrary to the findings reported in our paper—and also to those reported by Lach and Cortes—they argue that the aggregate demand channel has been effective. However, they focus on a poor-country context; so, in this sense, their results may not be directly comparable to the results documented by Lach and Cortes. [Bentolila, Dolado, and Jimeno \(2008\)](#) show, using a macro approach, that immigration led to a decline in consumer price inflation in Spain in the 1995–2006 period. [Zachariadis \(2012\)](#) use cross-country data for the 1990–2006 period and show that a 10 percent increase in the share of immigrant workers in total employment decreases the prices of final products by approximately 3 percent.<sup>1</sup> So, the consensus is that, other than the aid versus non-aid food discussion for poor countries, there is a negative relationship between immigration and the level of consumer prices.

Our paper can also be related to the literature using natural experiments (i.e., data on forced immigration or refugee flows) to estimate the impact of immigration on various outcomes. Most of the papers in this literature focus on employment and wage outcomes. [Card \(1990\)](#)

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<sup>1</sup>See also [Zachariadis \(2011\)](#).

exploits the natural experiment provided by the Mariel Boatlift of Cubans to Miami in 1980. He shows that the wave of immigration had virtually zero effect on the labor market outcomes of the existing Miami residents. [Hunt \(1992\)](#) employs a similar strategy for the 1962 Algerian repatriates in France and report that they had only a negligible effect on the labor market outcomes of natives in France. [Carrington and de Lima \(1996\)](#) find strong adverse effects of 1970 repatriates from Africa to Portugal on both employment and wage outcomes of the natives in Portugal. [Friedberg \(2001\)](#) documents that the exogenous inflow of immigrants from the former Soviet Union to Israel had almost no adverse effects on the labor market outcomes of natives in Israel. [Cohen-Goldner and Paserman \(2011\)](#) find that the impact of these Russian immigrants on wage outcomes in Israel have become visible in the long-run. [Mansour \(2010\)](#) exploits the labor supply shock generated by the Israeli-Palestinian conflict and shows that the wages for low-skill workers in Israel have been negatively affected, while the effect on the wages of high-skill workers is statistically insignificant. [Glitz \(2012\)](#) estimates the impact of the collapse of Berlin wall on the labor market outcomes in Germany and finds negative employment effects along with zero wage effects. Using a similar identification strategy to ours, [Ceritoglu, Gurcihan Yunculer, Torun, and Tumen \(2015\)](#) show that the rapid and unexpected inflow of Syrian refugees have led to negative employment outcomes (mostly through the informal employment channel), while the wage effects have been negligible. There are several other papers focusing on other outcomes exploiting similar natural experiments. [Gould, Lavy, and Paserman \(2009\)](#) investigate the impact of immigration on long-term educational outcomes. [Paserman \(2013\)](#) estimate the effect of immigration on worker productivity. [Maystadt and Verwimp \(2014\)](#) analyze the welfare effects of forced immigration. [Saarela and Finnas \(2009\)](#) study the long-term effects of forced migration on mortality rates.

### **3 Data and Facts**

#### **3.1 Details about Syrian Refugees in Turkey**

There has been a massive flow of refugees from Northern Syria toward the Southeastern regions of Turkey following the civil conflict in Syria. Syrians residing in the troubled regions

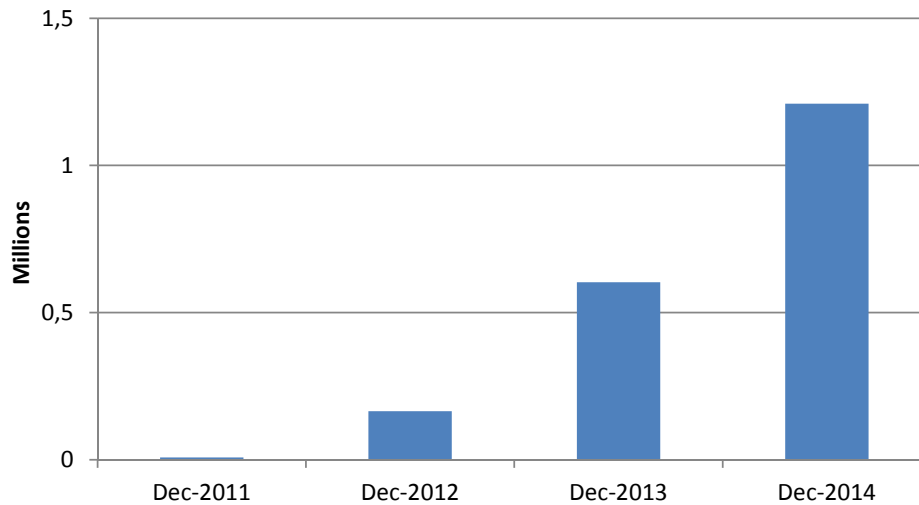


Figure 1: **Stock of registered Syrian refugees in Turkey (thousands)**. *Source:* UN Refugee Agency, <http://data.unhcr.org/syrianrefugees/country.php?id=224>.

moved toward the nearest border and were accepted to the neighboring countries, including Turkey, Lebanon, and Jordan, as refugees. The ones accepted by Turkey mostly came from the regions geographically close to the Syrian-Turkish border. Figure (1) demonstrates the dramatic increase in the number of Syrian refugees in Turkey. Before 2012, there was virtually no Syrian refugees in Turkey. By the end of 2014, the number of registered refugees has reached to almost 1.2 millions and the process is still ongoing. Considering the unregistered ones, the total number of Syrian refugees in Turkey is estimated to be around 2 millions. The refugees were initially accommodated in the centers or camps constructed and controlled by the Turkish government, but there is also a quite large population of refugees living outside of the camps. The government-operated accommodation centers are located in Adana, Adiyaman, Hatay, Gaziantep, Kahramanmaras, Kilis, Malatya, Mardin, Osmaniye, and Sanliurfa—there are 20 camps in these cities.<sup>2</sup>

We observe that most of the Syrian refugees are clustered in these cities or the neighboring ones due to two main reasons: (1) These cities are close to Syria and they hope to go back home easily once the civil conflict is resolved. Surveys conducted in the region confirm the validity of this motive. (2) Cities in which the government-operated camps are located also offer government-supported education, health-care, child-care, social/psychological support, and

<sup>2</sup>See Figure (2) for the exact location of these cities on the map.

monetary aid. So, the existence and generosity of these amenities also provide incentives for the refugees to stay clustered in the Southeastern Turkey. The refugees are densely located in Kilis, Sanliurfa, Gaziantep, Hatay, Osmaniye, and Mardin—the respective refugee-population ratios are 38 percent, 9.5 percent, 12 percent, 12.5 percent, 2.5 percent, and 9 percent.

Syrian refugees do not have work permit—as of December 2014. However, surveys conducted by governmental aid organizations indicate that most of the refugees are willing to be employed informally and are actively searching for jobs. The rate of informal employment is high, especially in the Southeastern Turkey, which means that there are extensive informal employment opportunities for refugees. The observed characteristics of the Syrian refugees are, on average, quite similar to the Turkish natives living in the hosting region. The gender composition among the refugees is more or less balanced. They have low education levels. Only around 20 percent of the refugees have high school education or above. Most of the refugees are in the age group 19–54.<sup>3</sup>

### **3.2 Data on Consumer Prices**

For consumer prices, we use the Turkish Statistical Institute’s (TURKSTAT) data set, which is used to calculate the official CPI figures in Turkey. This is a publicly available data set and it is freely accessible from TURKSTAT’s web site. In determining the items and weights as well as calculating the consumer price index, Target Based Individual Consumption classification (COICOP) is used. Based on this classification, expenditures are organized in 44 sub-groups and 12 major groups [see Tables (1) and (2)]. Overall, 437 items are used in constructing the index. The prices of goods and services covered by the index are retail prices including taxes but excluding any deposits and installments. The methodology used to calculate the CPI is in line with EUROSTAT’s standards. The prices are collected using a sample of around 13,000 households. The index covers the entire population in Turkey without adjusting the weights according to income level or geographical areas. The regional prices are given based on NUTS2-level regional categorization. There are 81 cities in Turkey and these cities are

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<sup>3</sup>For more contextual details, see the documentation posted on the website of the Turkish Disaster and Emergency Management Presidency (AFAD).



grouped into 26 NUTS2-level regions. We can only observe prices at the NUTS2 level, not at the city level.

To determine which sectors have high informal labor intensities, we use the Turkish Household Labor Force Survey micro-level data sets for the period 2010–2011—i.e., for the pre-immigration period. This data set is also compiled by TURKSTAT and is used to construct the official employment statistics in Turkey. There are 87 sectors (or industries) classified at the two-digit level based on NACE-Rev2. The survey also asks whether the worker is registered with the social security authority in his/her current job. If the worker is not registered, we classify him/her as an informal worker. Using information on informal employment and sector of employment, we determine the level of informal labor intensity in each sector for the treatment region. More precisely, we call a sector “informal labor intensive” if more 50 percent of all workers employed in that sector are informal workers. We then match the consumption items with the sector information to analyze whether the price changes emanate from informal labor intensive sectors or not.

## 4 Empirical Strategy

In this section, we discuss the details of our identification strategy. The ultimate goal is to estimate the causal impact of immigration on the level of consumer prices in the hosting regions. It is well-known that the non-experimental immigration data typically suffer from selectivity problems [[Borjas \(1987, 1994\)](#), [Borjas, Bronars, and Trejo \(1992\)](#)]. One way to deal with the self-selection problem is to rely on immigration cases that generate “forced” movements across borders. By this way, immigrants will not self-select themselves into a certain country; instead, they will be forced to move from one country to the other based on reasons orthogonal to their location preferences. The movement of refugees from Northern Syria to Southeastern Turkey offers a suitable setting using which one can design a quasi-experimental estimation strategy.

The validity of the quasi-experiment in our case relies on the following three conditions: (1) the

immigration wave should be generated by external forces, (2) the location of the immigrants within the hosting country should also be driven, at least partially, by external forces, and (3) immigrant flows should not generate a wave of internal migration of natives from immigrant-intensive areas toward other areas in the country. The first condition is satisfied by nature. The civil conflict in Syria has been violent and Syrians in the affected regions had no choice but move toward the nearest border. Countries including Turkey, Lebanon, and Jordan received massive amounts of refugees. The institutional setting in Turkey also generated an almost exogenous location choice within Turkey, which confirms the validity of the second condition. Government-operated accommodation camps have been constructed in the Southeastern part of Turkey. Almost all of the registered Syrians are located in these camps. There is also a quite large amount of unregistered immigrants. However, most of them also choose to live in the cities with accommodation camps, because the Turkish government provides education, child-care, health-care, social, and monetary support to immigrants in these cities. The existence of these camps increases the appeal of these cities for the unregistered immigrants. The government, on the other hand, chooses the location of the camps solely based on proximity to major source cities in Syria. So, the clustering of Syrian refugees in the Turkish cities also relies mostly on exogenous factors. Finally, we also observe that there is currently no sign of a flow of natives from the hosting regions toward regions with no immigrants. Based on the Turkish Statistical Institute data showing the patterns of internal migration, we observe no significant change in the internal migration patterns in the post-immigration era relative to the pre-immigration era. We conclude that the case at hand is suitable for implementing quasi-experimental techniques.

We use a difference-in-differences (DID) approach to estimate the impact of immigration on prices. There is a “treatment region” versus a “control region” and a “pre-immigration period” versus a “post-immigration period.” Figure (2) presents a visual display of our treatment and control regions. Our data set does not allow us to see the city-level details. Instead, we can observe the price data for regions at the NUTS2-level detail. There are 81 cities in Turkey and they are grouped under 26 NUTS2-level regions. Our treatment region consists of five

NUTS2-level regions, which are the regions with high immigrant concentration. The cities in the treatment area include Kilis, Osmaniye, Gaziantep, Kahramanmaras, Sanliurfa, Batman, Diyarbakir, Adiyaman, Sirnak, Siirt, Adana, Mardin, Hatay, and Mersin. These cities are indicated with green color on the map. There is a certain degree of heterogeneity within the treatment region in terms of immigrant concentration. It should be noted that cities with low immigrant concentration, such as Diyarbakir, Siirt, and Sirnak, are included due to the restriction that we can only observe region-level geographical detail rather than city-level. Still, for all cities in the treatment region, the immigrant to population ratio is above 0.2 percent—it goes up to 40 percent in Kilis. The control area, on the other hand, consists of four regions indicated with pink color on the map. The immigrant to population ratio is virtually zero in the control region. The cities in the control area are Erzurum, Erzincan, Elazig, Malatya, Mus, Van, Kars, Ardahan, Agri, Igdirdir, Hakkari, Bingol, Tunceli, Bayburt, and Bitlis. The treatment and control areas are very close to each other in terms of geographical location, cultural background, social norms and attitudes, and the level of economic development. In this sense, our research design is quite similar to [Card and Krueger \(1994\)](#), who investigate the impact of a change in the minimum wage law in New Jersey on employment outcomes by performing a comparison across the fast food restaurants among New Jersey and Eastern Pennsylvania. The main identifying assumption is that the two regions are close to each other geographically and similar in many other respects. [Ceritoglu, Gurcihan Yunculer, Torun, and Tumen \(2015\)](#) show that our treatment and control regions are quite similar to each other in terms of prior trends in labor market outcomes. We provide evidence that the prior trends in price changes also exhibit similar patterns. In other words, the prices in the treatment and control regions follow very similar trends prior to refugee inflows [see [Figure \(3\)](#)]. In [Section 6](#), we try alternative control regions to address the concern that the results may be driven by the choice of the control region and provide strong evidence that our estimates are quite robust to using alternative control regions.

As we indicate above, there is also a divide across pre-immigration versus post-immigration periods. [Figure \(1\)](#) suggests that the refugee inflows have started after January 2012. Before

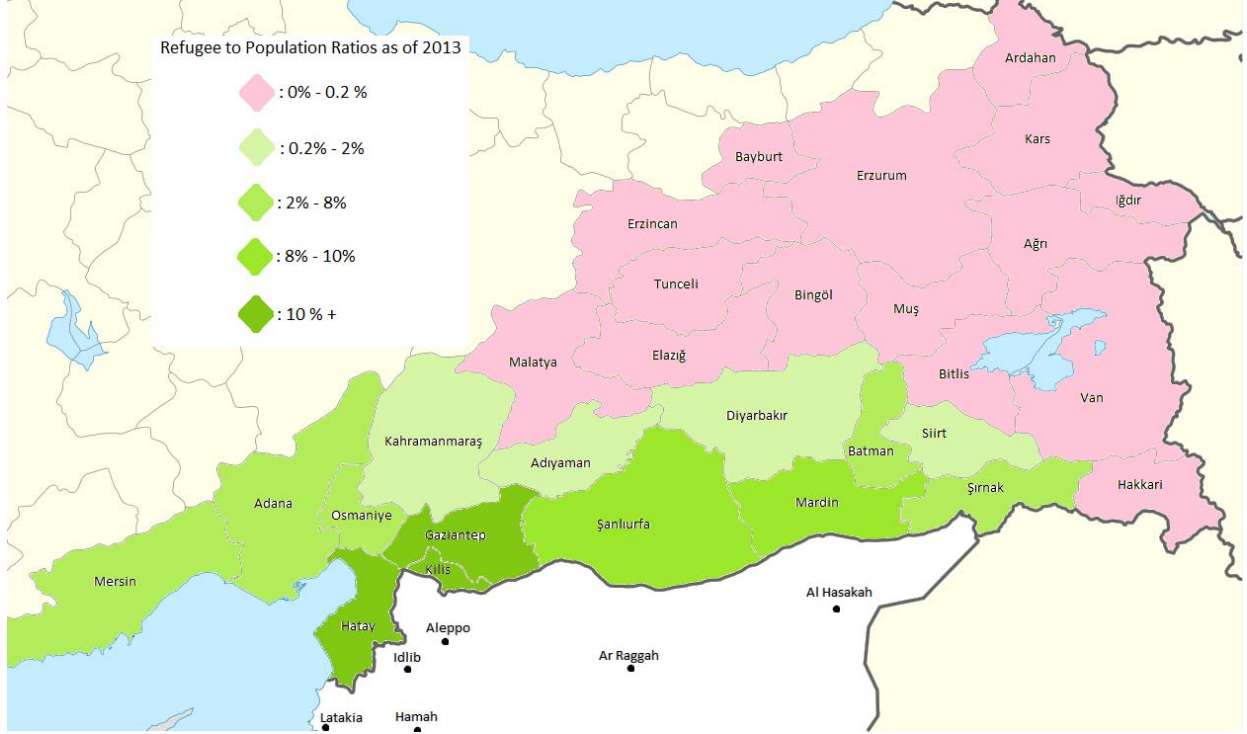


Figure 2: **Visual representation of treatment and control regions.** The green area is the treatment region, while the pink area is the control region.

this date, the immigrant flow was basically nil. Taking January 2012 as the cutoff point, we construct a window that sets 2010–2011 as the pre-immigration period and 2012–2014 as the post-immigration period. Our identification strategy aims at estimating the impact of immigration on the consumer prices in the hosting region by comparing the pre- and post-immigration outcomes in the treatment versus control regions. To achieve this goal, we construct a dummy variable  $T$  taking 1 in the treatment region, 0 in the control region and another dummy variable  $P$  taking 1 in the post-immigration period, 0 in the pre-immigration period. This structure implies the following DID equation:

$$\ln p_{i,r,y,m} = \delta + \beta \cdot (T_{i,r} \times P_{i,y}) + f_i + f_r + f_y + f_m + \epsilon_{i,r,y,m}, \quad (4.1)$$

where  $i$ ,  $r$ ,  $y$ , and  $m$  index items, regions, years, and months, respectively,  $\ln p$  is the natural logarithm of the item price, and  $f_i$ ,  $f_r$ ,  $f_y$ , and  $f_m$  are item-level, region-level, year-level, and month-level fixed effects. The parameter  $\beta$  gives the average impact of immigration on the level prices in the treatment region in percentage terms. In our estimations, we use three

different product-class categories, so the interpretation of  $f_i$  will be different in each of these three cases. See the next section for details.

## 5 Results and Discussion

We begin by describing the impact of immigration on the overall level of prices in the hosting region. To understand the potential mechanisms, we further refine our analyses by conditioning our regressions on certain sub-groups of items. First, we perform separate regressions for goods and services. [Cortes \(2008\)](#) suggests that production of services is more likely to be immigrant-intensive; therefore, labor-cost advantages in the production of services could generate important reductions in the prices of services relative to the prices of goods. Second, we perform separate regressions for formal labor intensive and informal labor intensive sectors. [Ceritoglu, Gurcihan Yunculer, Torun, and Tumen \(2015\)](#) find that Syrian refugees substitute out natives in the informal labor market. If this channel is effective, then the prices of items produced in the informal labor intensive sectors will decline relative to those produced in the formal labor intensive ones. Finally, we perform separate regressions for 12 broad product categories to see the particular categories on which the effect of immigration has been most prevalent. To make our estimates consistent with the weights of items in the consumption basket in Turkey, we use CPI weights in our regressions. Standard errors are clustered with respect to the month of observation to capture the possibility that there might be month-specific correlations in price changes.

Table (3) presents the results for the overall prices. There are 437 items in our data set and we have 216,932 price observations for these items. As we describe in Section 2, we make three categorizations consistent with the formal definitions of items in the CPI basket. The first one groups the items under 12 broad product classes. The second one forms 44 product classes. The third one does not impose any grouping across items. Column [1] controls for fixed effects for 12 (broad) product classes, column [2] controls for product-class fixed effects for 44 (narrower) categories, and column [3] controls for 437 item-level fixed effects. We find that Syrian refugee inflows have led to a decline in the overall level of prices and this result is

robust to alternative product-class categorizations and the inclusion of associated fixed effects. For the finest categorization—i.e., when we include 437 item-level fixed effects—we find that immigration has reduced prices, on average, by around 2.5 percent. This number is consistent with the range of estimates reported in the related literature.

Table (4) reports the results of the regressions for only goods—excluding services. There are 340 items that are classified as goods and we observe 166,926 prices for these goods. Similar to Table (3), we report the estimates for 3 different categorizations. The results for the goods are quite similar to the results from the overall regressions. In particular, we find that, controlling for 340 item-level fixed effects, immigration has reduced prices of goods by approximately 2.6 percent in the hosting region relative to the control region. Table (5) presents the estimates for services only. There are 97 items and 50,006 price observations for these items in our sample. We find that, controlling for 97 item-level fixed effects, the reduction in services is around 2.2 percent. Although the estimates for services are slightly lower than the estimates for goods, the economic significance of this difference is low. We conclude that the overall reduction in prices due to immigration is driven almost equally by goods and services. This is different from the results presented by [Cortes \(2008\)](#), who finds that prices are more likely to be reduced for non-traded goods and services because production is heavily immigrant-intensive in these sectors. Our findings suggest that goods and services are almost equally affected by refugee inflows; in fact, the reduction in the prices of goods is slightly larger than the reduction in the prices of services.

[Ceritoglu, Gurcihan Yunculer, Torun, and Tumen \(2015\)](#) find that the inflow of Syrian refugees have negatively affected the employment outcomes of the natives residing in the hosting region. Specifically, they further show that the negative employment effects mostly consist of employment losses in the informal labor market. In particular, they report that around 4–5 percent of informal native workers are substituted by immigrants. The Syrian refugees do not have work permit; so, their penetration has become possible through the informal labor market, which is large in Turkey—around 20 percent of all non-agricultural workers are not registered with the social security authority. The rate of informal employment is even larger,

close to 50 percent, in the hosting region. Taken at face value, this finding implies that high-cost informal workers have been substituted out by Syrian immigrants who are willing to work in exchange for a much lower pay than his or her Turkish native counterpart. This would generate a labor cost advantage, and in the existence of competitive forces in the product market, would drive the prices down in the informal labor intensive sectors. To test this hypothesis, we perform separate regressions for the items produced in the informal labor intensive sectors versus the sectors in which the share of informal employment is lower. To determine in which sectors informal workers are mostly employed, we use the Turkish Household Labor Force Survey micro-level data set, which has information on 87 industry categories classified based on the standard NACE-Rev2. Items produced in sectors with 50 percent and more informal employment are marked as informal labor intensive products. See Section 3 for more details on the data.

Table (6) reports the results of the regressions for informal labor intensive items. Based on the description given above, there are 208 informal labor intensive items with 99,871 price observations. We find that the reduction in the prices of those items, after controlling for 208 item-level fixed effects, is around 4 percent. Table (7) repeats the same exercise for products of the formal labor intensive sectors, for which we have 229 items and 117,061 price observations. Our estimates say that the decline for the prices of formal labor intensive items is very close to zero—in the order of 0.4 percent. In other words, the decline in the prices of informal labor intensive items is 10-fold larger than the decline in the prices of formal labor intensive ones. These results suggest that the mechanism through which Syrian refugee inflows lead to a decline in the level of prices in the hosting region is related to informal employment. Replacing informal native workers with observationally equivalent immigrants, who are willing to accept much lower wages, would be a rational choice for the firms operating in informal labor intensive sectors. [Ceritoglu, Gurcihan Yunculer, Torun, and Tumen \(2015\)](#) also report that Syrian refugee inflows do not alter the wage outcomes of the natives—both for formal and informal wages. This does not contradict with the mechanism we offer. The informal workers who are more likely to be replaced by low-pay immigrants are (*i*) the least productive ones

and (ii) the ones who receive relatively high wages. Replacing a combination of the workers from these two groups with observationally equivalent immigrants may not alter the average wages of informal native workers in a statistically significant way.

Finally, to broadly understand the sectors in which the price reductions are most effective, we condition our regressions on the following 12 product categories: food, alcohol and tobacco, clothing and shoes, housing, furniture, health, transportation, communication, recreation, education, hotel and restaurant, and other [see Table (8)]. We find that there are large price declines in food (4.5 percent), hotel and restaurant (5.4 percent), and education (10.5 percent). Production of food, especially fresh fruits and vegetables, and services related hotels and restaurants are highly informal labor intensive. Food, and hotels and restaurants have the largest weight in the consumption basket. So, this result is consistent with the mechanism we offer. For education, the decline is likely not related to informal employment. Government subsidies in the region in the post-immigration era are likely the reason for reduction in prices in the education sector. For other categories, we either see smaller price declines, which are statistically significant, or statistically insignificant small increases. Overall, results from the sub-categories support the role of substitution-driven price reductions in informal labor intensive sectors. Next we perform several exercises to check the robustness of our estimates as well as testing the validity of the mechanism we offer.

## 6 Robustness Checks

We perform two different robustness exercises. The first one exploits the time variation in the stock of refugees in Turkey. The second one uses alternative control regions to address the concern that the choice of the control group in our original analysis might be driving the results.

Our first robustness exercise exploits the increase in the stock of refugees over time for the purpose of detecting whether the estimates reported in the previous section should indeed be interpreted as the impact of immigration on prices. Figure (1) says that the refugee inflows



have become larger over time. Thus, if our estimates are indeed associated with immigration, then we should obtain only a small negative estimate when we set 2012 as the post-immigration period. When we condition separately on 2013 and 2014, on the other hand, we should obtain substantially larger estimates than 2012. Moreover, the estimate for 2014 should be even larger than the estimate for 2013. Also, the role of the informal employment channel should become clearer as we move from 2012 to 2014. Two forces may be driving this result. First, the rapid increase in the number of refugees over time might be reinforcing the negative impact of immigration on prices. Second, the level of labor market attachment among refugees might be going up over time, which may generate amplified price effects.

To test these insights, we repeat our baseline analyses by setting the post-immigration period as 2012, 2013, and 2014 in separate regressions. Table (9) reports the results of three exercises and confirms all the insights mentioned above with great clarity. Panels *A*, *B*, and *C* separately set 2012, 2013, and 2014 as the post-immigration period, respectively. The pre-immigration period is 2010–2011 in all three regressions. Since we use item-level fixed effects in all regressions, the results are comparable to the results given in column 3 of Table (3). The results suggest that the decline in prices were only 1.5 percent in 2012, while it became 2.7 and 3.2 percent in 2013 and 2014, respectively. This means that the negative impact of immigration on prices became more pronounced as the number of Syrian refugees in Turkey went up. The mechanism that we propose—that price decreases are realized through labor cost advantages generated in sectors with high informal labor intensity—is also strongly supported by the results of this robustness exercise. The decline in prices for the products of the sectors with high informal labor intensity is estimated as 2 percent, 4.2 percent, and 5.1 percent for 2012, 2013, and 2014, respectively. In all three years, almost the entire effect comes from the informal labor intensive sectors.

The second robustness exercise fixes the treatment region and uses alternative control regions. Our original control region includes the cities in the Eastern Anatolia, which are similar to the cities in the treatment region in terms of cultural, demographic, and socio-economic characteristics. One can argue that the choice of the control region might be driving our

results. To address this concern, we replace our original control region with two alternative regions. The first one is the entire country excluding the treatment region. Table (10) reports the results of the regression in which we replace the original control region with this alternative control region. The results are mainly the same, although the magnitudes are a bit smaller. On aggregate, the prices have declined by 1.7 percent. Again, the decline has been driven by the sectors, which intensively rely on informal workers. To be precise, the prices have declined by around 2.7 percent in informal labor intensive sectors, while the price changes are almost equal to zero in formal labor intensive sectors.

The second alternative control region is defined as entire country excluding the treatment region and the original control region. The purpose of this second exercise is to entirely exclude the original control region from the analysis. Table (11) documents the results. The results are almost unchanged. Our main observation is that, although the estimates are a bit smaller than the original estimates, the results of these robustness exercise confirm the validity of the qualitative nature of our results.

## 7 Concluding Remarks

Most of the migration research investigate the link between the intensity of immigration and the labor market outcomes of natives. The main reason is that labor market outcomes are directly related to the purchasing power and, therefore, the welfare levels of the natives residing in the hosting regions. Another important channel, which is often neglected, that can directly affect the purchasing power of natives is the level of consumer prices and immigration may lead to a change in the level of prices in the hosting region through several mechanisms. First, immigration may increase the aggregate demand in the hosting region, so it can shift the prices up. Second, immigrants might be the ones with less stringent time constraints than natives; so, if this is the case, then immigrants will have more time to search for lower prices, which will decrease prices of consumption goods in the hosting region. Finally, new immigration can reduce the level of prices for the items produced in the immigrant labor intensive sectors, since arrival of immigrants will likely generate labor cost advantages in these sectors. There

is a consensus in the literature that immigration likely leads to a reduction in consumer prices in the hosting region, but the mechanism through which these price declines take place is still an open question.

In this paper, we exploit the forced immigration from Syria to Turkey, due to civil conflict in Syria, as a natural experiment to estimate the causal effect of immigration on the level of consumer prices. Our findings confirm that immigration is associated with consumer price declines and the magnitude of this decline is around 2.5 percent, on average. We also find strong evidence supporting the relevance of the labor-market channel. Syrian refugees are more willing to accept lower pay relative to the natives residing in the region. Labor cost advantages generated in the sectors in which immigrants are employed reduce the prices of goods and services produced in these sectors. We identify a particular channel through which the labor cost advantages take place: informal employment. Syrian refugees do not have work permit. However, informal employment is prevalent in Turkey and the rate of informal employment is particularly high in the hosting region. The existence of informal employment opportunities facilitates the diffusion of Syrian refugees into the Turkish labor markets. So, if this is a relevant channel, then we should observe significant price reductions in the informal labor intensive sectors in the hosting region in the post-immigration era. We show that price reductions almost exclusively come from the sectors heavily relying on informal workers. We conclude that Syrian refugees substitute out informal native workers in sectors with high informal labor intensities. This substitution generates labor cost advantages and, in combination with competition in the product market, leads to reductions in consumer prices.

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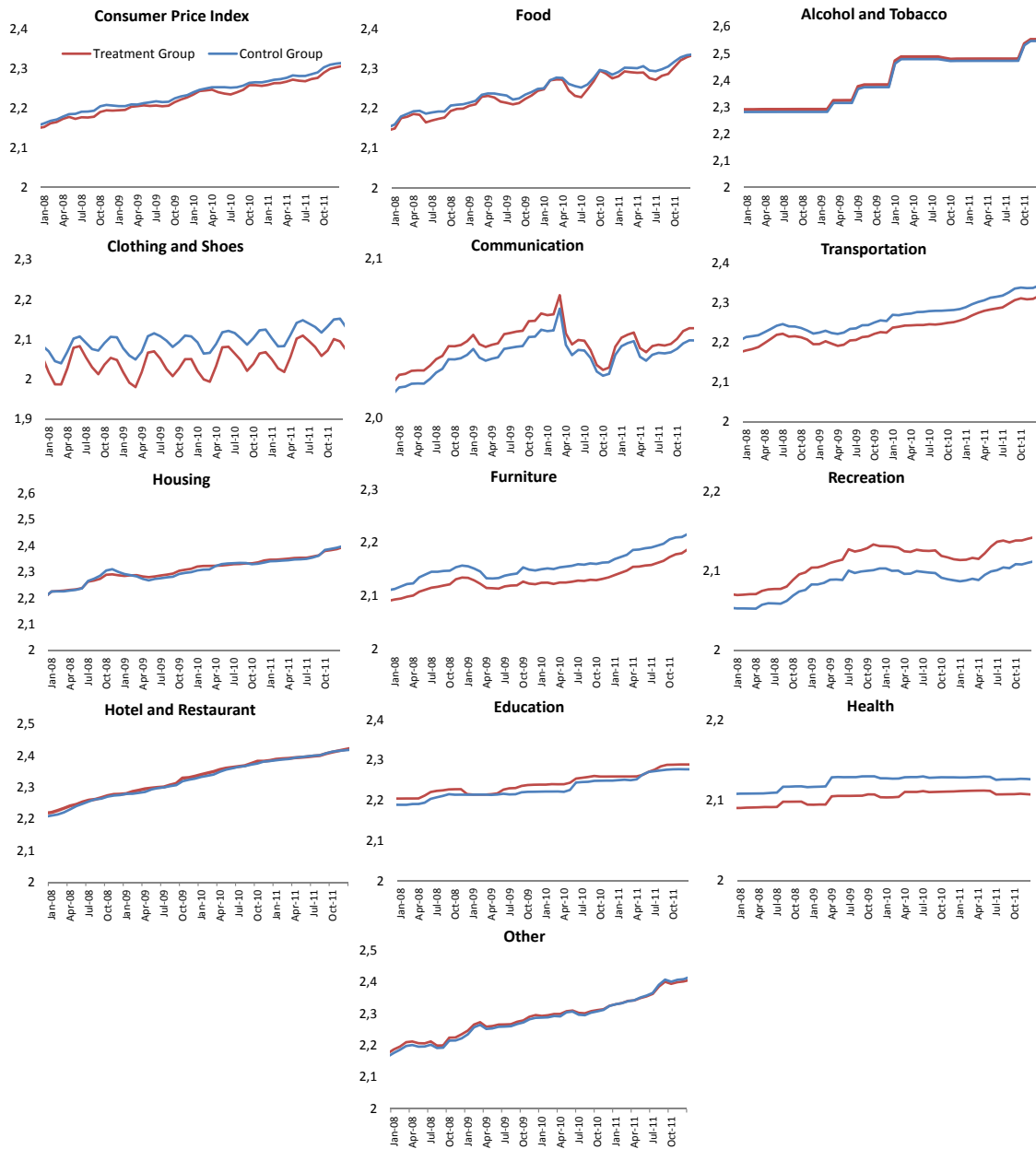


Figure 3: **Prior trends by broad categories.** Red color: treatment region. Blue color: control region. The  $y$ -axis describe the natural logarithm of the corresponding price index (2003=100 for all categories). The trends are plotted for the pre-immigration period—between Jan 2008–Dec 2011.

## 12 Broad Categories in the CPI

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Food and Non-alcoholic Beverages  
Alcoholic Beverages and Tobacco  
Clothing and Footwear  
Housing, Water, Electricity, Gas, and Other Fuels  
Furnishings, Household Equipment, Routine Maintenance of the House  
Health  
Transport  
Communications  
Recreation and Culture  
Education  
Hotels, Cafes, and Restaurants  
Miscellaneous Goods and Services

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Table 1: **12 Product Categories:** A list of 12 broad product categories in the CPI.

#### 44 Sub-categories in the CPI

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Food
Non-alcoholic Beverages
Alcoholic Beverages
Tobacco
Clothing
Footwear
Actual Rents for Housing
Maintenance and Repair of the Dwelling
Water Supply and Miscellaneous Services Related to the Dwelling
Electricity, Gas, and Other Fuels
Furniture and Furnishings, Carpets and Other Floor Coverings
Household Textiles
Household Appliances
Glassware, Tableware, and Household Utensils
Tools and Equipment for House and Garden
Goods and Services for Routine Household Maintenance
Medical Products, Appliances, and Equipment
Outpatient Services
Hospital Services
Purchase of Vehicles
Operation of Personal Transport Equipment
Transport Services
Postal Services
Telephone and Fax Equipment
Telephone and Fax Services
Audio-visual, Photographic, and Information Processing Equipment
Other Major Durables for Recreation and Culture
Other Recreational Items and Equipment, Gardens, and Pets
Recreational and Cultural Services
Newspapers, Books, and Stationery
Package Holidays
Pre-primary and Primary Education
Secondary Education
Post-secondary Education
Tertiary Education
Education not Definable by Level
Catering Services
Accommodation Services
Personal Care
Personal Effects N.E.C.
Social Protection
Insurance
Financial Services N.E.C.
Other Services N.E.C.

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Table 2: **44 Product Sub-categories:** A list of 44 product sub-categories in the CPI.



**Dependent Variable: Natural Logarithm of Price Levels**

**ALL ITEMS**

Variable	[1]	[2]	[3]
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0369*** (0.0030)	-0.0327*** (0.0029)	-0.0249*** (0.0028)
Product class fixed effects (broad)	Yes	No	No
Product class fixed effects (narrow)	No	Yes	No
Product fixed effects	No	No	Yes
Year fixed effects	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Month-of-year fixed effects	Yes	Yes	Yes
Intercept	1.3543*** (0.0134)	1.3720*** (0.0121)	1.4210*** (0.0193)
$R^2$	0.273	0.746	0.992
# of Obs.	216,932	216,932	216,932

Table 3: **Natural Logarithm of Price Levels (All Items):** \*\*\*, \*\*, and \* refer to 1%, 5%, and 10% significance levels, respectively. Standard errors clustered with respect to the month of observation are reported in parentheses. The prices are weighted by the CPI weights, which reflect the weight of the corresponding item in households' consumption basket. The product fixed effects for broad (column [1]) and narrow (column [2]) classifications control for 12 and 44 product categories, respectively. In column [3], we control for the fixed effects for 437 individual-level products.  $I = 1$  refers to the refugee-receiving area and  $D = 1$  refers to the post-immigration period. The total number of price observations for all items over the data horizon is 216,932.

**Dependent Variable: Natural Logarithm of Price Levels**

**GOODS**

Variable	[1]	[2]	[3]
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0424*** (0.0033)	-0.0356*** (0.0032)	-0.0264*** (0.0032)
Product class fixed effects (broad)	Yes	No	No
Product class fixed effects (narrow)	No	Yes	No
Product fixed effects	No	No	Yes
Year fixed effects	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Month-of-year fixed effects	Yes	Yes	Yes
Intercept	1.3816*** (0.0059)	1.3976*** (0.0050)	1.4486*** (0.0135)
$R^2$	0.356	0.780	0.997
# of Obs.	166,926	166,926	166,926

Table 4: **Natural Logarithm of Price Levels (Goods):** \*\*\*, \*\*, and \* refer to 1%, 5%, and 10% significance levels, respectively. Standard errors clustered with respect to the month of observation are reported in parentheses. The prices are weighted by the CPI weights, which reflect the weight of the corresponding item in households' consumption basket. The product fixed effects for broad (column [1]) and narrow (column [2]) classifications control for 10 and 26 product categories, respectively. In column [3], we control for the fixed effects for 340 individual-level goods.  $I = 1$  refers to the refugee-receiving area and  $D = 1$  refers to the post-immigration period. The total number of price observations for all items over the data horizon is 166,926.

**Dependent Variable: Natural Logarithm of Price Levels**

**SERVICES**

Variable	[1]	[2]	[3]
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0155*** (0.0016)	-0.0216*** (0.0032)	-0.0216*** (0.0032)
Product class fixed effects (broad)	Yes	No	No
Product class fixed effects (narrow)	No	Yes	No
Product fixed effects	No	No	Yes
Year fixed effects	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Month-of-year fixed effects	Yes	Yes	Yes
Intercept	3.6581*** (0.0605)	3.4873*** (0.0613)	3.4644*** (0.0608)
$R^2$	0.240	0.546	0.952
# of Obs.	50,006	50,006	50,006

Table 5: **Natural Logarithm of Price Levels (Services)**: \*\*\*, \*\*, and \* refer to 1%, 5%, and 10% significance levels, respectively. Standard errors clustered with respect to the month of observation are reported in parentheses. The prices are weighted by the CPI weights, which reflect the weight of the corresponding item in households' consumption basket. The product fixed effects for broad (column [1]) and narrow (column [2]) classifications control for 8 and 25 product categories, respectively. In column [3], we control for the fixed effects for 97 individual-level services.  $I = 1$  refers to the refugee-receiving area and  $D = 1$  refers to the post-immigration period. The total number of price observations for all services items over the data horizon is 50,006.

**Dependent Variable: Natural Logarithm of Price Levels**

**INFORMAL LABOR INTENSIVE**

Variable	[1]	[2]	[3]
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0386*** (0.0045)	-0.0385*** (0.0045)	-0.0384*** (0.0045)
Product class fixed effects (broad)	Yes	No	No
Product class fixed effects (narrow)	No	Yes	No
Product fixed effects	No	No	Yes
Year fixed effects	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Month-of-year fixed effects	Yes	Yes	Yes
Intercept	3.4084*** (0.0066)	1.4084*** (0.0066)	1.4654*** (0.0126)
$R^2$	0.434	0.442	0.991
# of Obs.	99,871	99,871	99,871

Table 6: **Natural Logarithm of Price Levels (Informal Labor Intensive)**: \*\*\*, \*\*, and \* refer to 1%, 5%, and 10% significance levels, respectively. Standard errors clustered with respect to the month of observation are reported in parentheses. The prices are weighted by the CPI weights, which reflect the weight of the corresponding item in households' consumption basket. The product fixed effects for broad (column [1]) and narrow (column [2]) classifications control for 8 and 25 product categories, respectively. In column [3], we control for the fixed effects for 208 individual-level items.  $I = 1$  refers to the refugee-receiving area and  $D = 1$  refers to the post-immigration period. The total number of price observations for all services items over the data horizon is 99,871.

**Dependent Variable: Natural Logarithm of Price Levels**

**FORMAL LABOR INTENSIVE**

Variable	[1]	[2]	[3]
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0351*** (0.0014)	-0.0241*** (0.0010)	-0.0039*** (0.0007)
Product class fixed effects (broad)	Yes	No	No
Product class fixed effects (narrow)	No	Yes	No
Product fixed effects	No	No	Yes
Year fixed effects	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Month-of-year fixed effects	Yes	Yes	Yes
Intercept	0.9860*** (0.0366)	0.9983*** (0.0333)	3.0808*** (0.0268)
$R^2$	0.192	0.798	0.991
# of Obs.	117,061	117,061	117,061

Table 7: **Natural Logarithm of Price Levels (Formal Labor Intensive)**: \*\*\*, \*\*, and \* refer to 1%, 5%, and 10% significance levels, respectively. Standard errors clustered with respect to the month of observation are reported in parentheses. The prices are weighted by the CPI weights, which reflect the weight of the corresponding item in households' consumption basket. The product fixed effects for broad (column [1]) and narrow (column [2]) classifications control for 8 and 25 product categories, respectively. In column [3], we control for the fixed effects for 229 individual-level items.  $I = 1$  refers to the refugee-receiving area and  $D = 1$  refers to the post-immigration period. The total number of price observations for all services items over the data horizon is 117,061.

**Dependent Variable: Natural Logarithm of Price Levels**  
**BY BROAD PRODUCT CLASS – SEPARATE REGRESSIONS**

Product Class	Refugee effect ( $I = 1$ & $D = 1$ )
Food	-0.0446*** (0.0055)
Alcohol and Tobacco	-0.0159** (0.0074)
Clothing and Shoes	0.0007 (0.0059)
Housing	-0.0046** (0.0019)
Furniture	0.0017 (0.0018)
Health	0.0188*** (0.0042)
Transportation	0.0075*** (0.0007)
Communication	0.0004 (0.0004)
Recreation	-0.0029 (0.0018)
Education	-0.1053*** (0.0061)
Hotel and Restaurant	-0.0543*** (0.0041)
Other	-0.0183*** (0.0031)
Product fixed effects	Yes
Year fixed effects	Yes
Region fixed effects	Yes
Month-of-year fixed effects	Yes

Table 8: **Natural Logarithm of Price Levels (By 12 Product Classes)**: \*\*\*, \*\*, and \* refer to 1%, 5%, and 10% significance levels, respectively. Standard errors clustered with respect to the month of observation are reported in parentheses. The prices are weighted by the CPI weights, which reflect the weight of the corresponding item in households' consumption basket. 437 product fixed effects are controlled for.  $I = 1$  refers to the refugee-receiving area and  $D = 1$  refers to the post-immigration period.

<b>Dependent Variable: Natural Logarithm of Price Levels</b>			
<b>ALL ITEMS</b>			
<b>Variable</b>	<b>Total</b>	<b>Formal</b>	<b>Informal</b>
<i>A. Post-Immigration Period: 2012</i>			
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0149*** (0.0031)	-0.0066** (0.0024)	-0.0195*** (0.0040)
<i>B. Post-Immigration Period: 2013</i>			
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0273*** (0.0027)	-0.0052** (0.0024)	-0.0420*** (0.0031)
<i>C. Post-Immigration Period: 2014</i>			
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0317*** (0.0026)	-0.0038 (0.0027)	-0.0505*** (0.0031)
Product fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Month-of-year fixed effects	Yes	Yes	Yes

Table 9: **Robustness Exercise I:** \*\*\*, \*\*, and \* refer to 1%, 5%, and 10% significance levels, respectively. Standard errors clustered with respect to the month of observation are reported in parentheses. The prices are weighted by the CPI weights, which reflect the weight of the corresponding item in households' consumption basket.  $I = 1$  refers to the refugee-receiving area and  $D = 1$  refers to the post-immigration period. Panels *A*, *B*, and *C* separately set 2012, 2013, and 2014 as the post-immigration period, respectively.

<b>Dependent Variable: Natural Logarithm of Price Levels</b>			
<b>Variable</b>	<b>Total</b>	<b>Formal</b>	<b>Informal</b>
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0170*** (0.0030)	0.0034 (0.0009)	-0.0274*** (0.0024)
Product fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Month-of-year fixed effects	Yes	Yes	Yes
Intercept	1.3897*** (0.0165)	3.0177*** (0.0183)	1.4231*** (0.0138)
$R^2$	0.991	0.990	0.993
# of Obs.	628,476	264,120	364,356

Table 10: **Robustness Exercise II – Alternative control region (All Turkey except the treatment region):** \*\*\*, \*\*, and \* refer to 1%, 5%, and 10% significance levels, respectively. Standard errors clustered with respect to the month of observation are reported in parentheses. The prices are weighted by the CPI weights, which reflect the weight of the corresponding item in households' consumption basket. The product fixed effects for 437 individual-level products are controlled for.  $I = 1$  refers to the refugee-receiving area and  $D = 1$  refers to the post-immigration period.

**Dependent Variable: Natural Logarithm of Price Levels**

<b>Variable</b>	<b>Total</b>	<b>Formal</b>	<b>Informal</b>
Refugee effect ( $I = 1$ & $D = 1$ )	-0.0152*** (0.0016)	0.0061*** (0.0011)	-0.0261*** (0.0023)
Product fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Month-of-year fixed effects	Yes	Yes	Yes
Intercept	1.3750*** (0.0167)	3.0041*** (0.0185)	1.4082*** (0.0139)
$R^2$	0.992	0.990	0.993
# of Obs.	532,204	223,560	308,644

Table 11: **Robustness Exercise III – Alternative control region (All Turkey except the treatment and original control regions):** \*\*\*, \*\*, and \* refer to 1%, 5%, and 10% significance levels, respectively. Standard errors clustered with respect to the month of observation are reported in parentheses. The prices are weighted by the CPI weights, which reflect the weight of the corresponding item in households' consumption basket. The product fixed effects for 437 individual-level products are controlled for.  $I = 1$  refers to the refugee-receiving area and  $D = 1$  refers to the post-immigration period.