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Abstract

We investigate the effect of immigration on consumer prices in Spain between 1997 and 2013. Using variation across provinces, we first document a positive correlation between consumer prices and the share of migrants in the population. However, controlling for regional supply and demand shocks, and addressing endogeneity through an instrumental variables approach, we show that immigration has actually reduced consumer prices in Spain. An increase in the share of migrants by 10 percentage points reduces (CPI-weighted) consumer prices by approx. 1.25 percent. We show that the effect materializes around the years of the 2008 financial crisis, and that it is concentrated among non-tradable goods and services. Focusing on individual products, we find that some of those products that rely most heavily on migrant labor have been subject to considerable price reductions, while we find no such effects for those products that make intensive use of native labor. Finally, we find that it is immigration from outside Western Europe that led to a reduction in consumer prices, while the effect of immigration from Western Europe is zero. Overall, our results paint a complex picture of the effects of immigration on consumer prices. They support the idea that immigration can reduce consumer prices through both supply-side and demand-side channels.

JEL-Codes: F220, J610.

Keywords: immigration, consumer prices, Spain.

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1 Introduction

Immigration is a topic of considerable public concern. Much research has been devoted to analyzing the impact of immigration on labor market outcomes such as wages and employment.¹ Less research, on the other hand, has been carried out on the impact of immigration on consumer prices, although empirical evidence into this relationship is clearly desirable, as it carries first-order welfare implications for the native population through changes in real incomes and wealth.

The purpose of this paper is to provide new evidence on the effect of immigration on consumer prices by looking into the remarkable case of Spain. In particular, we analyze the relationship between immigration and prices for a variety of consumer goods and services and focusing on the time period between 1997 and 2013. This period includes a full-blown immigration boom in Spain and the ensuing global financial crisis and economic recession. The Spanish case is quite unique in terms of the magnitude and pace of migration: within just 10 years the share of migrants increased from 2 to 12 percent. We believe, therefore, that it can serve as an interesting opportunity to generate valuable empirical evidence into the relationship between immigration and consumer prices.

To identify the effect of immigration on consumer prices, we exploit variation in the share of migrants across provinces. Specifically, we relate changes in consumer prices over time to changes in the share of migrants at the province level. Our analysis is challenged by a formidable endogeneity problem in the relationship between prices and immigration, which implies that simple OLS estimates are biased and inconsistent. To overcome this problem, we combine a stringent fixed effects estimation (to control for regional supply and demand shocks) with an instrumental variables approach familiar from the literature.

We first estimate the relationship using OLS, and document a strong positive correlation between consumer prices and the share of migrants in the population. However, this correlation could be the result of migrants targeting locations subject to strong economic growth and, thus, rising prices. Addressing this endogeneity problem, we show that immigration has actually *reduced* consumer prices in Spain. Our estimates imply that an increase in the share of migrants by 10 percentage points reduces (CPI-weighted) average consumer prices by approx. 1.25 percent. We show that the effect materializes in the wake of the 2008 financial crisis, and that it is concentrated among non-tradable goods and services, while the average effect among tradable goods is zero (in a statistical sense).

Focusing on individual products, we find that some of those products whose production relies most heavily on migrant labor (food; household maintenance; restaurant & hotel services) have been subject to considerable price reductions, while we find no such effects for those products that

¹See [Dustmann et al. \(2008\)](#) and [Edo \(2019\)](#) for reviews of this important and extensive literature.

make intensive use of native labor. This suggests that some of the observed price effects are driven by downward pressure on wages and a corresponding reduction in the unit cost of production. In 2002, by far the largest share of migrants in a given sector—35%—can be found in household-related activities.² This is also where we find the largest price effect with a semi-elasticity exceeding -1.0 . This implies that an increase in the share of migrants by 10 percentage points reduces prices for household services by more than 10 percent.

We also reveal a sharp difference in the price effects between migrants from Western Europe and those from other countries. In particular, we find that it is immigration from other countries that reduces consumer prices, while the effect of immigration from Western Europe is essentially zero. This finding supports the idea that the effect of migration on prices operates through different channels, and that the type of migration matters greatly for the relevance of specific channels. Migration from high-income countries in Western Europe is a mix of retirement-related migration and labor migration. Both supply-side and demand-side effects are plausibly small. Migration from low-income countries outside of Western Europe, on the other hand, is mostly labor migration. Under the assumption that these migrants are more price-sensitive than natives, we can expect both supply-side and demand-side explanations to be relevant for the price reductions that we find.

Our paper is most closely related to [Frattini \(2008, 2014\)](#) who investigates the impact of migration on consumer prices for a similar period as we do (1997-2012), but who focuses on the case of the UK. Like ours, his empirical strategy exploits the fact that, relative to the overall population, immigrants are not uniformly distributed across locations, but instead cluster in some places. The results indicate that immigration helped in slowing down price inflation of non-tradable goods and services in the pre-recession period (1997-2007), albeit modestly, while having no effect in the post-crisis period (2008-2012). The results also suggest that immigration had the strongest effect on the prices of those goods and services that rely intensively on low-wage labor. This supports a supply-side explanation of the effect operating through a reduction in wages at the bottom of the wage distribution, a channel supported through evidence by [Dustmann et al. \(2013\)](#).³

A paper emphasizing, and credibly identifying, demand-side effects as opposed to supply-side effects is [Lach \(2007\)](#). He studies the response of detailed consumer prices to the sudden and unexpected arrival of a large number of immigrants from the former Soviet Union in Israel in 1990. He finds that migration had a negative effect on prices through its effect on goods demand. The underlying idea, supported by the data, is that migrants and natives differ in terms of their price

²Source: EU Labor Force Survey from 2002.

³Another important paper supporting the hypothesis of supply-driven effects of immigration on prices is [Cortes \(2008\)](#). She analyzes the effect of low-skilled immigration on US prices of non-traded goods and services, and finds that this type of immigration benefits the native population by decreasing the prices of services that rely intensively on immigrant labor. More recently, [Balkan and Tumen \(2016\)](#) use the inflow of Syrian refugees in Turkey after 2011 as a natural experiment, and find that Syrian immigration reduced consumer prices through labor cost reductions in the informal labor market.

elasticities of demand, and that the influx of migrants took away some of firms' market power resulting in lower prices.⁴

Another strand of the literature related to what we do investigates the relationship between immigration and housing prices. [González and Ortega \(2013\)](#) look into the case of Spain focusing on the effect of immigration on both housing prices and housing supply. They use some of the same data as we do, and also employ an instrumental variables strategy in order to isolate the causal effects of immigration on the housing market from other confounding factors. They find that immigration accounted for one quarter of the rise in housing prices over the period 2000 to 2010, but also one half of the construction activity observed over the same period.⁵

The rest of the paper is organized as follows. In the next section, we introduce the data we use in our empirical analysis, and we provide a few facts on the evolution of immigration and consumer prices between 1997 and 2013. In Section 3, we first describe the empirical methodology we employ to identify the effects of immigration on consumer prices, and then present and discuss the estimation results we obtain across a variety of empirical specifications. Section 4 closes with a brief summary.

2 Main data sources

Migration data. The migration data we use come from the Spanish Municipal Register (*Padrón Municipal*) and are given at the province level in Spain. Spain is divided into 52 different provinces. We exclude the two enclaves Ceuta and Melilla from our analysis due to their special geographical location in North Africa. The 50 provinces (*provincias*) we consider belong to 17 regions (*comunidades autónomas*); see Table A.1. This will become important later in the context of our identification strategy.⁶ All residents in Spain are obliged to confidentially register in the local Municipal Register with their name, surname, sex, usual domicile, nationality, passport number, as well as their place and date of birth.

A major advantage of the data is that they are likely to include both documented and undocumented immigrants. This is so because all immigrants were strongly incentivized to register at the time of arrival, as the *Law on the Rights and Freedoms of Aliens in Spain and their Social In-*

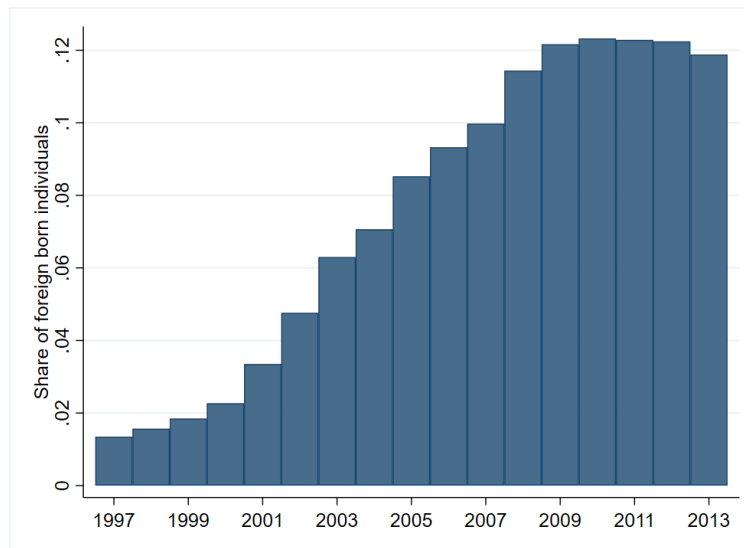
⁴[Zachariadis \(2012\)](#) finds international migration to be a vehicle for international price convergence in cross-country data for the period 1996-2006. Price convergence occurs because of both supply-side effects along the lines of [Cortes \(2008\)](#), and demand-side effects along the lines of [Lach \(2007\)](#).

⁵[Sá \(2015\)](#) investigates the effect of immigration on the housing market in the UK. Earlier papers studying the link between immigration and housing prices are [Saiz \(2003, 2007\)](#) and [Ottaviano and Peri \(2012\)](#), among others.

⁶In principle, the data are also available at the municipality level (*municipios*), but since no price data are available at such a high level of disaggregation, we conduct the analysis at the province level. The migration data can be accessed through the website of the Instituto Nacional de Estadística (INE) at <https://www.ine.es/dyngs/INEbase/es/categoria.htm?c=Estadistica.P&cid=1254734710984>.

tegration in 2000 (Ley Orgánica 4/2000, artículo 12) entitled all foreigners (with or without legal residence permits) to free medical care under the same conditions as Spanish nationals provided they were registered in the Municipal Register.

Figure 1: Share of migrants in Spain (1997-2013).[†]

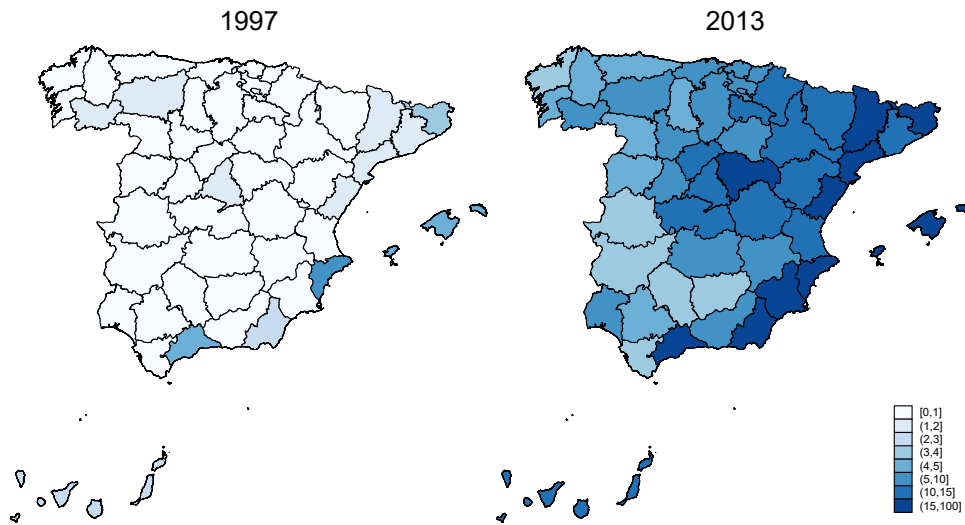


[†]Source: Author’s illustration using data from INE.

Figure 1 illustrates the considerable increase in the number of immigrants in Spain between 1997 and 2013. The share of foreign-born individuals started out from a low level—less than 2 percent—and settled at more than 12 percent after the financial crisis.⁷ Figure 2 visualizes differences in the share of immigrants by province and makes a comparison between 1997 and 2013. We see sizable differences in the share of migrants across provinces, not just in terms of the level in 2013, but also in terms of the changes relative to 1997. This is the variation in the data that we will exploit for identification purposes in the econometric analysis. Figure 3 shows stocks and flows of immigrants from the six most important countries of origin. These are Romania, Morocco, Ecuador, Colombia, the UK, and Bolivia. The pattern of migration differs a bit between countries, but overall the yearly inflow of migrants accelerated initially, around the year 2000, and declined in the years of the financial crisis (while fluctuating in between in some countries).

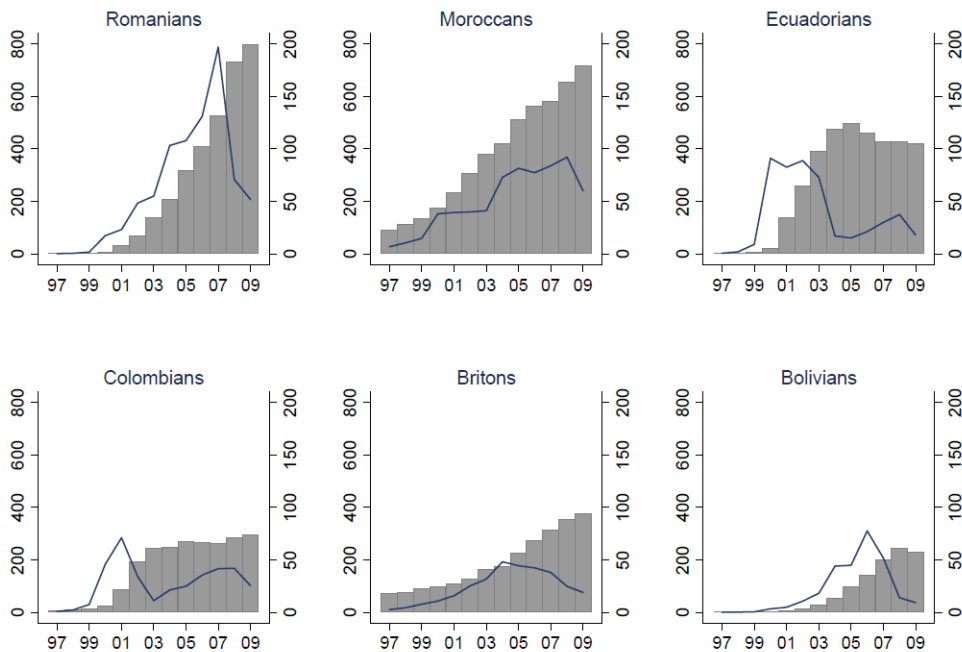
⁷The share of foreign-born individuals among the working-age population was even larger and exceeded 16 percent.

Figure 2: Share of migrants by province in Spain.[†]



[†]Note: This figure illustrates the distribution of migrants across provinces in Spain in 1997 and 2013, respectively. The numbers are defined as the share of migrants in the total population multiplied by 100. Darker colors indicate larger migrant shares. The provinces Las Palmas and Santa Cruz de Tenerife are grouped together as Islas Canarias. *Source:* Author's illustration using data from INE.

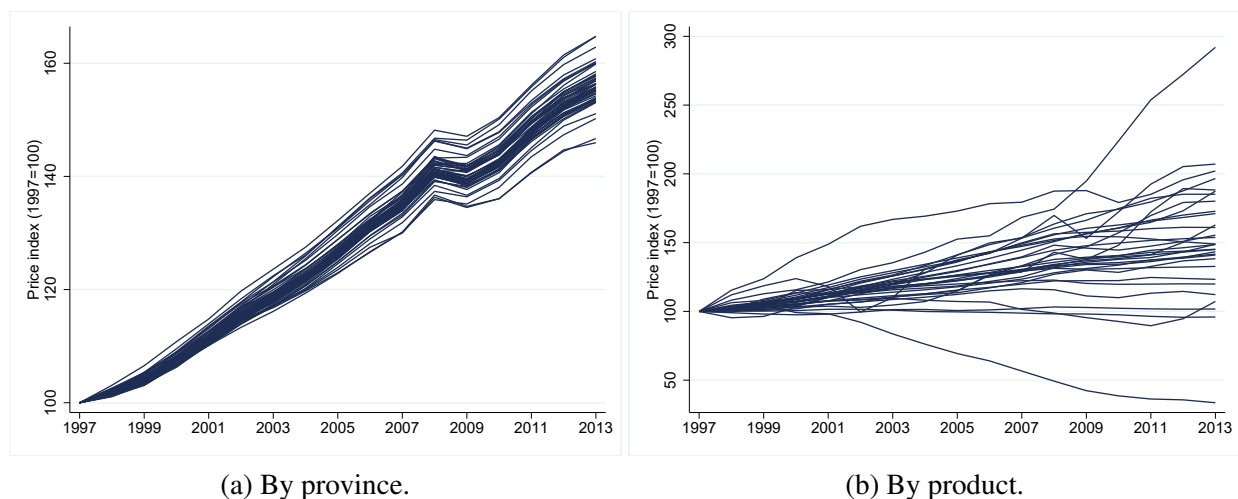
Figure 3: Migrants by country of origin (1997-2009).[†]



[†]Note: This figure shows migrant stocks in Spain (bars; left ordinate) and gross inflows to Spain (lines; right ordinate) by nationality for the six major origin countries over the period 1997-2009. Numbers are in thousands ('000s). *Source:* Author's illustration using data from INE.

Price data. The price data are also from INE and they are disaggregated by different product subgroups. By matching two series with slightly different subgroup classifications, we construct a consistent series with annual price data from 1997 to 2013 for 31 products at the province level; see Table A.4 in the Appendix for how we match the data.⁸

Figure 4: Evolution of consumer prices (1997-2013).[†]



[†]Note: This figure shows the evolution of consumer prices by province (a) and by product (b) between 1997 and 2013. Prices are normalized to 100 in 1997. In (a), products are weighted by national CPI weights from 2002; see Table A.4. Ceuta and Melilla are excluded. Source: Author's illustration using data from INE.

Figure 4a shows the evolution of consumer prices by province over our period of analysis. Prices are normalized to 100 in the year 1997.⁹ We see a monotonic increase in prices in all provinces, interrupted only by the 2008 financial crisis. Importantly, we observe significant differences in the price evolution across provinces. In 2013, the maximum difference in the price index was 18.7 index points. The three provinces with the highest compound annual inflation rate are Lleida (3.12%), Barcelona (3.11%), and Girona (3.04%), while the ones with the lowest compound annual inflation rate are Santa Cruz de Tenerife (2.34%), Las Palmas (2.34%), and Badajoz (2.49%). Figure 4b illustrates the same data, but slices them by product rather than province. Prices for different products have evolved very differently. The products with the strongest price increase over the whole period are tobacco (+292%), use of vehicles (+207%), and tourist services

⁸The series follow slightly different versions of the Classification of Individual Consumption by Purpose (COICOP), which is the international reference classification of household expenditure. The data are accessible through the INE website at https://www.ine.es/dyngs/INEbase/es/categoria.htm?c=Estadistica_P&cid=1254735976607.

⁹In this figure and the empirical analysis that follows, we use common national and time-constant CPI weights from 2002 to construct the price data series, in order to evaluate all consumer price differences on an equal footing; see Table A.4 in the Appendix for the product-specific weights we employ. The weights can be accessed through the INE website at <https://www.ine.es/dynt3/inebase/index.htm?padre=649&capsel=649>.

(+202%). The most moderate price development is seen for postage and communication (−66%), heating and household appliances (−4%), and recreational goods and accessories (+2%).

3 Empirical analysis

3.1 Methodology

The starting point of our analysis is the observation that immigrants have targeted some provinces in Spain much more than others. This allows us to exploit variation in the share of migrants across provinces for identification purposes. We index provinces by j , regions by ℓ (with $j \in \ell$), and years by t . Then the basic equation we bring to the data reads as follows:

$$\ln p_{jt} = \beta \mu_{jt} + \gamma_j + \gamma_{\ell t} + \mathbf{X}_{jt}^{\top} \boldsymbol{\gamma} + \varepsilon_{jt}, \quad j \in \ell, \quad (1)$$

where $\ln p_{jt}$ is the log price, μ_{jt} is the share of migrants, γ_j is a province fixed effect, $\gamma_{\ell t}$ is a region×year fixed effect, \mathbf{X}^{\top} is a row vector of control variables, $\boldsymbol{\gamma}$ is the corresponding column vector of parameters to be estimated, and ε_{jt} is the error term. The central parameter of interest is β , which captures the relationship between immigration and prices.

We estimate Equation (1) in first differences, which eliminates the province fixed effect γ_j . Differences in price *levels* across provinces are, therefore, immaterial for our analysis. To control for demand- and supply-side factors that could influence prices differentially over time, we do two things. First, we include as province-specific control variables the unemployment rate as well as the size of the native population (in logs).¹⁰ Secondly, and more importantly, we include region×year dummy variables to capture $\gamma_{\ell t}$. This controls for all supply and demand shocks that affect a certain region in the same way, and it means that we identify β from differential changes in migration and prices across provinces *within regions*. Hence, the fact that immigration to certain boom regions in Spain is endogenous is not a problem, per se, for our analysis.¹¹

However, it is still possible that even within regions immigrants in Spain targeted specific provinces characterized by above-average GDP growth rates and lots of job opportunities and, thus, potentially higher growth in consumer prices. To address this endogeneity issue, we follow [Dustmann et al. \(2013\)](#) and [Frattini \(2014\)](#) and implement an instrumental variables strategy. Specifically, we use as an instrumental variable the fourth lag of the share of migrants in levels in the first-differenced equation of (1), that is, we instrument the change in the migrant share, $\Delta \mu_{jt}$,

¹⁰These data are also available freely from the INE website.

¹¹Regions in our analysis are autonomous communities (*comunidades autónomas*); see Table A.1 in the Appendix.

by the (fourth lag of the) level of the migrant share, μ_{jt-4} .¹²

3.2 Estimation and results

All goods and services. We start by estimating Eq. (1) in first differences on all goods and services (whether tradable or not). The dependent variable is the log average price of all goods and services.¹³ In Table 1, columns (1)-(3) report the OLS estimates; columns (4)-(6) report the IV results based on the fourth lag of the migrant share as an instrument. For either estimation approach, we first run the regression with the migrant share as the only explanatory variable (apart from simple year dummy variables); we then augment the regression by including the unemployment rate as well as the size of the native population as additional explanatory variables at the province-level; and in the last specification we augment the model by region \times year dummy variables. This is clearly our preferred specification, as it controls for all region-specific demand and supply shocks which move consumer prices in one or the other direction. In all specifications, we estimate robust standard errors clustered at the province level.

The OLS estimates indicate a positive correlation between prices and the migrant share over the period considered. In columns (1) and (2), we find highly significant estimates of β close to +0.09. An increase in the migrant share by 10 percentage points is thus associated with an increase in consumer prices by almost 1 percent. However, this estimate is likely to be biased upwards, as migrants can be expected to move to boom locations that experience above-average price growth (Frattini, 2014). Allowing for region-specific shocks, whether permanent or transitory, by augmenting the estimation with region \times year fixed effects supports this possibility, as the estimated coefficient becomes considerably smaller and turns insignificant. Turning to our IV estimates, we find a *negative* estimate of β throughout. The first stage F-statistic of a test whether the excluded instrument is significantly different from zero suggests that the instrument is sufficiently strong. The point estimates range from -0.158 to -0.125 , and the coefficient is significantly different from zero (at the 10 percent level) in our preferred specification with region \times year fixed effects. Hence, our IV estimates demonstrate that the OLS estimates are highly misleading, and that immigration has, if anything, led to a reduction in the CPI in Spain. In the following we cut the data in different ways to shed further light on the possibility of a negative causal effect running from immigration to prices.

¹²We have also experimented with a shift-share type of instrument based on the past sorting of immigrants across provinces; see Frattini (2014). However, this alternative approach suffered from a notorious weak-identification problem.

¹³Since we use the fourth lag to instrument the migrant share, and since the relevant data we use go back until 1995, we can only base our estimates on the period from 1999 to 2013. To make our OLS and our IV estimates comparable, we use the same sample for both estimators.

Table 1: All goods and services

	Dep. var.: Log average price of all goods and services					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	2SLS	2SLS	2SLS
Migrant share	0.084*** (0.031)	0.090*** (0.031)	0.024 (0.024)	-0.158 (0.154)	-0.134 (0.128)	-0.125* (0.073)
Unemployment rate		-0.011* (0.006)	-0.002 (0.007)		0.000 (0.009)	0.003 (0.007)
Native population (in logs)		-0.018 (0.027)	0.002 (0.029)		-0.013 (0.031)	-0.004 (0.026)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year fixed effects	No	No	Yes	No	No	Yes
First stage F-test of excl. inst.				76.10	55.53	121.10
N	750	750	750	750	750	750

Note: The dependent variable in all regressions is the log average price of all goods and services. The equation is estimated in first differences. 2SLS refers to our instrumental variable based on the fourth lag of the migrant share (this variable is *not* given in first differences in the estimation). All variables are given at the province level (*provincias*). Full first stage results are available from the author upon request. Robust standard errors are clustered at the level of 50 different provinces and are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively.

Tradables vs. non-tradables. We first make a broad distinction between tradable goods on the one hand and non-tradable goods and services on the other hand. From a theoretical point of view, there are reasons to believe that tradable goods are affected differently by migration than non-tradable goods and services.

Table 2: Tradable goods

	Dep. var.: Log average price of tradable goods					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	2SLS	2SLS	2SLS
Migrant share	0.073** (0.031)	0.079** (0.031)	0.014 (0.040)	-0.237 (0.176)	-0.189 (0.140)	-0.069 (0.077)
Unemployment rate		-0.009 (0.007)	0.001 (0.009)		0.004 (0.011)	0.003 (0.009)
Native population (in logs)		-0.033 (0.034)	0.027 (0.039)		-0.028 (0.037)	0.024 (0.030)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year fixed effects	No	No	Yes	No	No	Yes
First stage F-test of excl. inst.				76.10	55.53	121.10
N	750	750	750	750	750	750

Note: The dependent variable in all regressions is the log average price of all tradable goods. The equation is estimated in first differences. 2SLS refers to our instrumental variable based on the fourth lag of the migrant share (this variable is *not* given in first differences in the estimation). All variables are given at the province level (*provincias*). Full first stage results are available from the author upon request. Robust standard errors are clustered at the level of 50 different provinces and are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively.

For non-tradable goods and services, both demand- and supply-side effects might be important. On the demand side, if migration raises local demand, and local supply adjusts sluggishly, then we would expect migration to raise prices in the short run (temporarily). But migrants could also have different price elasticities of demand than natives, which could raise or reduce the market power of firms (and thus the markups over marginal costs) even in the medium and long run. Evidence in favor of this basic mechanism is documented by [Lach \(2007\)](#) in the case of Israel, even though he focuses on short-run effects. On the supply side, migrants could reduce wages and, thus, the unit cost of production in those industries that rely heavily on “migrant-intensive” occupations subject to poor wage growth. For perfectly tradable goods, we expect no supply-side effects on prices, unless trade costs that depend on local labor supply make up a significant portion of the total costs. Demand-side effects might, however, play a role also for perfectly tradable goods. For these reasons, we run the same set of regressions as before, but we now distinguish between

tradable goods (Table 2) and non-tradable goods and services (Table 3).¹⁴

Table 3: Non-tradable goods and services

	Dep. var.: Log average price of non-tradable goods					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	2SLS	2SLS	2SLS
Migrant share	0.094** (0.038)	0.099** (0.038)	0.032 (0.035)	-0.090 (0.166)	-0.088 (0.150)	-0.173* (0.091)
Unemployment rate		-0.011 (0.009)	-0.004 (0.011)		-0.002 (0.011)	0.002 (0.010)
Native population (in logs)		-0.004 (0.029)	-0.021 (0.034)		-0.000 (0.031)	-0.029 (0.034)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year fixed effects	No	No	Yes	No	No	Yes
First stage F-test of excl. inst.				76.10	55.53	121.10
N	750	750	750	750	750	750

Note: The dependent variable in all regressions is the log average price of all non-tradable goods and services. The equation is estimated in first differences. 2SLS refers to our instrumental variable based on the fourth lag of the migrant share (this variable is *not* given in first differences in the estimation). All variables are given at the province level (*provincias*). Full first stage results are available from the author upon request. Robust standard errors are clustered at the level of 50 different provinces and are given in parentheses. *,**,*** denote significance at the 10%, 5%, 1% levels, respectively.

We obtain somewhat lower point estimates for β for tradable goods than for non-tradable goods and services when using OLS. These point estimates are positive throughout, but as before insignificant when controlling for regional supply and demand shocks; see column (3) in either table. More importantly, while we find again negative IV estimates of β throughout all specifications and across both types of goods (tradables and non-tradables), these estimates are only different from zero (in a statistical sense) for non-tradable goods and services and once we include region \times year fixed effects. Specifically, in this last regression we obtain an estimated coefficient of the migrant share equal to -0.173 with an estimated standard error of 0.091 . We interpret this as evidence in favor of the idea that the room for price changes following migration is somewhat bigger for non-tradable goods and services than for tradable goods, as we would expect and as was also found by [Frattini \(2014\)](#).

Boom vs. crisis period. We next make a distinction between the earlier years in our sample and the later years. We do this because the later years are arguably characterized by a strikingly different

¹⁴In our list of products, the distinction between tradables and non-tradables is unfortunately somewhat blurry; see Table A.4.

environment in the labor and product markets than the earlier years due to the 2008 financial crisis and subsequent recession. The strong (and accelerating) inflow of migrants seen in the years preceding the crisis also slowed down considerably in the wake of the crisis; see Figure 1.

Table 4: Boom vs. crisis: Tradable goods

	Dep. var.: Log average price of tradable goods					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	2SLS	2SLS	2SLS
Migrant share	0.091** (0.038)	0.103*** (0.036)	0.024 (0.048)	0.015 (0.097)	0.135* (0.070)	0.012 (0.078)
Migrant share \times Crisis	-0.077 (0.051)	-0.109** (0.046)	-0.039 (0.074)	-1.200* (0.721)	-0.908** (0.403)	-0.187 (0.185)
Unemployment rate		-0.009 (0.007)	0.001 (0.009)		0.002 (0.012)	0.002 (0.008)
Native population (in logs)		-0.042 (0.034)	0.025 (0.040)		-0.105* (0.054)	0.013 (0.031)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year fixed effects	No	No	Yes	No	No	Yes
N	750	750	750	750	750	750

Note: The dependent variable in all regressions is the log average price of all tradable goods. The equation is estimated in first differences. Crisis is a dummy variable equal to one for the years 2008 to 2013, and zero otherwise. 2SLS refers to our instrumental variable based on the fourth lag of the migrant share (this variable is *not* given in first differences in the estimation). We use this variable interacted with the Crisis dummy as a second excluded instrument. All variables are given at the province level (*provincias*). Full first stage results are available from the author upon request. Robust standard errors are clustered at the level of 50 different provinces and are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively.

To investigate differences in the effect of immigration on consumer prices across the boom period (1997-2007) and the crisis period (2008-2013), we run the same set of regressions as before, but we now interact the migrant share with a crisis dummy variable which is equal to one in the years 2008 to 2013, and zero otherwise. We show the results separately for tradable goods (Table 4) and for non-tradable goods and services (Table 5). Focusing on our preferred specification based on our IV approach in column (6) of either table, we gain two important insights from these regressions. First, there is no significant effect of immigration on the average price of tradable goods, irrespective of the period of analysis (boom or crisis years). Secondly, and more importantly, the negative effect on non-tradable goods and services materializes fully in the crisis period, and is non-existent in the boom period. Indeed, the coefficient estimates of the migrant share and its interaction with the crisis dummy variable in column (6) of Table 5 suggest a quantitatively im-

portant and statistically significant effect of immigration, but only in the period from 2008 to 2013. One possible explanation for this is that the labor market effects of immigration also materialized in the crisis, much more than in the boom years, with corresponding implications for changes in production costs and prices. In line with this possibility, Carrasco et al. (2008) find no wage effects of immigration in the earlier years of Spain’s immigration boom. An alternative explanation is that differences in the price elasticity of demand between migrants and natives became more evident in the crisis. It is possible, for example, that migrants suffered more severe income losses than natives during the crisis, which might have raised their price elasticity of demand beyond the one for natives. Investigating this possibility is, however, beyond the scope of this paper.

Table 5: Boom vs. crisis: Non-tradable goods and services

	Dep. var.: Log average price of non-tradable goods					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	2SLS	2SLS	2SLS
Migrant share	0.129*** (0.046)	0.137*** (0.046)	0.079* (0.041)	0.053 (0.103)	0.109 (0.088)	0.134 (0.089)
Migrant share × Crisis	-0.156*** (0.056)	-0.167*** (0.061)	-0.168** (0.077)	-0.679 (0.512)	-0.550 (0.389)	-0.709** (0.331)
Unemployment rate		-0.011 (0.009)	-0.004 (0.010)		-0.003 (0.012)	-0.003 (0.008)
Native population (in logs)		-0.018 (0.030)	-0.032 (0.037)		-0.047 (0.046)	-0.070 (0.046)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year fixed effects	No	No	Yes	No	No	Yes
N	750	750	750	750	750	750

Note: The dependent variable in all regressions is the log average price of all non-tradable goods and services. The equation is estimated in first differences. Crisis is a dummy variable equal to one for the years 2008 to 2013, and zero otherwise. 2SLS refers to our instrumental variable based on the fourth lag of the migrant share (this variable is *not* given in first differences in the estimation). We use this variable interacted with the Crisis dummy as a second excluded instrument. All variables are given at the province level (*provincias*). Full first stage results are available from the author upon request. Robust standard errors are clustered at the level of 50 different provinces and are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively.

Intensity of migrant labor at the product level. We have so far lumped all products together or we have drawn a (somewhat blurry) line between tradable and non-tradable goods and services. Table A.2, using 2002 data from the European Labor Force Survey (EU-LFS), demonstrates that migrants are not equally represented across sectors of employment (NACE rev. 1.1). Specifically,

the top five sectors in terms of migrant employment shares are domestic households (33.65%); hotels and restaurants (18.89%); mining and quarrying (15.50%); construction (9.88%); and agriculture (9.72%).¹⁵ We also know from the EU-LFS data that migrants are highly overrepresented in service-related occupations as well as elementary occupations with just basic educational requirements; see Table A.3.

Table 6: Products intensive in migrant labor

	Dep. var.: Log average price of a specific good or service					
	Food		Household maintenance		Rest. & hotel services	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Migrant share	0.007 (0.067)	-0.282** (0.115)	-0.222 (0.160)	-1.117*** (0.328)	0.041 (0.105)	-0.085 (0.148)
Unemployment rate	0.013 (0.018)	0.021 (0.016)	-0.032 (0.040)	-0.004 (0.035)	0.008 (0.020)	0.012 (0.017)
Native population (in logs)	0.111** (0.042)	0.100*** (0.036)	-0.068 (0.155)	-0.102 (0.154)	0.009 (0.046)	0.004 (0.036)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-test of excl. inst.		121.10		121.10		121.10
N	750	750	750	750	750	750

Note: The dependent variable in all regressions is the log average price of a specific product. The equation is estimated in first differences. 2SLS refers to our instrumental variable based on the fourth lag of the migrant share (this variable is *not* given in first differences in the estimation). All variables are given at the province level (*provincias*). Full first stage results are available from the author upon request. Robust standard errors are clustered at the level of 50 different provinces and are given in parentheses. *,**,*** denote significance at the 10%, 5%, 1% levels, respectively.

We use this information to investigate potential supply-side effects on consumer prices in “migrant-intensive” sectors, and we expect to find a more moderate price development in these sectors, through the potential effect migration has on wages and, thus, the unit cost of production. To do so, we match NACE rev. 1.1 industries to products in our INE data; see Table A.5. The three products included in the CPI and most intensive in migrant labor are thus food; household maintenance (including domestic service); and restaurants, bars, coffee bars and hotels along with tourist services. Table 6 reports our estimation results, separately for the three product groups, and always for the most comprehensive specification with the full set of control variables. Our IV

¹⁵This abstracts from extra-territorial organizations and bodies (NACE code Q), which is irrelevant in our context.

estimates of the coefficient of the migrant share are always negative. They are significant for food and for households maintenance, respectively, and insignificant otherwise. As it turns out, we find the largest negative (and highly significant) coefficient (-1.12) for household maintenance, which corresponds to the sector with the highest share of migrants in Spain. Table 7 reports the results for the three products in the CPI with the least intensive use of migrant labor. These are electricity, gas, and other fuels; education; and financial services. Interestingly, we find no significant price effects there. Hence, our product-specific estimates are in line with a supply-side explanation of the effect of immigration on consumer prices.

Table 7: Products intensive in native labor

	Dep. var.: Log average price of a specific good or service					
	El., gas, fuels		Education		Fin. services	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Migrant share	0.160 (0.166)	0.250 (0.222)	0.058 (0.078)	-0.289 (0.204)	-0.002 (0.105)	-0.041 (0.132)
Unemployment rate	0.034 (0.044)	0.031 (0.036)	-0.059** (0.026)	-0.049** (0.022)	-0.064* (0.034)	-0.063** (0.027)
Native population (in logs)	-0.311** (0.123)	-0.307*** (0.098)	0.145** (0.065)	0.132** (0.065)	-0.035 (0.082)	-0.037 (0.063)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-test of excl. inst.		121.10		121.10		121.10
N	750	750	750	750	750	750

Note: The dependent variable in all regressions is the log average price of a specific product. The equation is estimated in first differences. 2SLS refers to our instrumental variable based on the fourth lag of the migrant share (this variable is *not* given in first differences in the estimation). All variables are given at the province level (*provincias*). Full first stage results are available from the author upon request. Robust standard errors are clustered at the level of 50 different provinces and are given in parentheses. *,**,*** denote significance at the 10%, 5%, 1% levels, respectively.

Different countries of origin. In a final step of our analysis we consider different countries of origin. It is well-known that for many people from Western Europe Spain serves as a country to spend their retirement. It is obvious that the implications for wages and consumer prices can be radically different depending on whether migrants integrate into the labour market or not, what their incomes and wealth are, and how much time per year they actually spend in the country. To capture these differences in a very simple fashion, we distinguish between migrants from Western European countries and migrants from all other countries in the world. In terms of the regression

equation, we include now the share of migrants from Western Europe and the share of migrants from other countries simultaneously, so that we need to instrument two endogenous variables. We do this with the four-year lags of the two respective level variables in the first-differenced estimation equation.

Table 8: Migrants from Western Europe vs. other countries: Tradable goods

	Dep. var.: Log average price of tradable goods					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	2SLS	2SLS	2SLS
Migrant share (Western Europe)	-0.116 (0.121)	-0.105 (0.114)	-0.014 (0.061)	-0.701* (0.415)	-0.634* (0.381)	-0.082 (0.083)
Migrant share (Other countries)	0.115*** (0.037)	0.119*** (0.037)	0.021 (0.046)	0.186 (0.187)	0.217 (0.189)	-0.057 (0.126)
Unemployment rate		-0.008 (0.008)	0.001 (0.009)		-0.005 (0.009)	0.003 (0.009)
Native population (in logs)		-0.032 (0.033)	0.027 (0.039)		-0.026 (0.036)	0.024 (0.030)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year fixed effects	No	No	Yes	No	No	Yes
First stage F-test of excl. inst. (Western Europe)				54.96	100.33	72.68
First stage F-test of excl. inst. (Other countries)				17.26	16.78	70.12
N	750	750	750	750	750	750

Note: The dependent variable in all regressions is the log average price of all tradable goods. The equation is estimated in first differences. 2SLS refers to our instrumental variables based on the fourth lag of the two different migrant shares (these variable are *not* given in first differences in the estimation). All variables are given at the province level (*provincias*). Full first stage results are available from the author upon request. Robust standard errors are clustered at the level of 50 different provinces and are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively.

For tradable goods, we find no significant effect of immigration on consumer prices, regardless of the country of origin. This can be seen in column (6) of Table 8, where the coefficients of both migrant shares are insignificant. For non-tradable goods and services, we find that the effect of migrants from Western Europe is insignificant, while the effect of migrants from other countries is negative and highly significant; see column (6) of Table 8. The estimated coefficient of -0.273 implies that an increase in the share of migrants from other countries (i.e., non-Western European countries) by 10 percentage points reduces average consumer prices of non-tradable goods and

Table 9: Migrants from Western Europe vs. other countries: Non-tradable goods and services

	Dep. var.: Log average price of non-tradable goods					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	2SLS	2SLS	2SLS
Migrant share (Western Europe)	-0.238** (0.098)	-0.229** (0.096)	-0.091 (0.067)	-0.326* (0.173)	-0.322** (0.144)	-0.078 (0.130)
Migrant share (Other countries)	0.167*** (0.042)	0.171*** (0.042)	0.065 (0.041)	0.126 (0.207)	0.126 (0.203)	-0.273*** (0.103)
Unemployment rate		-0.010 (0.009)	-0.004 (0.011)		-0.007 (0.011)	0.004 (0.011)
Native population (in logs)		-0.001 (0.026)	-0.022 (0.034)		0.000 (0.025)	-0.029 (0.037)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year fixed effects	No	No	Yes	No	No	Yes
First stage F-test of excl. inst. (Western Europe)				54.96	100.33	72.68
First stage F-test of excl. inst. (Other countries)				17.26	16.78	70.12
N	750	750	750	750	750	750

Note: The dependent variable in all regressions is the log average price of all non-tradable goods and services. The equation is estimated in first differences. 2SLS refers to our instrumental variables based on the fourth lag of the two different migrant shares (these variable are *not* given in first differences in the estimation). All variables are given at the province level (*provincias*). Full first stage results are available from the author upon request. Robust standard errors are clustered at the level of 50 different provinces and are given in parentheses. *,**,*** denote significance at the 10%, 5%, 1% levels, respectively.

services by more than 2.5 percent. This is a sizable effect, and it squares well with the idea that immigrants can help in reducing domestic consumer prices by raising domestic labor supply. The effect is also consistent, however, with different price elasticities of demand depending on immigrants' countries of origin (low-income versus high-income).

4 Conclusion

We have conducted an investigation into the effect of immigration on consumer prices in Spain focusing on a major migration episode from the recent past: the immigration boom to Spain triggered by strong economic growth before the 2008 financial crisis. Overall, we find plausible and negative effects on consumer prices concentrated among non-tradable goods and services, as well as among goods intensive in migrant labor. Interestingly, these effects materialize exclusively in the wake of the 2008 financial crisis and subsequent economic recession, a period of extraordinary economic distress.

We should like to close by emphasizing the significant negative effect that we found immigration to have on food prices. Food products have the largest weight in the national CPI index that we use in our analysis (more than 20%). The benefits of these price reductions caused by immigration accrue to all households. However, they favor low-income households more than high-income households, because food accounts for a larger share of expenditure among low-income households. According to data from Eurostat, households in Spain from the bottom income quintile allocated 23.8% of their total consumption expenditure to food in 2005.¹⁶ The same number for households from the top income quintile was a mere 11.8%. This is a sizable difference that needs to be taken into account when evaluating effects of immigration on real wages and inequality.

¹⁶The data are available at https://ec.europa.eu/eurostat/databrowser/product/page/hbs_str.t223.

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A Appendix

Table A.1: Regions and provinces in Spain

<u>ANDALUCÍA</u>	<u>CASTILLA Y LEÓN</u>	<u>CATALUÑA</u>	<u>GALICIA</u>
Almería	Ávila	Barcelona	La Coruña
Cádiz	Burgos	Girona	Lugo
Córdoba	León	Lleida	Orense
Granada	Palencia	Tarragona	Pontevedra
Huelva	Salamanca		
Jaén	Segovia	<u>COMUNITAT VALENCIANA</u>	<u>PAÍS VASCO</u>
Málaga	Soria	Alicante	Álava
Sevilla	Valladolid	Castellón	Guipúzcoa
	Zamora	Valencia	Vizcaya
<u>ARAGÓN</u>			
Huesca	<u>CASTILLA-LA MANCHA</u>	<u>EXTREMADURA</u>	<u>OTHER PROVINCES/REGIONS</u>
Teruel	Albacete	Badajoz	Principado de Asturias
Zaragoza	Ciudad Real	Cáceres	Illes Balears
	Cuenca		Cantabria
<u>CANARIAS</u>	Guadalajara		Comunidad de Madrid
Las Palmas	Toledo		Región de Murcia
Santa Cruz de Tenerife			Comunidad Foral de Navarra
			La Rioja

Note: The table shows autonomous communities and provinces in Spain. Ceuta and Melilla are excluded.

Table A.2: Migrants by industry in 2002 (NACE rev. 1.1)

NACE code	Industry	Migrant share (in %)
A	Agriculture, hunting and forestry	9.72
B	Fishing	5.60
C	Mining and quarrying	15.59
D	Manufacturing	5.40
E	Electricity, gas and water supply	2.60
F	Construction	9.88
G	Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods	6.19
H	Hotels and restaurants	18.89
I	Transport, storage and communication	6.96
J	Financial intermediation	3.32
K	Real estate, renting and business activities	8.86
L	Public administration and defence, compulsory social security	2.20
M	Education	4.57
N	Health and social work	5.19
O	Other community, social and personal service activities	5.75
P	Activities of households	33.65
Q	Extra-territorial organizations and bodies	70.15

Note: The data come from the EU Labor Force Survey (EU-LFS).

Table A.3: Migrants by occupation in 2002 (ISCO 88)

ISCO 88 code	Occupation name	Migrant share (in %)
11	Legislators and senior officials	4.01
12	Corporate managers	8.15
13	Managers of small enterprises	5.83
21	Physical, mathematical and engineering science professionals	7.82
22	Life science and health professionals	6.15
23	Teaching professionals	4.42
24	Other professionals	6.72
31	Physical and engineering science associate professionals	5.16
32	Life science and health associate professionals	6.08
33	Teaching associate professionals	3.01
34	Other associate professionals	5.83
41	Office clerks	4.38
42	Customer services clerks	8.41
51	Personal and protective services workers	13.34
52	Models, salespersons and -demonstrators	5.10
61	Market-oriented skilled agricultural and fishery workers	4.54
71	Extraction and building trades workers	8.24
72	Metal machinery and related trades workers	5.79
73	Precision handicraft, craft printing and related trades workers	3.60
74	Other craft and related trades workers	5.05
81	Stationary plant and related operators	4.85
82	Machine operators and assemblers	4.51
83	Drivers and mobile plant operators	5.44
91	Sales and services elementary occupations	17.90
92	Agricultural, fishery and related labourers	24.00
93	Labourers in mining, construction, manufacturing and transport	13.44

Note: The data come from the EU Labor Force Survey (EU-LFS). Armed forces are excluded.

Table A.4: Product correspondence COICOP subgroups (before/after 2002)

COICOP (from 2002 on)	COICOP (before 2002)	CPI weight 2002 (in %)
011 Food*	Food	206.452
012 Non-alcoholic beverages*	Non-alcoholic beverages	12.178
021 Alcoholic beverages*	Alcoholic beverages	8.999
022 Tobacco*	Tobacco	23.171
031 Clothing*	Clothing, including repairs	79.258
032 Footwear*	Footwear, including repairs	20.023
041 Actual rentals for housing 043 Maintenance and repair of the dwelling 044 Water supply and miscellaneous services relating to the dwelling	Housing and water supply	69.21
045 Electricity, gas and other fuels	Heating and lighting	41.049
051 Furniture and furnishings, carpets and other floor coverings*	Furniture, accessories, floor coverings and repairs	19.547
052 Household textiles*	Articles, other furniture and repairs	5.626
053 Household appliances*	Heating apparatus, electrical appliances and repairs	10.795
054 Glassware, tableware and household utensils*	Glassware, crockery, household furnishings and ut. and repairs	1.972
055 Tools and equipment for house and garden* 056 Goods and services for routine household maintenance	Goods and services for household maintenance, except domestic service Domestic service	25.63
061 Medical products, appliances and equipment*	Medicines and other pharmaceutical products Apparatus, therapeutic material and repairs	16.203
062 Out-patient services	Out-of-hospital services of doctors, nurses and others	10.841
063 Hospital services	Hospital care and similar services	1.018
071 Purchase of vehicles*	Purchase of vehicles for personal transport	71.769
072 Operation of personal transport equipment	Use of vehicles	72.912
073 Transport services	Transport services	11.079
082 Telephone and telefax equipment* 083 Telephone and telefax services 091 Audio-visual, photographic and information processing equipment*	Communication	39.38
093 Other recreational items and equipment, gardens and pets*	Recreational articles, accessories and repairs	10.379
094 Recreational and cultural services	Leisure, entertainment and cultural services	14.526
095 Newspapers, books and stationery	Books, newspapers and magazines	17.2
096 Package holidays	Tourist services	11.507
101 Pre-primary and primary education 102 Secondary education 104 Tertiary education 105 Education not definable by level	Education	17.444
111 Catering services 112 Accommodation services	Restaurants, bars, coffee bars and hotels	112.707
121 Personal care	Goods and services for personal care	22.531
123 Personal effects n.e.c.*	Other personal articles	5.173
124 Social protection		2.314
125 Insurance	Medical insurance	34.693
126 Financial services n.e.c.	Financial services	0.278
127 Other services n.e.c.	Other services	4.135

Note: Product subgroups marked with an asterisk (*) are classified as tradable goods. The CPI weight is the national CPI weight from 2002.

Table A.5: Industry-product correspondence (NACE rev. 1.1/COICOP)

Industry NACE rev. 1.1	COICOP (from 2002 on)
A Agriculture, hunting and forestry	011 Food
B Fishing	
C Mining and quarrying	
D Manufacturing	012 Non-alcoholic beverages 021 Alcoholic beverages 022 Tobacco 031 Clothing 032 Footwear 051 Furniture and furnishings, carpets and other floor coverings 052 Household textiles 053 Household appliances 054 Glassware, tableware and household utensils 055 Tools and equipment for house and garden 061 Medical products, appliances and equipment 082 Telephone and telefax equipment 091 Audio-visual, photographic and information processing equipment 071 Purchase of vehicles 123 Personal effects n.e.c.
E Electricity, gas and water supply	044 Water supply and miscellaneous services relating to the dwelling 045 Electricity, gas and other fuels
F Construction	
G Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods	072 Operation of personal transport equipment 093 Other recreational items and equipment, gardens and pets
H Hotels and restaurants	096 Package holidays 111 Catering services 112 Accommodation services
I Transport, storage and communication	073 Transport services 081 Postal services 083 Telephone and telefax services 095 Newspapers, books and stationery
J Financial intermediation	125 Insurance 126 Financial services n.e.c.
K Real estate, renting and business activities	041 Actual rentals for housing 043 Maintenance and repair of the dwelling 127 Other services n.e.c.
L Public administration and defence, compulsory social security	124 Social protection
M Education	101 Pre-primary and primary education 102 Secondary education 104 Tertiary education 105 Education not definable by level
N Health and social work	062 Out-patient services 063 Hospital services
O Other community, social and personal service activities	094 Recreational and cultural services 121 Personal care
P Activities of households	056 Goods and services for routine household maintenance
Q Extra-territorial organizations and bodies	