Immigrants, Legal Status, and Illegal Trade

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Abstract

Does globalization also integrate illegal markets? Illicit smuggling across international borders generates nearly $2 trillion per year, yet little is known about what forces shape this trade. In this paper, I use novel data on nearly 10,000 seizures of illegal drugs in Spain to study how immigrants and immigrant legal status affect the flow of illegal drugs. I estimate a gravity model of drug trafficking and instrument for bilateral immigrant population. I find that a 10% higher bilateral immigrant population raises the imported drug seizures by 12% and that this relationship is driven entirely by immigrants without legal status. To better understand the role of immigration policy, I exploit an extraordinary regularization of nearly half a million immigrants in 2005. Event study estimates suggest that providing immigrants a path to citizenship may further diminish the effect of immigrants on drug trafficking.

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1 Introduction

Many illegal goods are not produced where they are consumed, resulting in the trafficking of nearly \$2 trillion worth of illegal goods across international borders—worth 10% of the value of legal global merchandise trade (Mavrellis, 2017). Yet, research on illegal trafficking has primarily focused on determinants of trafficking at the region-level, ignoring its bilateral (region-to-region) nature. One popular but untested opinion holds that immigrants facilitate the trafficking of illegal goods from the immigrants' home country to their host region.[1]

It is widely believed that immigrants without legal status primarily drive crime and trafficking in particular.[2] Immigrants without legal status are prevented from working in the formal sector, thereby reducing their earnings relative to their legal counterparts (Kossoudji and Cobb-Clark, 2002; Kaushal, 2006; Simón et al., 2014; Sanromá et al., 2015). The Becker-Ehrlich model of crime (Becker, 1968; Ehrlich, 1973) suggests that this differential in earnings, and therefore opportunity costs, will result in a higher propensity in participation in financially-motivated illegal activities, such as trafficking in illegal goods.

In this paper, I estimate how immigrants and immigration policy affect the trafficking of one of the most consequential illegal goods: illegal drugs. Credibly answering this question is challenging for two reasons. First, the illegal nature of trafficking and undocumented immigration makes measurement difficult. Second, other factors (such as geography) may drive both bilateral immigrant population and illegal trafficking.

To make progress on the lack of drug trafficking data, I use detailed data on bilateral drug seizures. In particular, I use a database of individual drug seizures compiled by the United Nations to proxy for actual drug flows in the context of Spain, a country with high-quality reporting of bilateral drug seizures. These data report not only where the drug seizure occurred within Spain but also which country the drugs were trafficked from and, if available, to which country the drugs were intended to be trafficked to, thus providing a unique bilateral view on trafficking. To validate that this indirect measure captures variation in actual flows of illegal goods, I compare seizures to survey-based measures of drug use and availability at the province-level. I find that more seizures correspond to more drug use and availability.

[1] Most famously is Donald Trump's suggestion in 2015 that Mexican immigrants were "bringing drugs [and] crime" into the United States. Others have made a similar points. For example, in 2017 then presidential candidate Sebastian Piñera blamed Chile's immigration laws for "importing problems like delinquency, drug trafficking and organized crime" (Esposito and Iturrieta, 2017). In addition, the European Union High Representative for Common Foreign and Security Policy argued in 2003 that, "massive flow[s] of drugs and migrants are coming to Europe and [will] affect its security. These threats are significant by themselves, but it is their combination that constitutes a radical challenge to our security" (Solana, 2003).

[2] In both the United States and Europe, respondents to the Transatlantic Trends survey blame irregular immigrants for increasing crime much more than regular immigrants.

I exploit unique institutional features in Spain that facilitate the measurement of irregular immigrant populations. Unlike the United States and other European countries, immigrants to Spain can obtain healthcare and other government benefits regardless of their legal status in exchange for registering with the local population registry. Comparing this immigrant total population count with the number of immigrants with legal residency permits allows for a straightforward estimation of the irregular immigrant population (González-Enríquez, 2009; Gálvez Iniesta, 2020).

To make progress on causal identification, I take a gravity approach with instrumental variables. In particular, I relate bilateral drug seizures to bilateral immigrant population in a gravity equation, which allows me to control for observed and unobservable features of the origin and destination regions. In addition, I adapt the instrumental variables approach developed by Burchardi et al. (2019) to generate exogenous variation in bilateral immigrant populations.

I find that a higher bilateral immigrant population facilitates bilateral importation and re-export of illegal drugs. On average, I find that a 10% increase in the bilateral immigrant population relative to the mean raises the likelihood of a seizure occurring by 0.5 percentage points and the value of bilateral imported drugs seized by 12%. In addition, I find that a 10% increase in the bilateral immigrant population raises the likelihood of bilateral seizure of drugs intended for re-export by 0.4 percentage points and the value of drugs intended for re-export by 7%.

Next, I assess the extent to which immigrant legal status can explain my baseline results. To do so, I modify my baseline gravity specification by including separate terms for regular and irregular bilateral immigrant population. I find that the estimated effect of immigrants on trafficking is driven entirely by irregular immigrants

The baseline bilateral results are robust to a range of alternative specifications and sampling choices. I gradually relax the functional form assumptions in my baseline specification, first using non-linear generalized method of moments, and then using non-parametric estimation methods, and find results consistent with my baseline estimation. In addition, no single drug or region drives my baseline result, as I find consistent effects when leaving-out individual origins, destination, and drugs. I also use a similar gravity specification to analyze the impact of bilateral immigrant population on bilateral legal trade and find magnitudes comparable to what I find for illegal drug trafficking.

I argue that the social connections of immigrants to their origin country primarily drives the bilateral immigrant-traffickign relationship that I estimate. Net of the origin and destination fixed effects and differential immigrant selection, immigrants may raise bilateral trafficking of illicit drugs for two reasons. First, immigrants may prefer to consume goods from their home country (Bronnenberg et al., 2012; Atkin, 2013). However, product differentiation of illegal drugs across trafficking (not production) origins is unlikely to occur in the context of drug markets. In addition, I find that immigrants consume drugs at significantly lower rates than the native-born. Second, immigrants may reduce bilateral trade costs between origin and destination through their social connections to their origin country. Due to the absence of evidence on immigrant preferences driving my results, I rule-in the trade cost explanation.

A competing explanation is that the intensity with which law enforcement conduct drug enforcement activities rather than the actual amount of drug flows drives my results. Note that in the gravity specification, enforcement intensity that targets certain nationality groups (but is common across Spain) or provincial law enforcement that is especially effective (but uniformly effective across nationality groups) is absorbed by the origin and destination fixed effects. I take several approaches to rule out that residual bilateral-specific enforcement intensity drives my baseline results. I first quantitatively rule out that changes in enforcement intensity in response to more bilateral immigrants could explain my baseline effect size. Next, I show that more immigrants at the Spanish province-level lead to more drug consumption by the native-born. Finally, I exploit the fact that for bilateral links that I predict to be near the extensive margin of trafficking illegal drugs, enforcement changes caused by variation in the number of immigrants will not drive seizures. The estimates do not differ substantially from my baselines results.

I also find that general equilibrium responses, including the changes in the participation of the native-born in drug markets, do not offset the effect of immigrants on trafficking. I assess the strength of these general equilibrium responses by analyzing additional measures of drug market activity at the province-level. I find that a 10% increase in the proportion of immigrants in the local population in a province raises seizures of drugs imported into the province by 14%. I also find that a higher proportion of immigrants in the province population does not affect the number of arrests of native-born Spaniards for drug trafficking, but increases the number of cannabis plants cultivated per capita in the province.

To better understand how immigration policy can mitigate the immigrant-trafficking relationship, I exploit a major immigrant regularization program implemented in 2005. This program resulted in nearly half a million immigrants receiving legal status. The program also set regularized immigrants on the path to citizenship. Immigrants are eligible for citizenship after living in Spain continuously and legally for a number of years depending on the immigrant's country of origin.

I find that the 2005 mass immigrant regularization reduced drug trafficking significantly once immigrants became eligible to become Spanish citizens. While I observe no immediate effect of regularization on trafficking, this is consistent with Pinotti (2017), as the eligible immigrants had pre-existing attachment to the formal labor market. I calculate that the long-run effect of regularizing an additional 10,000 immigrants in a province reduces the likelihood of trafficking occurring in that province by 2.3 percent.

The main contribution of this paper is to provide the first causally identified estimates of the effect of immigrants on illegal trafficking and the first exploration of mechanisms that generate this relationship. Related work by Berlusconi et al. (2017), Giommoni et al. (2017), and Aziani et al. (2019) uses country-pair level on drug seizures to assess how bilateral immigrant population, among other factors, correlates with bilateral drug seizures. They consistently find that immigrant population is positively associated with drug trafficking. However, their analyses have three limitations relative to the present study. First, they do not use exogenous variation in bilateral immigrant population between countries, which may bias their results if unobserved bilateral factors, such as geographic similarity or cultural ties, drive both migration and smuggling. Second, they do not include origin or destination fixed effects, so unobserved country-specific factors may similarly cause omitted variable bias. Third, their analyses are at the country-pair level. Thus, even if they had included fixed-effects, unobserved national policies vis-a-vis a partner country may still bias the results. Finally, their analyses do not explore the mechanisms (including the role of legal status) driving the positive immigrants-seizures relationship that they estimate.

I provide evidence for a new mechanism linking immigration and crime: immigrants' social connections to their home country. Prior research on immigration and crime tends to focus on the labor market opportunities available to immigrants (Bell et al., 2013; Spenkuch, 2014; Pinotti, 2017; Freedman et al., 2018). I also show the potential for long-run effects of immigrant legalization, in part due to immigrant naturalization, whereas prior work focuses on short-run effects.

I extend the literature on the effects of globalization to illegal markets. Most related is the literature estimating the effect of immigrants on *legal* trade (Gould, 1994; Head and Ries, 1998; Rauch and Trindade, 2002; Combes et al., 2005; Cohen et al., 2017; Parsons and Vézina, 2018). However, none of the existing studies assessed the role that immigrants play in facilitating *illegal* trade.

Finally, I expand upon the literature on the economics of illegal trade by studying the trafficking of illegal drugs, one of the most consequential illegally smuggled goods. The present study follows a strand of mostly theoretical papers on the economics of smuggling (Bhagwati and Hansen, 1973; Grossman and Shapiro, 1988; Thursby et al., 1991) Fisman and Wei (2009) did more recent empirical work on the smuggling and misinvoicing of cultural goods and Akee et al. (2014) estimates the determinants of human trafficking.

This paper proceeds as follows. Section 2 introduces the data, some stylized facts about drug trafficking, and validates the drug seizures data as a proxy for actual drug flows. Section 3 presents my empirical strategy and results. Section 4 discusses enforcement intensity and general equilibrium responses, and Section 5 discusses the role for immigration policy. Section 6 concludes.

2 Measuring Bilateral Drug Trafficking

Because drug trafficking is illegal and therefore difficult to measure, I use an indirect measure to study bilateral drug trafficking: bilateral drug seizures. To validate that this indirect measure captures variation in actual flows of illegal goods, I compare seizures to survey-based measures of drug availability and use at the province-level and find that more seizures correspond to more drug use and availability.

2.1 Drug Trafficking Data Description

I use a database of individual drug seizures compiled by the United Nations to proxy for actual drug flows in the context of Spain, a country with high-quality reporting of bilateral drug seizures. Using indirect measures as a proxy for illegal and therefore hard-to-observe activity is typical in the study of crime and follows Dell (2015) and Dube et al. (2016) who also study illegal drug activity. These data report not only where the drug seizure occurred within Spain but also which country the drugs were trafficked from and, if available, to which country the drugs were intended to be trafficked to, thus providing a unique bilateral view on trafficking.

My measure of drug seizures derives from a novel dataset of individual wholesale-level drug seizures at the bilateral level compiled by the United Nations Office of Drugs and Crime (UNODC). An observation in these data is a single drug seizure event and details the type of drug, the amount seized, the country from which the drugs were trafficked, and, the location of the seizure. By including both the locality of a seizure and its country of departure, I observe the bilateral linkage for each seizure event. A subset of seizures list the intended destination country of the drugs.

I primarily utilize seizures reported by Spain.[3] These data are compiled in Spain's Sta-

[3]Reporting drug seizures to the UNODC is voluntary. I focus on Spain, a country that reports a substantial number of drug seizures to the UNODC annually (see Figure 1) and reports substantially higher quality data than other countries. For example, variables describing the hiding place of seized drugs, the installation where law enforcement found the drugs, the mode of transport, and the routing of the drugs, seizures reported by Spain were missing only 20% of values for these irregularly reported variables between 2011 and 2016. Meanwhile, Spain reported the highest number of bilateral seizures of any country during this

tistical System of Analysis and Evaluation on Organized Crime and Drugs (SENDA), a centralized repository of information on organized crime and the illegal drug trade. This database is filled out by three national law enforcement agencies: the National Police, the Guardia Civil, and the Customs and Excise Department. These agencies report both seizures enacted by their own personnel as well as those conducted in concert with or exclusively by local law enforcement authorities.

Country of origin and intended destination for each drug seizure in the dataset is assigned based on subsequent investigation, where country of origin refers to the most recent foreign country the drugs were in and not the country in which they were produced. For some drug interdictions, assignment of origin/destination country is fairly straightforward. For example, for drugs seized from airline passengers upon arrival at an airport, the origin country is the passenger's departure country and destination country is the passenger's ultimate destination on their travel itinerary. For drugs seized from cargo ship containers, a range of documents are checked for country of origin and intended destination, including the bill of lading, the commercial invoice, the certificate of origin, customs clearance forms and the relevant letter of credit. In the case of "narco-boats" that transport hashish resin in the Strait of Gibraltar, their country of origin is considered to be Morocco unless proven otherwise. For less straightforward cases, such as the case of drug gangs transporting cocaine intercepted in the Atlantic Ocean off the Galician coast, the country of origin/destination is determined based on additional information such as suspect and witness interviews and coordination with law enforcement agencies in the suspected origin and destination countries. If a person is arrested within Spain for drug trafficking but outside an airport or port, the country of origin of the drugs will be determined on the basis of the investigations that are carried out or any subsequent checks that may be made on the statements made voluntarily by the arrested person. [4]

To transform quantities seized in dollar amounts, I use illegal drug prices reported by the Centre of Intelligence against Organized Crime at the Spanish Ministry of the Interior.[5]

Three facts emerge when looking at the data. First, nearly all drugs seized by Spanish authorities are cocaine or cannabis, with negligible amounts of amphetamines and heroin as shown in Figure 2. Second, the distribution of drug seizure amounts is right skewed as shown in Figure 3, with many moderate sized seizures (the median seizure value is $43,796) and a

period. By contrast, the median number of seizures reported was 18 and the mean fraction of values of the aforementioned variables missing was 33%.

[4]The preceding description is based on discussions with representatives from the Spanish Ministry of the Interior.

[5]Specifically, these are prices in dollars for 2012 for heroin, cocaine, amphetamines, and cannabis as reported by Spain to the UNODC.

few huge seizures (the mean seizure value is $593,795). In addition, Spain imports cannabis almost exclusively from Morocco and cocaine from Latin America as shown in Figure 4 and exports drugs primarily to the rest of Europe and the Medterranean region . Finally, there is substantial variation in across Spain the the import and export of illegal drugs, as shown in figures 6 and 7.

2.2 Validation Exercise

I now turn to demonstrating that the drug seizures data are a valid proxy for actual illicit drug flows. In particular, I correlate the import drug seizures per capita (net of seizures destined for other countries) in a locality to the availability of drugs in that locality.

This approach is valid so long as local production is insubstantial relative to the local market. This is true for cocaine and heroin, which are produced almost exclusively Latin America and Asia (p. 21, UNODC, 2016). Cannabis can be produced locally, but seizures of domestic cannabis plants (Alvarez et al., 2016) are quite small in comparison with amount of cannabis seized coming from abroad. Amphetamines can also be produced locally, but appear to be a small part of the market, with only 2% of drug treatment entrants seeking help with an amphetamine addiction, a fraction roughly in line with the share of amphetamines in seizures.[6] Note that many drugs may be re-exported to other provinces within Spain, which will modulate the estimated correlation.

To measure local drug availability, I turn to the Survey on Alcohol and Drugs in Spain (EDADES). The EDADES is a nationally representative biennial survey on substance use in Spain of 20 to 30 thousand persons per survey. Respondents are asked about how easy it is for them to access various illegal drugs within 24 hours and how much of a problem illegal drugs are in their neighborhood. I aggregate individual responses from the 2011, 2013, and 2015 survey rounds up to the province level and correlate these to the per capita value of drugs seized from the UNODC over the same period aggregated to the province in which the seizure occurred.

I find that seizures positively correlate with a wide range of measures of local drug availability. In Figure 8 I plot the correlation coefficient between the fraction of respondents stating it was impossible, difficult, relatively easy, or very easy to obtain a particular drug (cannabis, cocaine, or heroin) within 24 hours with the amount of that drug seized in the province per capita between 2011 and 2016. Consistent with seizures corresponding to real flows of illicit drugs, I find that the higher the fraction of respondents declaring it "impossible" to obtain a particular drug, the less of that drug are seized in the province. Conversely, I

[6] https://www.emcdda.europa.eu/countries/drug-reports/2019/spain_en

find that the proportion of respondents saying it is “easy” or “very easy” to obtain a drug correlates positively with the amount of that drug seized in the province. This relationship is much stronger for cannabis and cocaine, the major drugs imported into Spain, and weaker for heroin, whose pathway into Europe is generally believed to lie through the Balkan countries rather than Spain (UNODC, 2014).[7]

I also find that seizures are weakly correlated with respondents’ personal drug use history, as shown in Figure 9. I find a positive correlation between seizures and personal use for cocaine, with imprecise zeros for cannabis and heroin.

In Figure 10 I plot the correlation coefficients of various measures of local drug availability and use to the value of seizures per capita across all illicit drugs. I measure local drug availability and use as the fraction of respondents replying that (in the first bar of Figure 10) drugs are a major problem in their neighborhood or that (for the remaining bars) they see frequently see evidence[8] of drug use and distribution in their neighborhood. For each survey question, seizures vary positively with local drug availability.

Overall, these results are consistent with Dobkin and Nicosia (2009) who find that drug markets quickly rebound even in response to seizures of massive quantities of drugs. The lack of strong correlation is unsurprising, however, since the seizures of drugs observed in the UNODC data are at the wholesale level. Hence, drugs imported into a particular locale may be distributed to other provinces in Spain, thereby weakening the relationship.

3 Bilateral Empirical Analysis

I seek to understand whether immigrants facilitate drug trafficking between their origin country and their new home province--that is, bilaterally. To do so, I relate bilateral drug seizures to bilateral immigrant population in a gravity equation, which allows me to control for observed and unobserved characteristics of the origin and the destination. Because migration and drug trafficking may be jointly determined by other factors, such as geographic or climatic similarity between origin and destination, I generate exogenous variation in bilateral immigrant population using an instrumental variables strategy.

While there exists a positive correlation between the number of immigrants and the value of drugs seized at the bilateral level as shown in Figure 11, this may be driven by other factors, such as origin- or destination-specific institutions or economic development,

[7]The EDADES does not include a question on ease of access to amphetamines for the whole sample period so I exclude it from this analysis.

[8]Respondents are asked how often in their neighborhood they see people (i) drugged and on the ground, (ii) inhaling drugs in paper or aluminum, (iii) injecting drugs, (iv) selling drugs, (v) smoking joints, (vi) snorting drugs by nose, and (vii) leaving syringes lying on the ground.

or bilateral-specific factors. As an example of the relationship which I explore with greater rigor in Section 3.1, I consider the case of Morocco, a major source of both immigrants and cannabis flowing into Spain. Spatially, there is substantial overlap between the immigrant population and the location of seizures of cannabis coming from Morocco, as shown in Figure 12. To more formally evaluate the relationship between bilateral immigrant population and drug trafficking, I next estimate this relationship at the bilateral level in the country of Spain.

3.1 Gravity Regression

My bilateral empirical specification, the gravity equation, allows me to control for origin- and destination-specific characteristics which may shape trafficking and migration. I also show that bilateral enforcement intensity variation does not bias my results so long as bilateral enforcement intensity is conditionally independent of bilateral immigrant population.

Specification I now turn to estimating the effect of the number of bilateral immigrants on bilateral drug trafficking. Because I cannot observe actual bilateral drug trafficking amounts, I instead look to seizures of illegal drugs. I define actual drug flows by value from origin country o to province d as $X_{o,d}$, which is unobserved, and bilateral enforcement intensity, also unobserved, as $E_{o,d} \in [0,1]$. The value of bilateral seizures of drug imports seized in province d and coming from country o as $S_{o,d}$, which I do observe, is then defined by

$$S_{o,d} = E_{o,d} X_{o,d} \tag{1}$$

Given perfect information, I would estimate gravity equation of the form[9]

$$\ln(X_{o,d}) = \alpha_o + \alpha_d + \beta M_{o,d} + \delta \ln(Dist_{o,d}) + \tilde{\varepsilon}_{o,d}$$

where α_o and α_d are origin and destination fixed effects, $Dist_{o,d}$ is the distance in kilometers between o and d taken from Peri and Requena-Silvente (2010), and $M_{o,d}$ is the number of immigrants from o living in d, usually defined as the log of 1 plus the number of immigrants in d from o, measured in thousands (my results are robust to this functional form choice, as I show in Section 3.5). I measure the bilateral immigrant population $M_{o,d}$ using the 2011 Spanish Census distributed by Minnesota Population Center (2019).

Plugging in equation 1, I obtain

$$\ln(S_{o,d}) = \alpha_o + \alpha_d + \beta M_{o,d} + \delta \ln(Dist_{o,d}) + \varepsilon_{o,d} \tag{2}$$

[9] I provide microfoundations for this gravity equation in Appendix A.

where the error term $\tilde{\varepsilon}_{o,d}$ includes all omitted bilateral forces, and $\varepsilon_{o,d} = \tilde{\varepsilon}_{o,d} + \ln(E_{o,d})$.

The origin country and destination province fixed effects are key to my identification strategy. The origin fixed effect α_o controls for, among other factors, the economic development, institutions, and crime in the origin country, as well as national-level policies of Spain vis-a-vis origin country o. These country-pair level policies can include visa regimes, customs regulations, national law enforcement priorities, and so on. Similarly, the destination fixed effect α_d similarly controls for factors of province d common across origins, such as the province's police force strength and the economic conditions in d.

For the empirical analysis, I replace the dependent variable $\ln S_{o,d}$ with $\ln(1 + S_{o,d})$ to avoid dropping bilateral links with no seizures, as these make up more than half my sample. I also estimate the immigrant-trafficking relationship using a dummy for whether any seizure occurred as a dependent variable.

I also explore how the number of immigrants affects the re-export margin of drug trafficking. For that exercise, I consider drugs seized in d but which were intended to go to country o. The dependent variables of interest in equation 2 then become a dummy for whether any seizure of outbound drugs occurred, $\mathbf{1}\{S_{d,o} > 0\}$, and the log of 1 plus the value of outbound drugs seized, $\ln(1 + S_{d,o})$.

OLS Results In Tables 1 through 4, I show results when iteratively adding fixed effects controls. As expected, I find that including the province and country fixed effects significantly reduces the strength of the positive correlation between immigrants and drug seizures.

3.2 Instrumental Variable Approach

There may be unobserved factors driving both migration and drug trafficking, such as geographic or climatic similarity. To purge this potential confounding variation from bilateral immigrant populations, I adapt a leave-out push-pull instrumental variables approach to my setting.

Consider, for example, Moroccan immigrants settling in the province of Alicante may be drawn by its similar Mediterranean climate. Additionally, drug traffickers who are skilled at piloting boats in the waters off the coast of Morocco will also be skilled at piloting boats in similar climates.

To obtain variation in migration exogenous to such concerns, I follow Burchardi et al. (2019) and develop instruments for bilateral immigrant population using a set of leave-out push-pull instruments. These instruments produce exogenous variation in bilateral immigrant inflows. I use two decades of inflows between 1991 and 2011 to predict the current bilateral immigrant population. During this period the share of immigrants in Spain's population rose from below 1 percent to well over 10 percent as shown in Figure 13, representing "the highest rate of growth of the foreign-born population over a short period observed in any OECD country since the Second World War". (OECD, 2010)

The intuition of the instrument is that a social connection, in this case a migration decision, between and origin and a destination is likely to occur when the origin is sending many immigrants at the same time the destination is pulling in many immigrants.

For example, suppose we want to predict the number of Moroccans settling in the province of Alicante. To do so, we look at the number of Moroccans inflowing into Spain and the number of immigrants from all origin countries inflowing into Alicante for the same decade. In particular, the instrument will predict Moroccans to settle in Alicante if large numbers of immigrants from other countries are also settling there. Similarly, if many immigrants from other origins are settling in Alicante, then an immigrant arriving from Morocco will be predicted to settle in that province.

More specifically, the migration leave-out push-pull instrument interacts the arrival at the national level of immigrants from different origin countries (push) with the attractiveness of different destinations to immigrants (pull) measured by the fraction of immigrants settling in destination d. A simple version of the instrument predicts bilateral immigrant inflows and is defined as

$$\tilde{IV}^{D}_{o,d} = I^{D}_{o} \times \frac{I^{D}_{d}}{I^{D}}, \tag{3}$$

where I^D_o is the number of immigrants from origin o coming to Spain in decade D, I^D_d is the number of immigrants from all origins settling in destination province d in decade D, and I^D is the total number of immigrants arriving in Spain in decade D.[10]

However, if immigrant inflows are correlated between similar origin countries or between similar Spanish provinces or if bilateral migration is a large share of migration to d or from o, then predicting bilateral flows between o and d using equation 3 would fail the exclusion restriction. For example, if both Moroccan and Algerian immigrants go to the province of Alicatnte due to their similar Mediterranean climates, then Moroccan migration to Alicante will be predicted, by Algerian migration so long as Algerian migration to Alicante is a sufficiently large share of total migration to Alicante, which are both jointly predicted by a third factor, climate, which may also affect drug trafficking (for example, if calm weather facilitates smuggling by sea). To avoid such endogeneity, I again follow Burchardi et al. (2019) and leave out both the continent of origin country o and the autonomous community (the highest-level administrative unit in Spain) of province d to construct the instrumental

[10] An inflow from o to d is defined as a person interviewed in d for the 2001 or 2011 Spanish census with a nationality from o who arrived in the 10 years prior to the survey.

variable defined as

$$IV_{o,d}^{D} = I_{o,-a(d)}^{D} \times \frac{I_{-c(o),d}^{D}}{I_{-c(o)}^{D}} \tag{4}$$

where $a(d)$ is the set of provinces in the autonomous community of d and $c(o)$ is the set of countries on o's continent.

To measure immigrant inflows, I use the 2001 and 2011 Spanish Census from the National Institute of Statistics distributed by the Minnesota Population Center (2019). From these data, I use respondents' country of nationality, current province of residence in Spain, and year of migration. Since the set of origin countries for which I observe immigrant nationality differs for the two Census waves, I aggregate countries into the smallest consistent units allowable.

In Figure 14 I plot the first-stage fit of the instruments for the two decades of predicted inflows. The instruments vary positively with the log number of immigrants as expected.

3.3 Results

Imports Table 5 shows the estimation results for the instrumented gravity specification, equation 2, for seizures of imported drugs. Column 1 shows the first-stage coefficients, with both instruments having positive and statistically significant coefficients and the first-stage F-statistic surpassing conventional threshold levels. In column 2, I estimate equation 2 on the extensive margin of drug trafficking while instrumenting for the number of immigrants using two decades of exogenous predicted immigrant inflows. The coefficient estimate of the effect of immigrants on the likelihood of a seizure of imported drugs on that bilateral link is 0.105 (SE=0.039), which is statistically significant at the 1% level. This estimate implies that at the mean level of bilateral immigrant population, 933, a 10% increase in the number of bilateral immigrants raises the likelihood that the link will be used for drug trafficking by 0.5 percentage points.[11] Similarly, in column 3, the coefficient estimate on bilateral immigrant population on the log value of drugs seized is 2.33 (SE=0.56), which implies that a 10% increase in bilateral immigrant population relative to the mean raises the value of drug imports seized by 12%.[12] This is in line with other estimates in the literature

[11] Using $\hat{\beta} = 0.105$ from column 2 in Table 5, we have: $\mathbb{1}\left[S_{o,d}^{2011-2016} > 0 | M_{o,d}^{2011} = 933\right] = 0.105\left(\ln\left(1 + \frac{933\times1.1}{1000}\right) - \ln\left(1 + \frac{933}{1000}\right)\right) \approx 0.0049$.

[12] Using $\hat{\beta} = 2.331$ from column 3 in Table 5, we have: $\frac{S_{o,d}^{2011-2016}[M_{o,d}^{2011}=1.1\times933]}{S_{o,d}^{2011-2016}[M_{o,d}^{2011}=933]} - 1 = \exp\left(2.331\left(\ln\left(1 + \frac{1.1\times933}{1000}\right) - \ln\left(1 + \frac{933}{1000}\right)\right)\right) - 1 = 0.116$.

examining the effect of bilateral immigrant population on legal trade.[13]

Re-Exports Table 6 shows the estimation results when the dependent variable is seizures of drugs intended for re-export. Column 2 shows the extensive margin result. The coefficient estimate of the effect of immigrants on the likelihood of a seizure of imported drugs on that bilateral link is 0.083 (SE=0.021), which is statistically significant at the 1% level. This estimate implies that at the mean level of bilateral immigrant population, 933, a 10% increase in the number of bilateral immigrants raises the likelihood that the link will be used for drug trafficking by 0.4 percentage points.[14] Similarly, in column 3, the coefficient estimate of bilateral immigrant population on the log value of drugs seized is 1.339 (SE=0.34), which implies that a 10% increase in bilateral immigrant population relative to the mean raises the value of drug imports seized by 6.5%.[15]

3.4 Preferences for Drugs and Trade Costs

Next, I argue the bilateral results presented in Section 3.3 are driven primarily by the reduction in bilateral trade costs caused by the social connections of immigrants. Imigrants may raise imports of illicit drugs for two reasons. First, immigrants may prefer to consume goods from their home country. Second, immigrants reduce trade costs between origin and destination. I argue that immigrant preferences are unlikely to be important in the case of illegal drugs, resulting in immigrant social connections reducing trade costs as the primary mechanism driving my baseline bilateral results.

Migrant Preferences. Atkin (2013) and Bronnenberg et al. (2012) suggest that immigrants may share the same tastes for food and other products as consumers in their origin region. To the extent that these tastes carry over to illicit drugs, more drugs may be trafficked to regions with more immigrants. To the extent that consumers can differentiate drugs trafficked from different origin countries, more drugs may be trafficked along bilateral links which also experience more immigration.

To address this, I compare drug-use between immigrants and the native-born. I find that immigrants consume drugs at a substantially lower rate than native-born Spaniards.

[13]See, for example, Parsons and Vézina (2018), who estimate the effect of a 10% increase in immigrant population raises the amount of legal trade by 4.5% to 13.8%.

[14]Using $\hat{\beta} = 0.083$ from column 2 in Table 6, we have: $\mathbb{1}\left[S_{d,o}^{2011-2016} > 0 | M_{o,d}^{2011} = 933\right] = 0.083\left(\ln\left(1+\frac{933\times1.1}{1000}\right) - \ln\left(1+\frac{933}{1000}\right)\right) \approx 0.0039$.

[15]Using $\hat{\beta} = 1.339$ from column 3 in Table 6, we have: $\frac{S_{d,o}^{2011-2016}[M_{o,d}^{2011}=1.1\times933]}{S_{d,o}^{2011-2016}[M_{o,d}^{2011}=933]} - 1 = \exp\left(1.339\left(\ln\left(1+\frac{1.1\times933}{1000}\right) - \ln\left(1+\frac{933}{1000}\right)\right)\right) - 1 = 0.065$.

Using the EDADES data introduced in Section 2.2 for the years 2005 through 2015 I find that 22% of those born outside of Spain have ever consumed marijuana, cocaine, heroin, or amphetamines compared to nearly 35% of the Spanish-born. This suggests that immigrants are not driving increases in the local drug use prevalence. In addition, drugs are unlikely to be differentiable to consumers across trafficking origin.

Trade Costs. Migrants may increase illegal trade in much the same way they raise legal trade. Felbermayr et al. (2015) notes that migrant networks can reduce information and search frictions for trade between two locations since trust may be greater within nationality and information travels more smoothly within nationality group. Qualitative studies from the criminology literature provide evidence for this mechanism in the drug trafficking context. For example, in a set of interviews with traffickers jailed the United Kingdom by Matrix Knowledge Group (2007), traffickers stressed the importance of recruiting workers from their social networks[16] (with whom they are likely to share nationality), the importance of greater trust within nationality,[17] and the helpfulness of living close to immigrants coming from source countries of illicit drugs in reducing search costs.[18] Additionally, migrant networks raise the cost of opportunistic or cheating behavior by firms within the nationality network, who can be punished for bad behavior by being shunned from business within the network (Rauch and Trindade, 2002).

3.5 Robustness to Functional Form

In my baseline specification, equation 2, I measure the endogenous variable of interest as the log of one plus the number of immigrants measured in thousands, $\ln\left(1 + \frac{migrants_{o,d}^{2011}}{1000}\right)$. To test whether my results are sensitive to changes in the function form of the endogenous variable, I perform several robustness exercises.

First, I estimate my baseline specification across a range of alternative functional forms for the number of immigrants, with results shown in Tables A.1 and A.2. Across functional forms, more immigrants still lead to more drug seizures. I also show a binscatter plot in Figure A.1 of the relationship between the bilateral number of immigrants and the dummy variable for whether any seizure occurs; this relationship rougly traces a log function.

[16] "A number of interviewees indicated that the importance of trust meant that they only recruited employees [for their smuggling organization] largely through their existing social networks." (Marsh et al., 2012)

[17] For example, "L-15 [a convicted drug trafficker] was from Ghana. In 2000 he was approached by a Ghanian friend to manage his drug business in the United Kingdom. He was trusted by the dealers he had to manage because they knew his family in Ghana." (Marsh et al., 2012)

[18] For example, one convicted trafficker said of importing cocaine into the United Kingdom, "You need to know someone in the West Indies but this is not difficult to do. London is multicultural, you can meet a contact." Matrix Knowledge Group (2007)

Next, I relax the log functional form assumption. Specifically, I estimate

$$\begin{aligned}
\mathbf{1}\left[S_{o,d}>0\right] &= \delta_o+\delta_d+\beta_1\ln(1+\pi_1 migrants_{o,d}^{2011})+\epsilon_{o,d} \\
\ln(S_{o,d}) &= \alpha_o+\alpha_d+\beta_2\ln(1+\pi_2 migrants_{o,d}^{2011})+\varepsilon_{o,d}
\end{aligned} \tag{5}$$

In equation 5 I estimate (π_1, π_2) whereas in equation 2 I assumed $\pi_1 = \pi_2 = 0.001$. I do so using non-linear Generalized Method of Moments using moment conditions

$$E\left[\begin{pmatrix} I_{o,d}^{IV,1991-2001} \\ I_{o,d}^{IV,2001-2011} \\ \left(I_{o,d}^{IV,1991-2001}\right)^2 \\ \left(I_{o,d}^{IV,2001-2011}\right)^2 \end{pmatrix} \times \left(Y_{o,d}-\alpha_o-\alpha_d-\beta_1\ln(\pi_1 migrants_{o,d}^{2011}+1)\right)\right] = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$E\left[\begin{pmatrix} \alpha_o \\ \alpha_d \end{pmatrix} \times \left(Y_{o,d}-\alpha_o-\alpha_d-\beta_1\ln(\pi_2 migrants_{o,d}^{2011}+1)\right)\right] = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

for dependent variable $Y_{o,d} \in \{\ln(S_{o,d}+1), \mathbf{1}\left[S_{o,d}>0\right]\}$ and instrument set

$$Z_{o,d} = \left(I_{o,d}^{IV,1991-2001}, I_{o,d}^{IV,2001-2011}, (I_{o,d}^{IV,1991-2001})^2, (I_{o,d}^{IV,2001-2011})^2\right)'$$

I include squared terms for the intruments to improve convergence. Including a moment for the constant, this yields 163 moments. I cluster standard errors by province.

Table 7 shows the results. My estimates of (π_1, π_2) do not reject my baseline functional form assumption of $\pi_1 = \pi_2 = \frac{1}{1000}$ and explicitly reject the more conventional functional form choice $\pi_1 = \pi_2 = 1$. In addition, the estimates of (β_1, β_2) also are statistically indistinguishable from my baseline coefficient estimates. At the point estimates, I find that a 10% increase in the number of immigrants relative to the mean raises the probability of a seizure occuring on a bilateral link by 1.1 percentage points and the value of drugs seized by 20 percent.

Finally, I relax completely my functional form assumption by estimating a non-parametric regression relating import drug seizures to the number of immigrants following Chetverikov and Wilhelm (2017). I depict the results in Figure 17. While I find a weakly increasing relationship between immigrants and import drug seizures, the standard errors are very large. Nevertheless, I take this as suggestive evidence supporting the above more parametric estimation.

3.6 Robustness to Sample

I also estimate my baseline effects using a variety of subsamples. Figure 18 shows the distribution of β estimates from equation 2 when I drop one origin country at a time for both dependent variables, $\mathbf{1}[S_{o,d} > 0]$ and $\ln(S_{o,d}+1)$. The histograms show that I estimate a positive β regardless of which country I drop from the sample, suggesting that no single country drives the results.

I also estimate the immigrant-seizures relationship separately by type of drug. For cannabis and cocaine, I estimate positive and statistically significant effect sizes. Interestingly, cocaine appears to be more reliant on immigrants for importation than cannabis, which can be produced locally in contrast to cocaine which must be imported. For heroin and amphetamines, the effect is close to zero, as shown in Figure 19. However, heroin and amphetamines represent less than 1% of drugs seized by Spain as shown in Figure 2 and therefore price estimates are unlikely.

I also consider a selection of high-trafficking countries and provinces alone. In Figure 15, I show the relationship between import drug seizures and immigrants graphically for Morocco and Colombia and two of the largest receiving provinces, Madrid and Barcelona. In Figure 16, I do this for re-exports with France and Italy and again with Madrid and Barcelona. In every case more immigrants lead to increase seizures.

3.7 Legal Trade

To gauge the magnitude of the effect size estimated in Section 3.3 for illegal trade relative to legal trade, I estimate the relationship between bilateral immigrant population and legal trade. To measure legal trade volume I turn to the ADUANAS-AEAT data set provided by the Spanish government. This data provides transaction level data and includes information on the origin (for imports) or destination (for exports) country, and the same for origin or destination province within Spain. I aggregate this data to the province-by-origin country level for imports for the years 2011 to 2016.

Because I find some sensitivity of this relationship with respect to functional form choices, I estimate the Generalized Method of Moments with moments

$$E\left[(\ln(X_{o,d}^{legal}+1) - \delta_2 - \beta_2 \ln(1 + \pi_2 migrants_{o,d}^{2011})) \times Z_{o,d}\right] = 0$$

where $X_{o,d}$ is the value of legal goods imported into province d originating from country o and for instrument set

$$Z_{o,d}=\left(I_{o,d}^{IV,1991-2001},I_{o,d}^{IV,2001-2011},(I_{o,d}^{IV,1991-2001})^2,(I_{o,d}^{IV,2001-2011})^2,(I_{o,d}^{IV,1991-2001}\times I_{o,d}^{IV,2001-2011})\right)'.$$ [19]

I show the results in column 2 of 7. I estimate that a 10% rise in the number of immigrants increases legal trade by about 13%, a magnitude comparable to the effect of immigrants on illegal drug seizures.[20]

4 Ruling Out Mechanisms for immigrant-Seizures Relationship

My bilateral estimates may not imply that overall illegal drug market activity rises with additional migration for two reasons. First, increases in trafficking may be offset by decreases in local production or decreases in imports on other bilateral links. Second, increases in bilateral immigrant population may increase the scrutiny of law enforcement, thus resulting in the relationship estimated in Section 3.3 but not corresponding to a real rise in actual drug flows. I find limited evidence for either of these channels, suggesting that immigrants are in fact raising overall drug imports.

4.1 General Equilibrium Responses

While I have shown that more immigrants on a bilateral link raise bilateral drug seizures, this effect may be offset by, for example, increased drug market activity by the native-born. I assess the strength of these general equilibrium responses by analyzing additional measures of drug market activity in a province. This analysis comes at the cost of worse causal identification, as these drug market activity measures are only available at the province-level.

To do so, I sum the amount of seizures and immigrants across origins, normalize by province population, and take logs to obtain

$$Y_d=\alpha+\beta\ln\left(\frac{M_d^{2011}}{P_d^{2001}}\right)+\epsilon_d \tag{6}$$

for measure Y_d of drugs trafficked into d, province population P_d^{2001} in 2001, and number of immigrants from all origins M_d^{2011} in 2011. Because there might be factors affecting both

[19] With nearly every province-origin country pair having positive trade I do not have enough variation along the extensive margin of trade to also estimate the comparable moment for legal trade.

[20] As shown in column 2 of Table 7, I estimate that $\hat{\beta}=1.36$, $SE=0.1$ and $\hat{\pi}=0.013$, $SE=0.0068$. To get the elasticity from this nonlinear equation, I compute that $\frac{X_{o,d}^{2011}[M_{o,d}^{2011}=1.1\times 963]}{X_{o,d}^{2011}[M_{o,d}^{2011}=963]}-1=\exp\left(1.36\left(\ln\left(1+0.012\times(1.1\times 963)\right)-\ln\left(1+0.012\times 963\right)\right)\right)-1=0.127$.

migration and drug smuggling into a province, I instrument using the previous leave-out push-pull summed across origins and normalized by population

$$IV_d^D = \frac{1}{P_d^{2001}} \sum_o I_{o,-a(d)}^D \times \frac{I_{-c(o),d}^D}{I_{-c(o)}^D} \tag{7}$$

However, because I am exploiting less variation than at the bilateral-level, interpreting β as the causal effect of immigrant share on drug activity requires a stronger identifying assumption. In particular, that there aren't province-level forces shaping both illegal drug activity in the province and either (i) migration from an origin country to two provinces in different autonomous communities or (ii) migration to a province from two different continents. In addition, seizure or arrest based measures of illegal drug market activity may contribute to my results, especially in the absensce of a province fixed effects.

4.1.1 Changes in Drug Supply

Drug Import Seizures. I estimate equation 6 with dependent variable

$$Y_d = \ln\left(\frac{S_d^{2011-2016}}{P_d^{2001}}\right)$$

i.e., the log value of seizures per capita. Table 9 shows the results. In column 1 I show the OLS result, which is that a 10% larger immigrant population share in a province raises the amount of drugs seized in that province by over 15%. Column 2 shows the first stage regression, which is strongly positive. Column 3 shows the two-stage least squares, where I find that a 10% increase in immigrant population share in a province raises drug smuggling into that province by 14% overall.

Native-born Drug Use. I next estimate equation 6 with dependent variable

$$Y_d = \ln\left(\frac{DrugUsers_d^{Native,2011-2016}}{P_d^{,2001,Native}}\right)$$

i.e., the log value native-born drug users per capita. Note that this analysis serves as an additional diagnostic on whether my results are driven primarily by enforcement intensity changes. If enforcement intensity can explain my results, we would expect an increase in the number of immigrants in the province to correspond to no increase in drug use by natives.

I graphically depict the results in Figure 20. I find that higher proportions of immigrants in a province's population lead to more drug use among the native-born across all drugs except heroin, where the effect is statistically indistinguishable from zero. The effect of a 10 percent increase in the proportion of immigrants in a province's population is to raise the prevalence of drug use among the native-born (across all drugs) by 11 percent.

4.1.2 Native-born Response

Native-born Drug Trafficking Arrests. I next estimate equation 6 with dependent variable

$$Y_d = \ln\left(\frac{Drug\ \ Arrests_d^{Native}}{P_d^{2001,Native}}\right)$$

i.e., the log value native-born drug users per capita. I measure $Drug\ \ Arrests_d^{Native}$ as the number of those with Spanish nationality arrested between 2011 and 2016 for a drug trafficking offense. As shown below in Table 10, I find that larger immigrant population share does not lead to differences in drug trafficking arrest rates of the native-born.

Domestic Production of Cannabis. Finally, I estimate equation 6 with dependent variable

$$Y_d = \ln\left(\frac{Cannabis\ \ Plants\ \ Seized_d^{2013}}{P_d^{2001,Native}}\right)$$

i.e., the log number of cannabis plants seized per capita. To measure cannabis plant seizures, I draw on Alvarez et al. (2016), who systematically assemble a dataset on cannabis plants seizures based on press reports and public statements by the Spanish government in 2013.[21] I additionally control for local cannabis use among the native born to control for demand-side conditions.

The effect of migration on domestic drug production is ambiguous. On the one hand, more immigrants should mean reduced trade costs with the immigrants' origin country, thus making trafficking drugs into the destination, rather than producing them there, more profitable. On the other hand, if immigrants systematically face barriers to the formal labor market (either through their legal status or if their human capital is less than that of the native-born on average), then more immigrants may reduce equilibrium wages in the criminal sector, thus making domestic production more profitable.

Column (2) in Table 11 shows the estimates for Equation 6. I find that as the share of the local population with foreign nationality increases, seizures of cannabis plants being grown locally rises. This result suggests that the informal labor market effects of immigration

[21] I do not have access to the microdata compiled by Alvarez et al. (2016), but instead use the approximate number of plants seized by province derived from their Figure 4. I therefore do not observe seizures in the (geographically small) provinces of Ceuta or Mellila.

dominate the trade cost effects.

Another channel through which migration could affect domestic production of cannabis is if immigrants bring knowledge of drug cultivation with them. This is particularly salient in the case of Morocco, which exports 99% of the cannabis seized by Spanish authorities. Morocco also instituted a cannabis crop-eradication program in 2005, which might drive growers from Morocco to Spain. To test, this hypothesis, I break out Moroccan immigrants from non-Moroccan immigrants (and similarly for the instrumental variable) with results shown in in Column (3). I find that with Moroccan immigrants facilitate increased cannabis production and other immigrants have a negative effect on cannabis production, though the latter effect is imprecisely estimated.

4.2 Enforcement Intensity

In Section 3 I explore whether immigrants affect drug *seizures* rather than actual illicit drug flows. Since bilateral seizures are a product of actual illicit drug flows and bilateral enforcement intensity, my results may be driven by variation in bilateral enforcement intensity instead of actual flows. I test this concern using several approaches.

It is worth reiterating, however, that my bilateral estimation strategy controls for enforcement intensity that is specific to Spanish provinces (and common across all origins) as well as enforcement intensity specific to origin countries (but common to all Spanish provinces). Therefore, the following exercises address the concern that *bilateral* enforcement intensity is a function of the *bilateral* number of immigrants and moreover that this is a significant driver of variation in drug seizures at the bilateral level.

In addition to the exercises below, I conduct additional tests for the extent to which enforcement intensity varying with the number of immigrants drives seizures in Section 4.1 and in Appendix B.1.

Extensive Margin of Trafficking. First, I exploit the fact that for bilateral links near the extensive margin of trafficking illegal drugs, enforcement changes caused by variation in the number of immigrants will not be important in driving seizures. To formalize this notion, take the derivative of equation 1 with respect to the number of immigrants:

$$\frac{dS_{o,d}}{dM_{o,d}} = E_{o,d}\frac{\partial X_{o,d}}{\partial M_{o,d}} + X_{o,d}\frac{\partial E_{o,d}}{\partial M_{o,d}} \tag{8}$$

While I want to estimate $\frac{\partial X_{o,d}}{\partial M_{o,d}}$, I will also pick up changes in bilateral enforcement intensity that result from changes in bilateral migration, $\frac{\partial E_{o,d}}{\partial M_{o,d}}$. This may occur if, for example, police target immigrant groups for drug trafficking enforcement actions once that group reaches a critical mass.

In my baseline estimates, I assume $\frac{\partial E_{o,d}}{\partial M_{o,d}} = 0$. However, this assumption may not always hold. To gauge the extent to which enforcement intensity variation may affect my results, I estimate

$$\mathbf{1}\{S_{o,d} > 0\} = \alpha_o + \alpha_d + \beta M_{o,d} + \delta \ln(Dist_{o,d}) + \varepsilon_{o,d}$$

for the subset of observations for which I predict that $X_{o,d} \approx 0$.[22]

To predict when actual flows $X_{od} \approx 0$, I use a similar leave-out push-pull structure for seizures as I did for immigrant inflows:

$$\hat{S}_{o,d} = S_{o,-a(d)} \times \frac{S_{-c(o),d}}{S_{-c(o)}}$$

where $\hat{S}_{o,d}$ interacts seizures of drugs originating from o but seized outside the autonomous community of d with the fraction of all drugs from outside o's continent seized in d. Implicit in this formulation is the assumption that (1) on average, law enforcement in province d will discriminate differently against immigrants from continents outside of $c(o)$, and (2) on average, law enforcement in other autonomous communities will discriminate differently against immigrants from o.

I show results in Table 8 subsetting to bilateral links which I predict having less than \$1,000 worth of drugs seized. While the point estimate falls when subsetting to the sample predicted to be on the extensive margin, the two estimates are statistically indistinguishable, suggesting that enforcement variation does not fully explain my bilateral results.

Quantitative Exercise. Next, I consider the plausibility of variation of enforcement intensity explaining the quantitative magnitudes that I estimated in section 3.1. In particular, I ask how much bilateral enforcement intensity would have to increase to explain the observed effect of immigrants on drug seizures.

Dividing equation 8 by the value of drugs seized $S_{o,d}$ and multiplying by the bilateral immigrant population, I obtain

$$\epsilon_{S,M} = \epsilon_{X,M} + \epsilon_{E,M} \tag{9}$$

where $\epsilon_{X,Y}$ is the elasticity of X with respect to M. In section 3.1, I estimate $\hat{\epsilon}_{S,M} = 1.2$. Suppose now that actual drug flows are not at all affected by the bilateral immigrant

[22] Akee et al. (2014) similarly focus on the extensive margin when estimating the determinants of transnational human trafficking.

population, i.e. $\epsilon_{X,M} = 0$. To assess the plausbility of this assumption, I need two objects: some standardized increase in the number of bilateral immigrants and the average fraction of drugs seized by Spain (i.e. enforcement intensity).

I consider the effects of a 2 standard deviation increase in the predicted bilateral immigrant population, residualized on origin and destination fixed effects and log distance. The median of predicted immigrants is 11 [23] and a 2 standard deviation increase raises this to 332[24]. This represents an increase in bilateral immigrant population of 3000%, which would imply a 3600% increase in enforcement intensity if my results were driven entirely by changes in enforcement.

To gauge the size of the implied increase in enforcement intensity, I compute a rough estimate of the fraction of drugs seized by Spain. I comute this as

$$\hat{E}_{Spain} = \frac{S_{Spain}}{C_{EU} \times \frac{S_{Spain}}{S_{EU}} + S_{Spain}}$$

where C_{EU} is the size of the market for illegal drugs in the European Union and S_X is the value of drugs seized by X. I focus on the market for cannabis and cocaine, as they are the primary drugs appearing in the Spanish seizures.

For C_{EU}, I use the European Monitoring Centre for Drugs and Drug Addiction[25] estimate for the size of the market for cocaine and cannabis in the European Union of about \$20 billion USD in 2013. I compute $\frac{S_{Spain}}{S_{EU}}$ using the UNODC seizures data, and find that Spain seized 78% of cannabis and cocaine by value. Between 2011 and 2016, on average 1 billion USD worth of cocaine and cannabis was seized by Spain. I therefore compute that about 6 percent of cocaine and cannabis entering Spain are seized by Spanish law enforcement. Therefore an increase in enforcement intensity of 3600% would raise enforcement intensity to 2.17, which violates the assumption that $E_{o,d} \leq 1$.

5 Legal Status, Naturalization, and Trafficking

Immigrants' integration into labor markets and civil society may be hampered when immigrants do not have legal status or a path to citizenship. This may induce some to participate in crime(Mastrobuoni and Pinotti, 2015; Pinotti, 2017; Freedman et al., 2018). To assess whether this matters for drug trafficking, I conduct two exercises. First, use the gravity equation to estimate separately the effect of irregular immigrants (those without legal sta-

[23] $11 \approx (exp(0.11) - 1) \times 1000$

[24] Standard deviation is ≈ 0.14.

[25] https://www.emcdda.europa.eu/system/files/publications/3096/Estimating%20the%20size%20of%20main%20drug%20m

tus) and regular immigrants on drug seizures and find my bilateral results are driven entirely by irregular immigrants. Second, I exploit an extraordinary regularization program in 2005 to explore the long-run dynamics of receiving legal status and later obtaining citizenship and find that granting immigrants citizenship can significantly reduce drug trafficking.

5.1 Background

In Spain, irregular immigrants are defined as those living in the country without a residency permit. Irregular immigrants generally enter Spain through legal means (González-Enríquez, 2009). These include immigrants who overstay their tourist visas, stay in Spain beyond the terms of their temporary residence permits, and so forth.[26] Moreover, irregular immigration is a common phenomenon in Spain among immigrants. Surveys of immigrants in Spain have found nearly 50% of immigrants are irregular (Pajares, 2004; Yruela and Rinken 2005). Díez Nicolás and Ramírez Lafita (2001) found that 83% of immigrants had arrived in Spain without a work permit but nevertheless began to work or look for a job.

Concurrent with its high levels of immigrant irregularity has been Spain's relatively more generous provision of public services to irregular immigrants as well as providing a path to regular status and thereafter to citizenship. For example, the country regularly provided legal status to hundreds of thousands of irregular immigrants in waves of regularizations between 2000 and 2005. In addition, irregular immigrants are eligible for access to the country's public healthcare and education systems so long as they register with the local population registry. This creates a strong incentive for irregular immigrants to register, a fact which I will exploit to measure irregular migration prevalence.[27]

Obtaining legal status puts immigrants on the path to citizenship. immigrants must live in Spain continuously and legally for 10 years before they can apply for naturalization. For immigrants from Latin America, this requirement drops to 5 years.[28] In addition, immigrants must meet various assimilation and "good citizen" requirements, such as knowledge of the Spanish language and avoidance of crime.

[26]Irregular immigrants who enter Spain via either crossing the Strait of Gibralter by boat or by illegally entering the Spanish North African cities of Ceuta or Mellila are a small fraction of irregular immigrants, though they garner a disproportionate share of press coverage (González-Enríquez, 2009).

[27]The population registry is an imperfect measure for several reasons. First, municipalities differ in their documentation requirements for registration and the degree to which they notify immigrants that they must re-register every two years. In addition, according to González-Enríquez (2009), sex workers and immigrants from China are less likely to register due to deportation fears. This will impact my estimation strategy only if there is a bilateral-specific measurement error, so origin country-specific immigrant behaviors common across all provinces or destination province policies common across all origins will be controlled for by the origin and destination fixed effects.

[28]This is based on a conversation with an employee at Spain's National Statistics Institute.

5.2 Measuring the Irregular Immigrant Population

To estimate the prevalence of irregular immigrants at the origin country-destination province level, I take the difference between the number of persons appearing in the population registry of province d from origin country o and the number of persons with residency permits in province d from country o. Specifically, I compute

$$Irregular\ \ Migrants_{od} = Population\ \ Registry\ \ Count_{od} - Residency\ \ Permits_{od} \quad (10)$$

and then divide by total bilateral immigrant population to obtain the fraction of immigrants who have irregular status.

I do this all 52 provinces in Spain as well as for the 75 origin countries for which I observe bilateral population registry figures and bilateral residency permits in 2011. I estimate that 27% of immigrants living in Spain are irregular, consistent with the estimate from González-Enríquez (2009) in 2008.

5.3 Gravity Estimation by Legal Status

To explore whether irregular migration is an important factor in explaining the connection I find between migration and drug trafficking, modify my baseline specification to include two separate terms for the bilateral immigrant population by regular and irregular status:

$$Y_{o,d} = \alpha_o + \alpha_d + \beta_{irreg} M_{o,d}^{irreg} + \beta_{reg} M_{o,d}^{reg} + \zeta \ln(Dist_{o,d}) + \varepsilon_{o,d} \quad (11)$$

To obtain exogenous variation in irregular and regular bilateral immigrant populations, I also modify the leave-out push-pull instrument predicting immigrant inflows to predict immigrant inflows by legal status. In particular, I interact the leave-out push-pull instrument with the leave-out fraction of immigrants with legal status L

$$IV_{o,d}^{D,L} = \frac{M_{o,-a(d)}^{2003,L}}{M_{o,-a(d)}^{2003}} \times IV_{o,d}^{D}$$

for $L \in \{regular, irregular\}$ and decade D.

Table 12 shows the results for estimating equation 11. I find that a 10% increase in bilateral *regular* immigrant population reduces the likelihood of a drug seizure by 0.5 percentage points, though the estimated coefficient is statistically insignificant, and a 10% increase in bilateral *irregular* immigrant population raises the likelihood of a drug seizure by 1.9 percentage points[29] (column 2) and that a 10% increase in bilateral regular immi-

[29]Using $\hat{\beta}^{Reg} = -0.112$ from column 2 and mean value of bilateral immigrant population of 933, I find that

grant population raises the value of drugs seized by 0.18% (also statistically insignificant), while a 10% rise in the bilateral population of irregular immigrants raises the value of drugs seized by 29%[30] (column 4). Taken together, these results suggest immigrant legal status is an important factor shaping immigrants' role in drug trafficking. However, my identification strategy cannot separate between the two channels through which legal status could be operating: that of selection–that certain origin-destination pairs tend to select for more irregular immigrants–and migration policy–the direct effect of legal status on drug trafficking. To better understand the role immigration policy can play in mitigating the immigrant-trafficking relationship, I turn to an event study of a major immigrant regularization.

5.4 2005 Mass Regularization Event Study

In 2005, Spain conducted the largest regularization event of immigrants in its history, with over half a million immigrants obtaining legal status. immigrants who were registered with their local council in the population registry as of August 8, 2004, offered a work contract of at least 6 months (3 months if in agriculture) and have no criminal record in their home country or in Spain, were eligible to apply for regular status, usually through their prospective employer (González-Enríquez, 2009).

I estimate the effect of this extraordinary 2005 regularization at the province-by-year level. This differs from my baseline cross-section estimates in Section 3.1 in that I use year-to-year variation in drug seizures. At the bilateral-level, seizures can occur highly irregularly, with no seizures for several years followed by a year with one massive seizure. This is likely more a result of variation in enforcement "luck" rather than changes in actual flows of illicit drugs, and therefore reflects measurement error. To smooth out this variation and thereby improve the precision with which I estimate the event study, I aggregate to the province-level. This has the added benefit of improving measurement of the number of irregular immigrants, as the bilateral-level measurement excludes many countries and appears to censor bilateral links with very few immigrants.

I estimate this event study using the equation

$$Y_{d,t} = \sum_{t \neq 2004} \theta_t \times M_d^{2003,irregular} + \delta_d + \delta_t + \epsilon_{d,t}$$

where I measure the number of irregular immigrants in 2003 as in equation 10. I plot the θ_t

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$\mathbb{1}\left[S_{o,d}^{2011-2016} > 0 | M_{o,d}^{2011} = 933\right] = -0.112\left(\ln\left(1 + \frac{933 \times 1.1}{1000}\right) - \ln\left(1 + \frac{933}{1000}\right)\right) \approx 0.005$ and for $\hat{\beta}^{Irreg} = 0.403$, this is 0.019.

[30]Using $\hat{\beta}^{Reg} = 0.0383$ from column 4, we have: $\frac{S_{od}^{2011-2016}[M_{o,d}^{2011}=1.1\times933]}{S_{od}^{2011-2016}[M_{o,d}^{2011}=933]} - 1 = \exp\left(0.0383\left(\ln\left(1 + \frac{1.1\times933}{1000}\right) - \ln\left(1 + \frac{933}{1000}\right)\right)\right) - 1 \approx 0.0018$. For irregular migration, this is 0.29.

coefficients in Figure 6, both for whether any seizures occured, $Y_{d,t} = \mathbf{1}\{S_{d,t} > 0\}$, and the log value of drug seizures, $Y_{d,t} = \ln(S_{d,t} + 1)$.

I find that the 2005 regularization led to sudden jump in the number of work authorizations granted to immigrants in Spain, as shown in Figure 21. In addition, naturalizations of immigrants increased markedly in 2005, 2010, and 2013. The 2005 increase is may be related to the 2000 regularization of several hundred thousand immigrants, while the 2010 increase relates to the 2005 regularization under study here. This is consistent with the timeline for naturalization for Latin Americans. The 2013 spike in citizenship granting is due to solving technical and bureaucratic issues which had delayed issuance of citizenship for many immigrants.[31]

In Figure 6 I show the effect of the 2005 regularization on drug seizures. I find that seizures declined significantly in 2010 and stayed low thereafter. In Figure 6 I show that this decline came primarily from declines in cocaine seizures. This is consistent with the increase in naturalizations for Latin Americans but a modest decline in naturalizations for immigrants from Africa, as shown in Figure 6.

Overall these results suggest that granting legal status to immigrants plays an important role in reducing drug trafficking by putting them on a path to citizenship. Taking the average of the coefficients from 2010 to 2016 for the event study estimated on the extensive margin of trafficking suggests that a province granting legal status and subsequent citizenship to an additional 10,000 immigrants reduces the likelihood of a seizure occurring in that province by 2.3 percent.

These results differ somewhat from the literature on immigrant legal status on crime. Freedman et al. (2018), Mastrobuoni and Pinotti (2015), and Pinotti (2017) find an immediate drop in immigrant criminal activity as a result of legalization, whereas I find a delayed effect. Pinotti (2017) provides a useful comparison. He shows that for immigrants with weak ties to the formal labor market, legalizations' impact on crime is substantial, but for those with the strongest ties to the formal labor market he finds no effect. Similarly, the 2005 regularization that I study only grants legal status to immigrants with a labor contract already lined up–often a labor relationship that pre-existed 2005 but is simply being formalized by the program. My results are therefore in line with Pinotti (2017) in terms of the immediate effects of legalization, but I look at an extended time horizon and find a reduction in crime around the time immigrants become eligible for citizenship. Therefore the results I present here may be a lower bound on the effects of immigrant legalization on crime.

[31] This is based on a conversation with an employee at Spain's National Statistics Institute.

6 Conclusion

The effect of immigration on crime has long been a controversial political issue. In this paper, I contribute to this debate by causally estimating that international migration is an important factor shaping international drug trafficking, on par with the effect immigrants have on legal trade. This effect is driven primarily by immigrants without legal status, and my evidence shows that granting legal status and a path to citizenship to immigrants can diminish this relationship.

These results have significant relevance to ongoing debates on immigration policy in the United States and around the world. In particular, as many European countries and the United States discuss providing some form of amnesty and a path to citizenship to their large populations of undocumented immigrants, this paper offers an additional potential benefit to society from such amnesties. Providing amnesty is also likely to be much cheaper than attempting to keep irregular immigrants from entering the country, such as building a wall. For example, Allen et al. (2018) estimate that the 2007-2010 expansion of the border wall on the U.S.-Mexico border cost approximately $57,500 per deterred immigrant. Amnesty programs are likely to be much cheaper to implement.

An important caveat is that immigrants generate a range of effects on their host countries, from wages of the native-born to innovation to consumer choices. Hence, generalizing welfare effects of immigration from just one outcome, as is the subject of the present study, can lead to suboptimal policy choices. Instead, future researchers and policymakers must weigh the varied impacts of migration when shaping immigration policy.

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Table 1: Relationship between Bilateral Immigrant Population and Extensive Margin of Drug Trafficking

	(1) Drug seizures (imports, any)	(2) Drug seizures (imports, any)	(3) Drug seizures (imports, any)	(4) Drug seizures (imports, any)
Log Migrants 2011	0.220***	0.205***	0.187***	0.137***
	(0.00766)	(0.00991)	(0.0150)	(0.0130)
Observations	5564	5564	5564	5564
R^2	0.213	0.237	0.385	0.416
Intended Dest. FE	N	N	Y	Y
Province FE	N	Y	N	Y
Ln dist	Y	Y	Y	Y

Standard errors clustered by 52 provinces in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Relationship between Bilateral Immigrant Population and Extensive Margin of Drug Trafficking

	(1) Drug seizures (exports, any)	(2) Drug seizures (exports, any)	(3) Drug seizures (exports, any)	(4) Drug seizures (exports, any)
Log Migrants 2011	0.0899***	0.0613***	0.114***	0.0609***
	(0.0135)	(0.00756)	(0.0228)	(0.0146)
Observations	5564	5564	5564	5564
R^2	0.107	0.194	0.227	0.309
Intended Dest. FE	N	N	Y	Y
Province FE	N	Y	N	Y
Ln dist	Y	Y	Y	Y

Standard errors clustered by 52 provinces in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Relationship between Bilateral Immigrant Population and Extensive Margin of Drug Trafficking

	(1) Drug seizures (imports, ln value)	(2) Drug seizures (imports, ln value)	(3) Drug seizures (imports, ln value)	(4) Drug seizures (imports, ln value)
Log Migrants 2011	3.006***	2.800***	2.628***	1.965***
	(0.157)	(0.148)	(0.298)	(0.243)
Observations	5564	5564	5564	5564
R^2	0.243	0.272	0.425	0.461
Origin FE	N	N	Y	Y
Province FE	N	Y	N	Y
Ln dist	Y	Y	Y	Y

Standard errors clustered by 52 provinces in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Relationship between Bilateral Immigrant Population and Extensive Margin of Drug Trafficking

	(1) Drug seizures (exports, ln value)	(2) Drug seizures (exports, ln value)	(3) Drug seizures (exports, ln value)	(4) Drug seizures (exports, ln value)
Log Migrants 2011	1.074***	0.722***	1.393***	0.751***
	(0.186)	(0.102)	(0.302)	(0.186)
Observations	5564	5564	5564	5564
R^2	0.101	0.198	0.229	0.320
Origin FE	N	N	Y	Y
Province FE	N	Y	N	Y
Ln dist	Y	Y	Y	Y

Standard errors clustered by 52 provinces in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Effect of Bilateral Immigrant Population on Drug Import Seizures

	(1) First-stage: Ln Migrants 2011	Drug Seizures 2011-2016 (2) 2SLS: (any)	Drug Seizures 2011-2016 (3) 2SLS: (ln value)
$IV_{o,d}^{2001-2011}$	0.0374**		
	(0.0140)		
$IV_{o,d}^{1991-2001}$	0.154***		
	(0.0261)		
Log Immigrants 2011		0.105***	2.322***
		(0.0381)	(0.549)
Observations	5564	5564	5564
R^2	0.699	0.045	0.061
Origin FE	Y	Y	Y
Dest. FE	Y	Y	Y
Ln dist.	Y	Y	Y
1st-stg F-stat.	23.4	23.4	23.4

Standard errors clustered by 52 provinces in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Effect of Bilateral Immigrant Population on Drug Re-Export Seizures

	(1) First-stage: Ln Migrants 2011	Drug Seizures 2011-2016 (2) 2SLS: (any)	Drug Seizures 2011-2016 (3) 2SLS: (ln value)
$IV_{o,d}^{2001-2011}$	0.0000374**		
	(0.0000140)		
$IV_{o,d}^{1991-2001}$	0.000154***		
	(0.0000261)		
Log Migrants 2011		0.0802***	1.277***
		(0.0211)	(0.337)
Observations	5564	5564	5564
R^2	0.699	0.013	0.008
Origin FE	Y	Y	Y
Dest. FE	Y	Y	Y
Ln dist.	Y	Y	Y
1st-stg F-stat.	23.4	23.4	23.4

Standard errors clustered by 52 provinces in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Effect of Bilateral Immigrant Population on Drug Seizures: Bilateral-Level, GMM

	(1) Drug Smuggling	(2) Legal Trade
β_1		
	0.137***	
	(0.021)	
π_1		
	0.006**	
	(0.006)	
β_2		
	2.52***	1.365***
	(0.39)	(0.0998)
π_2		
	0.003**	0.0127*
	(0.003)	(0.00679)
Observations	5564	5136

Standard errors clustered by 52 provinces in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample size in column 2 falls relative to column 1 due to miscoding of certain provinces in Spain (Ceuta, Melilla, and the Canary Islands). I do not estimate β_1 and π_1 for legal trade because virtually all bilateral links engage in some trade.

Table 8: Effect of Bilateral Immigrant Population on Drug Seizures: Extensive Margin

	(1) Drug seizures (any)	(2) Drug seizures (any)
Log Migrants 2011	0.105***	0.0541**
	(0.0381)	(0.0255)
Observations	5564	4015
R^2	0.045	0.017
Origin FE	Y	Y
Dest. FE	Y	Y
Ln dist	Y	Y
1st-stg F-stat.	23.4	20.0
Sample	All	< 1000 USD seized

Standard errors clustered by 52 provinces in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Effect of Immigrant Population Share on Drug Seizures: Destination-Level

	(1) OLS: Ln amt seized ($) per capita	(2) First-Stage: Ln migr. pop share	(3) 2SLS: Ln amt seized ($) per capita
Ln migr. pop share	1.577***		1.449**
	(0.578)		(0.563)
Predicted migr inflows, 2001-2011		14.22***	
		(1.200)	
Predicted migr inflows, 1991-2001		40.54***	
		(2.492)	
Observations	52	52	52
R^2	0.135	0.933	0.134
1st-stg. F-stat		230.1	230.1

Heteroskedasticity robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Effect of Immigrant Population Share on Rate of Drug Trafficking Arrests of Native-Born

	(1) OLS: Log rate of drug trafficking arrests of native-born	(2) First-Stage: Ln migr. pop share	(3) 2SLS: Log rate of drug trafficking arrests of native-born
Ln migr. pop share	-0.150		-0.0908
	(0.245)		(0.262)
Predicted migr inflows, 2001-2011		14.22***	
		(1.200)	
Predicted migr inflows, 1991-2001		40.54***	
		(2.492)	
Observations	52	52	52
R^2	0.005	0.933	0.004
1st-stg. F-stat		230.1	230.1

Heteroskedasticity robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Effect of Bilateral Immigrant Population on Domestic Cannabis Plant Seizures, Province-level

	(1) OLS: ln Cannabis plant seizures per native-born	(2) 2SLS: ln Cannabis plant seizures per native-born	(3) 2SLS: ln Cannabis plant seizures per native-born
Frac used cannabis last 12 mo.$_d^{native-born,2011-2016}$	17.09*	16.00*	14.88*
	(8.766)	(8.414)	(8.828)
Log migr. pop share	0.641**	0.760***	
	(0.287)	(0.265)	
Log Moroccan national pop share			0.784**
			(0.328)
Log Non-Moroccan national pop share			-0.317
			(0.447)

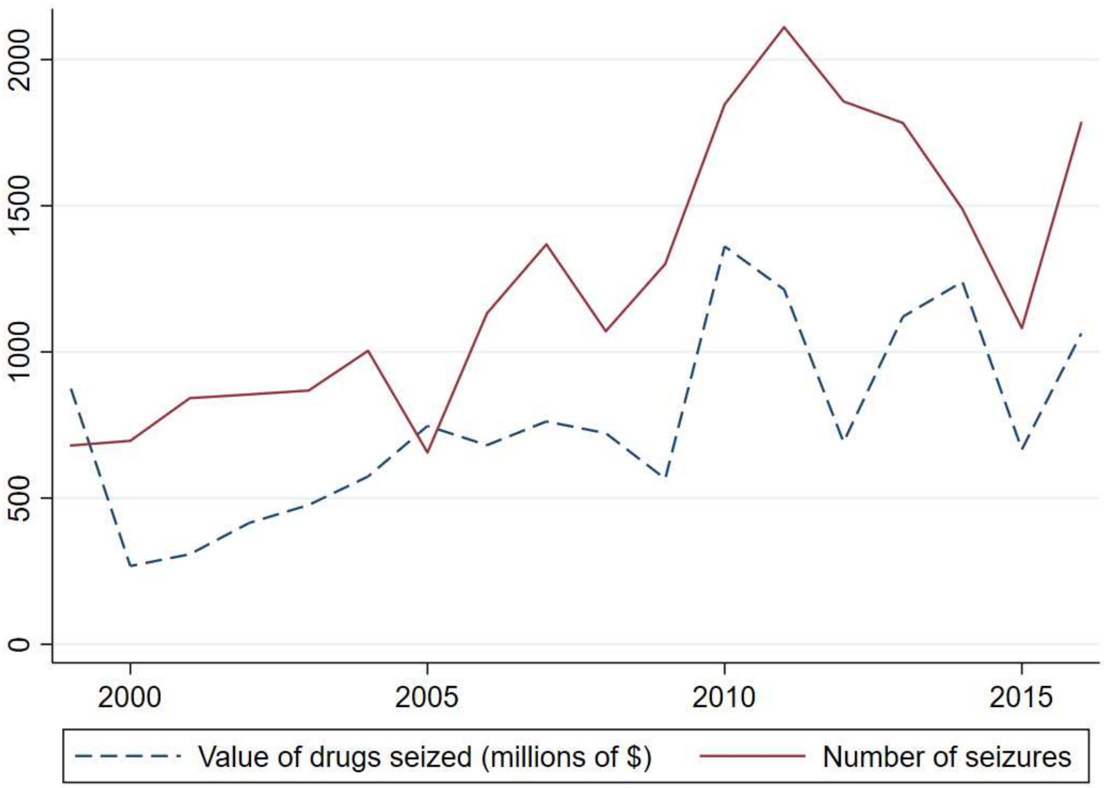
Table 12: Effect of Bilateral Immigrant Population & Irregular Migration on Drug Seizures

	(1) Drug seizures (any)	(2) Drug seizures (any)	(3) Drug seizures (ln value)	(4) Drug seizures (ln value)
Log Migrants 2011	0.155***		3.467***	
	(0.0364)		(0.477)	
Log Regular Migrants 2011		-0.112		0.0383
		(0.0856)		(1.266)
Log Irregular Migrants 2011		0.403***		5.459***
		(0.0821)		(1.121)
Observations	3116	3116	3116	3116
R^2	0.056	0.045	0.088	0.112
Origin FE	Y	Y	Y	Y
Dest. FE	Y	Y	Y	Y
Ln dist	Y	Y	Y	Y
Kleibergen-Paap F-stat.	61.0	8.3	61.0	8.3

Standard errors clustered by 52 provinces in parentheses.

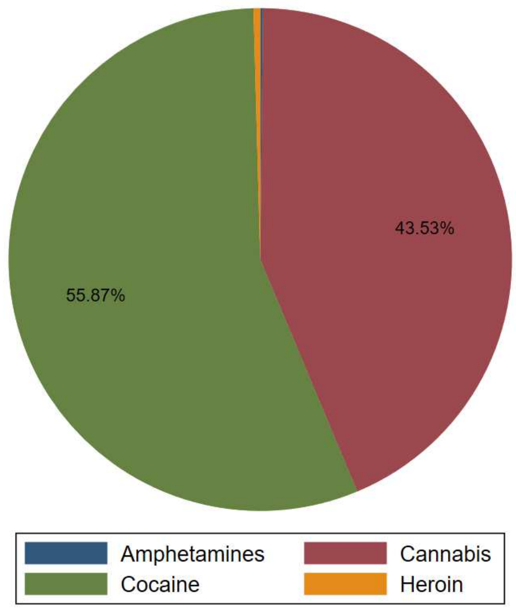
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Illegal Drug Seizures per Year, 1999-2016



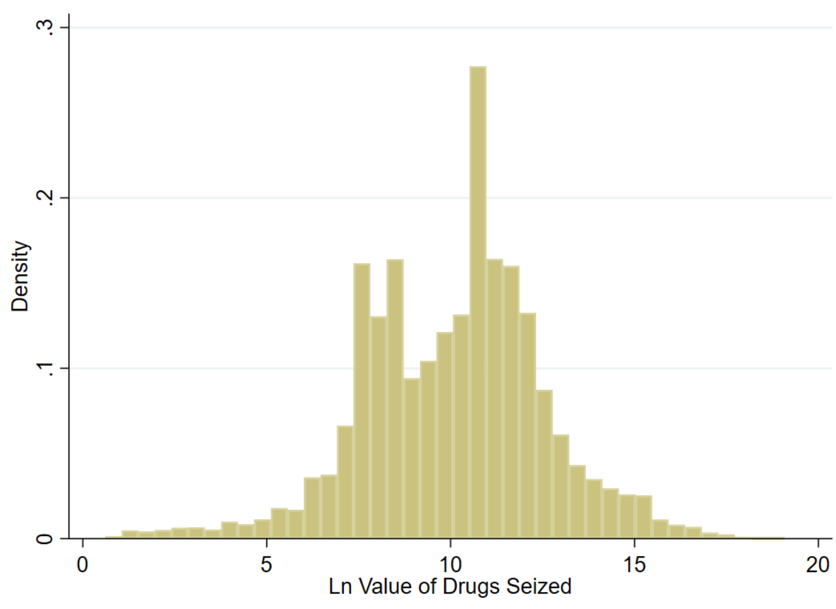
Notes: This figure shows the value of drugs trafficked from foreign countries seized over time by Spanish authorities and the number of seizure events as reported to the UNODC. Drug prices used are 2012 wholesale prices taken from a survey of Spanish drug prices reported to the UNODC.

Figure 2: Seizures by Drug Type



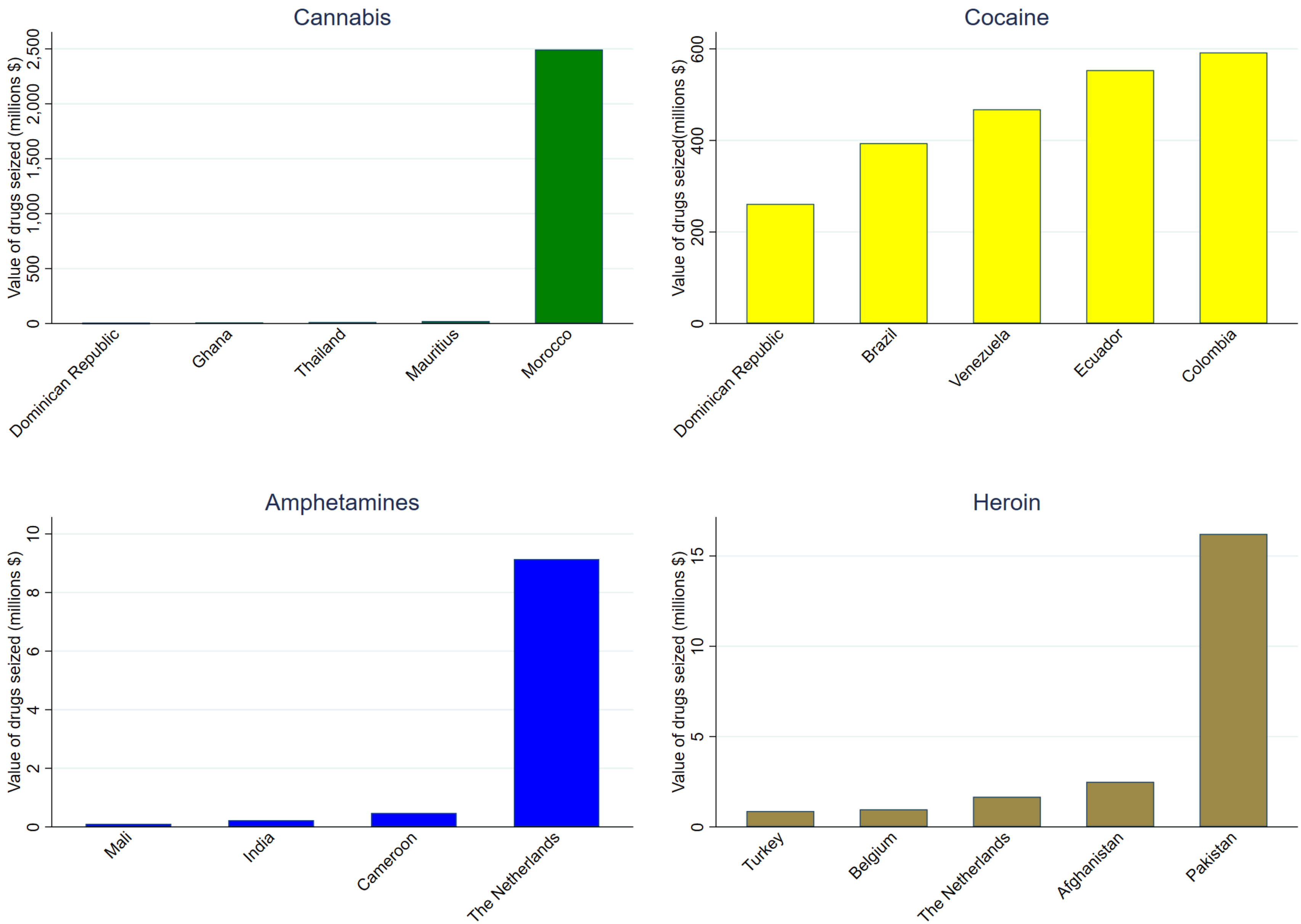
Notes: This figure shows the makeup of drug seizures in Spain by drug type. Drug prices used are 2012 wholesale prices taken from a survey of Spanish drug prices reported to the UNODC.

Figure 3: Distribution of Log Value of Seizures



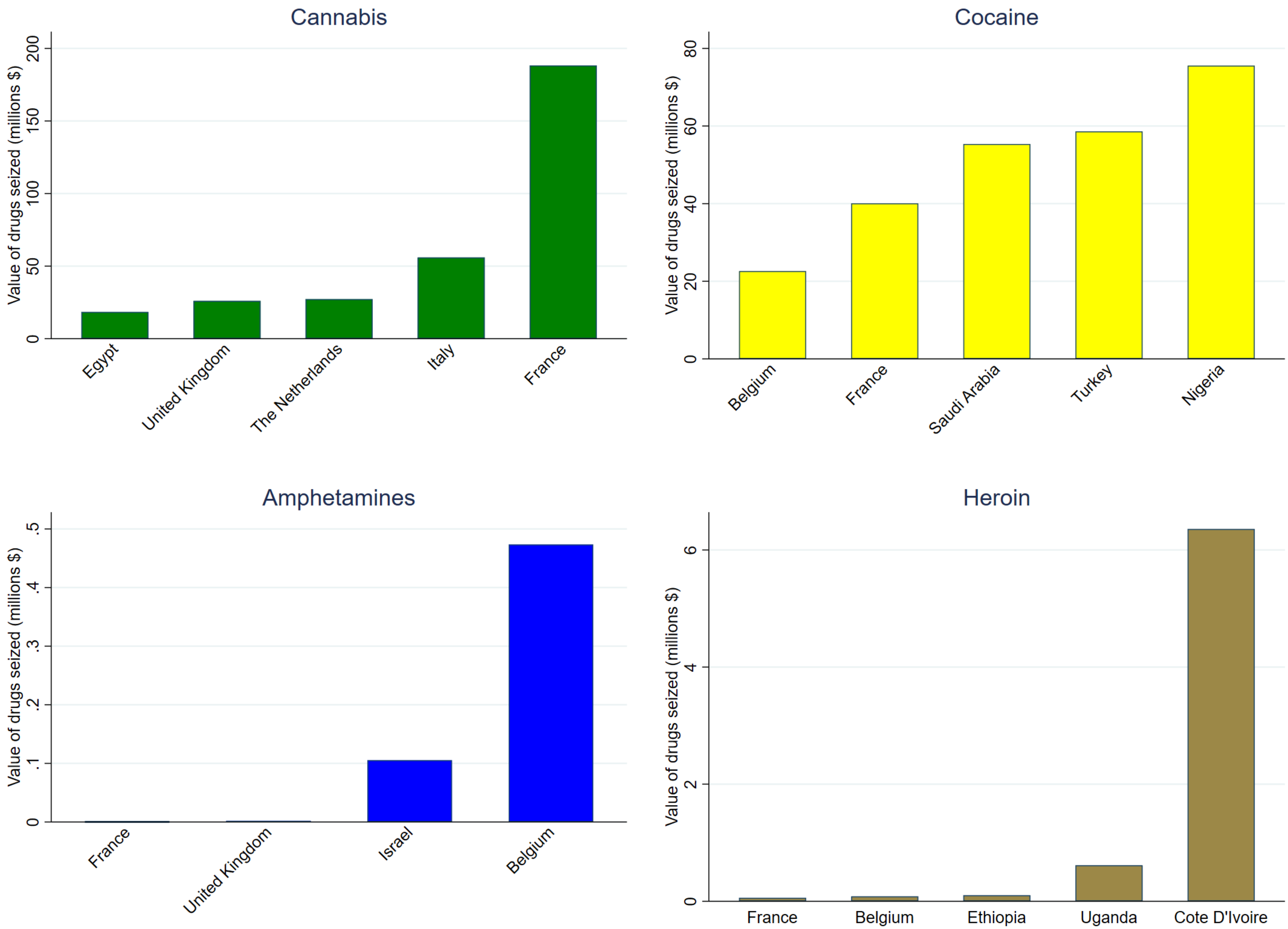
Notes: This figure shows the distribution of the log value of drug seizures in Spain between 2011 and 2016 as reported to the UNODC. Drug prices used are 2012 wholesale prices taken from a survey of Spanish drug prices reported to the UNODC.

Figure 4: Top 5 Origins by Drug



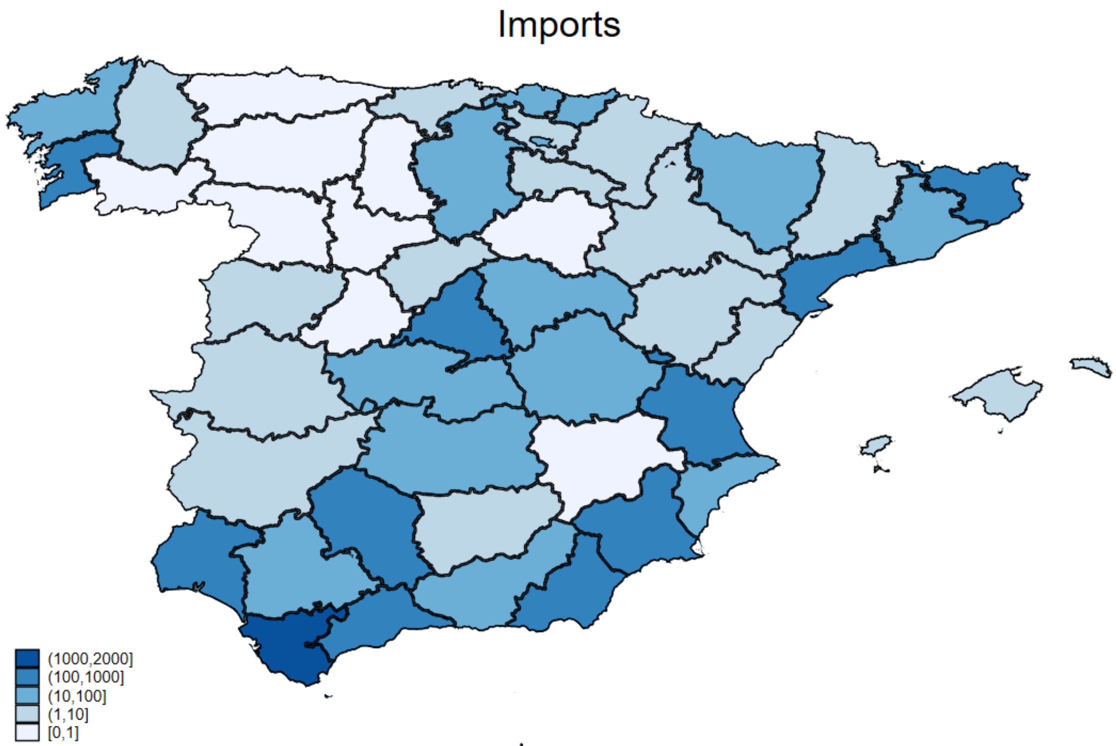
Notes: This figures shows the top 5 exporters of illegal drugs to Spain during 2011 through 2016 by drug as reported by Spain to the UNODC.

Figure 5: Top 5 Intended Destinations by Drug



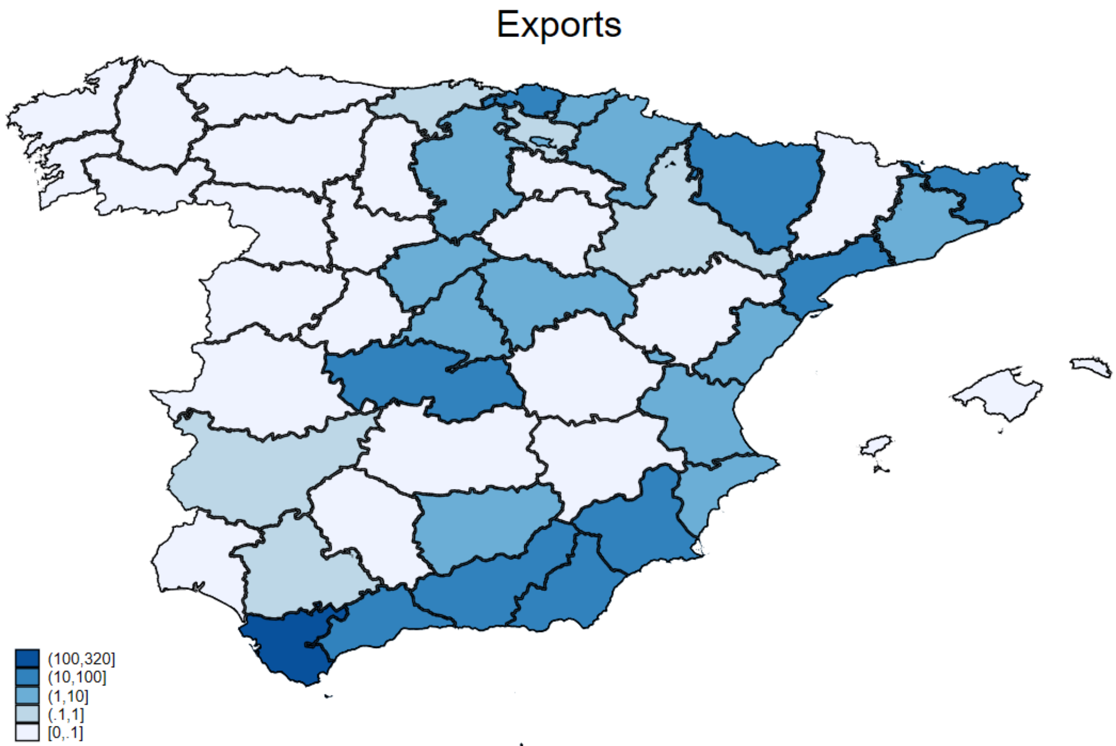
Notes: This figures shows the top 5 importers of illegal drugs from Spain during 2011 through 2016 by drug as reported by Spain to the UNODC.

Figure 6: Geography of Drug Import Seizures in Spain



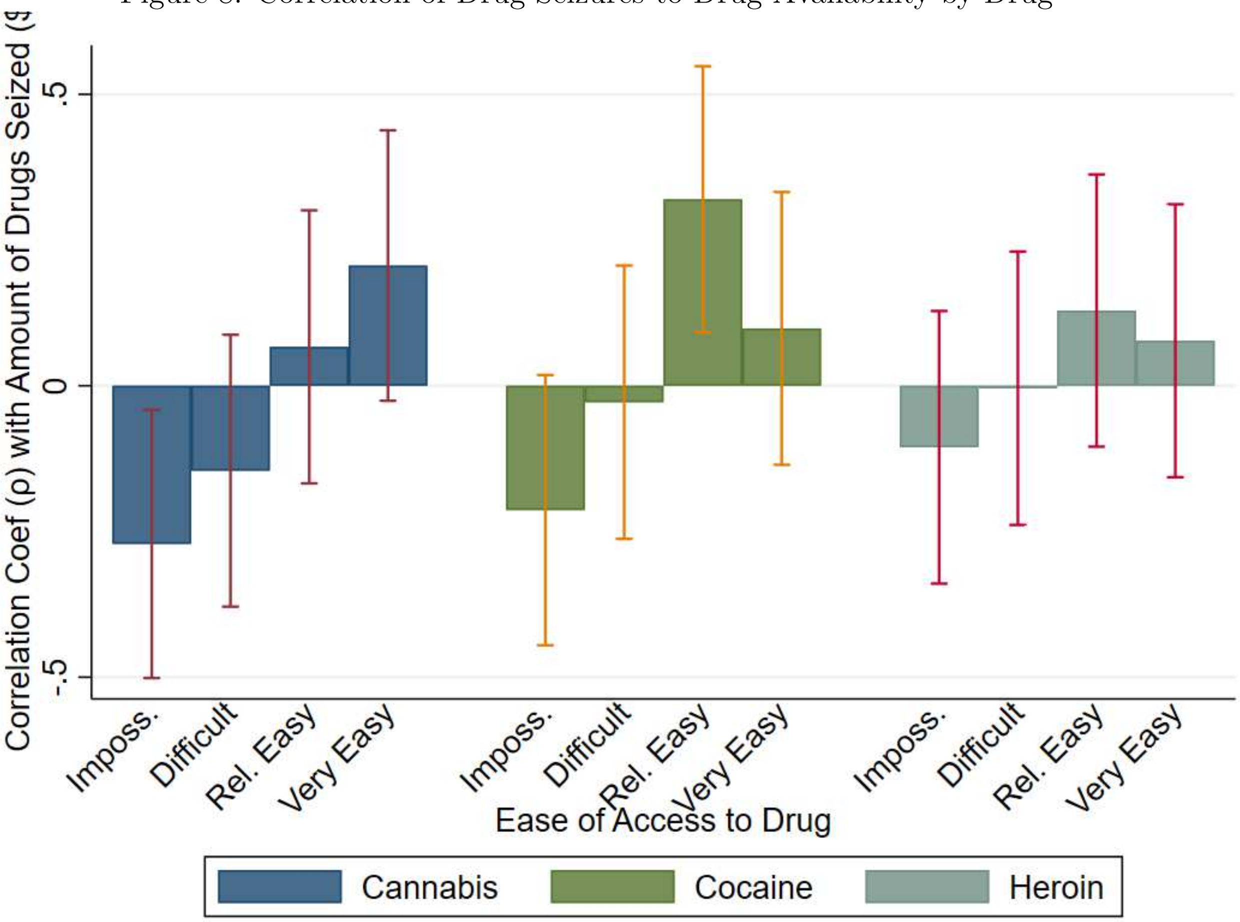
Notes: This figure shows the distribution of drug seizures of imports (measured in dollars by the estimated wholesale value of seized drugs) per capita across Spanish provinces for seizures occurring between 2011 and 2016 as reported by Spain to the UNODC.

Figure 7: Geography of Drug Seizures Intended for Re-Exports in Spain



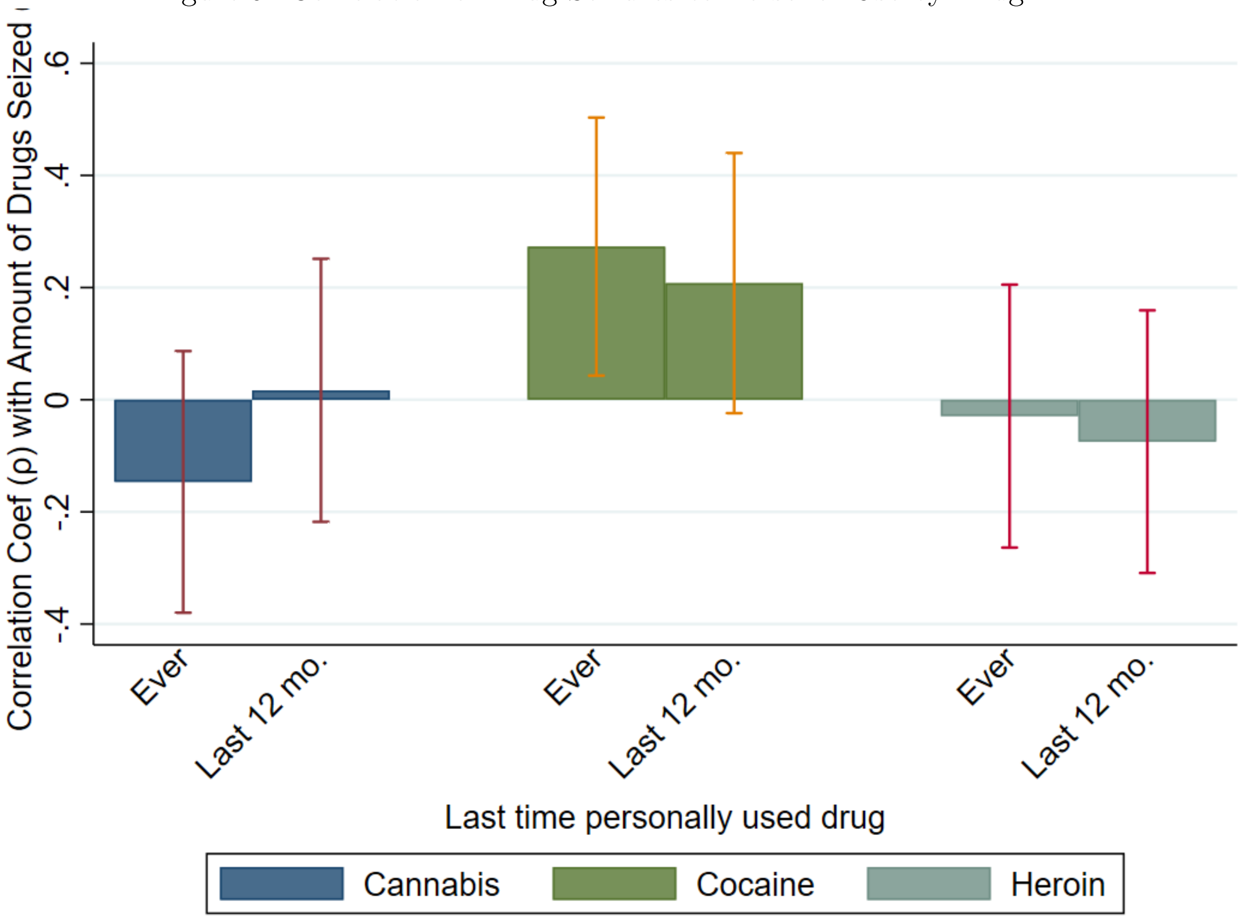
Notes: This figure shows the distribution of seizures of drugs intended for re-export (measured in dollars by the estimated wholesale value of seized drugs) per capita across Spanish provinces for seizures occurring between 2011 and 2016 as reported by Spain to the UNODC.

Figure 8: Correlation of Drug Seizures to Drug Availability by Drug



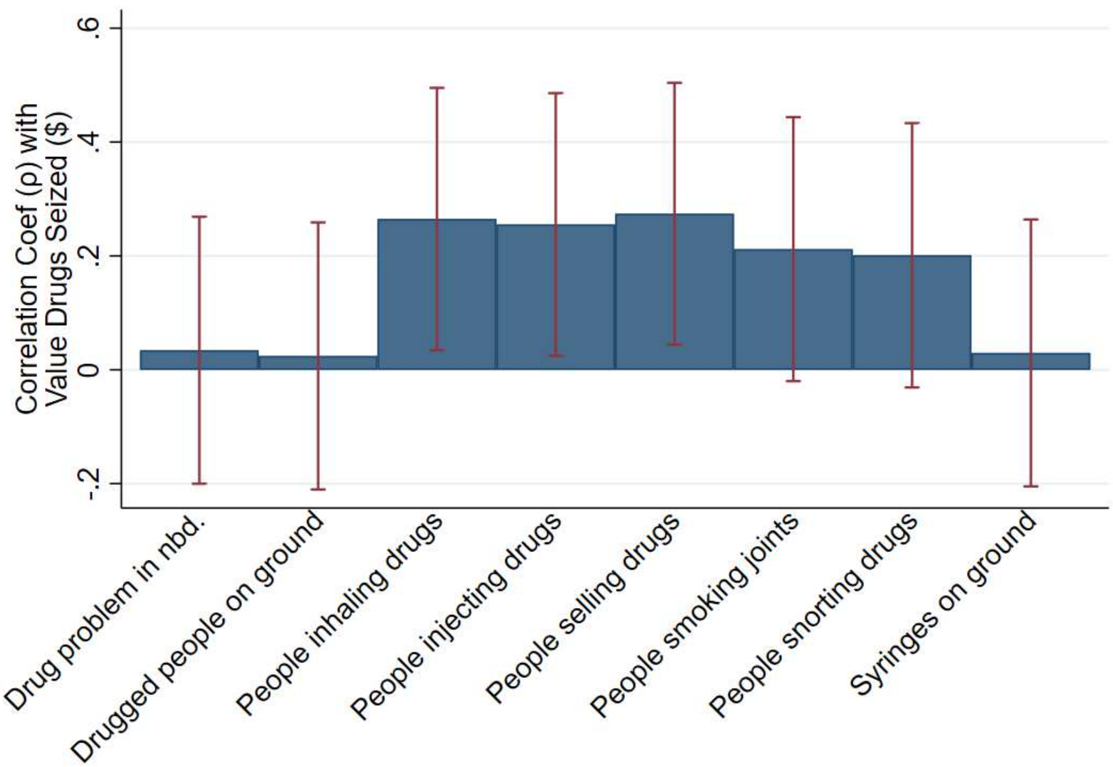
Notes: This figure shows the correlation coefficient between the amount of seizures per capita of a particular drug with the fraction of respondents in a province who report finding it impossible/difficult/relatively easy/very easy to obtain that drug within 24 hours averaged over the 2011, 2013, and 2015 waves of the EDADES survey. Amphetamines were not asked about until the 2013 survey, so I exclude them. 90% confidence intervals are shown in red. Estimated on a cross-section of 52 Spanish provinces.

Figure 9: Correlation of Drug Seizures to Personal Use by Drug



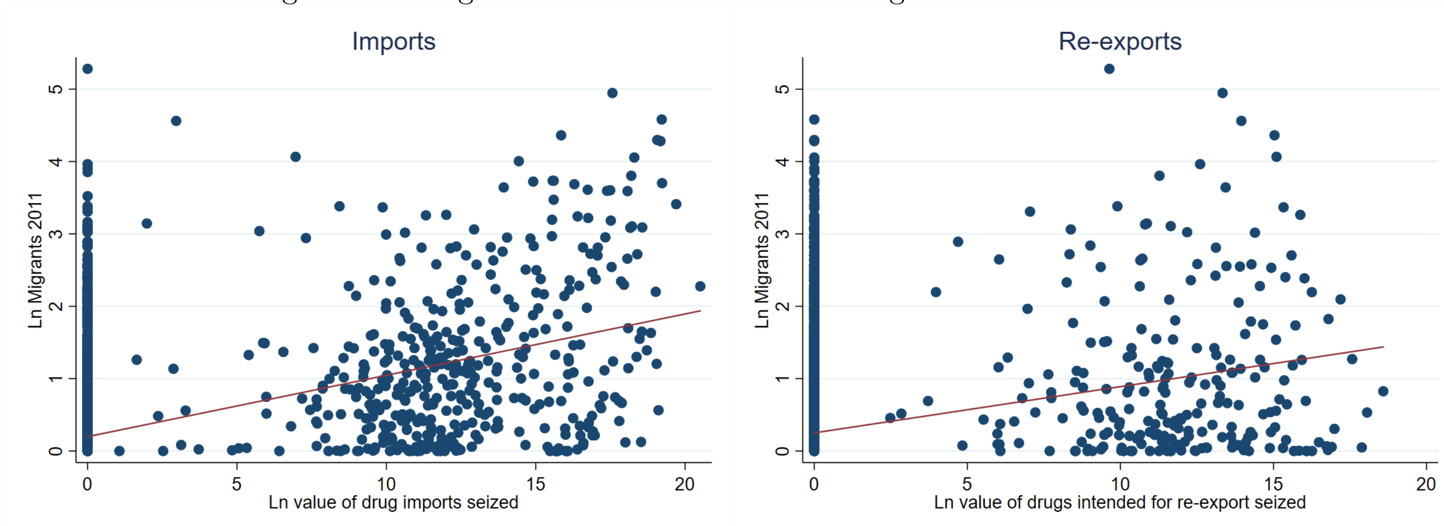
Notes: This figure shows the correlation coefficient between the amount of per capita of a particular drug with the fraction of respondents in a province who report having ever used the drug or having used the drug within the last 12 months averaged over the 2011, 2013, and 2015 waves of the EDADES survey. Amphetamines were not asked about until the 2013 survey, so I exclude them. 90% confidence intervals are shown in red. Estimated on a cross-section of 52 Spanish provinces.

Figure 10: Correlation of Drug Seizures to Drug Availability (across all drugs)



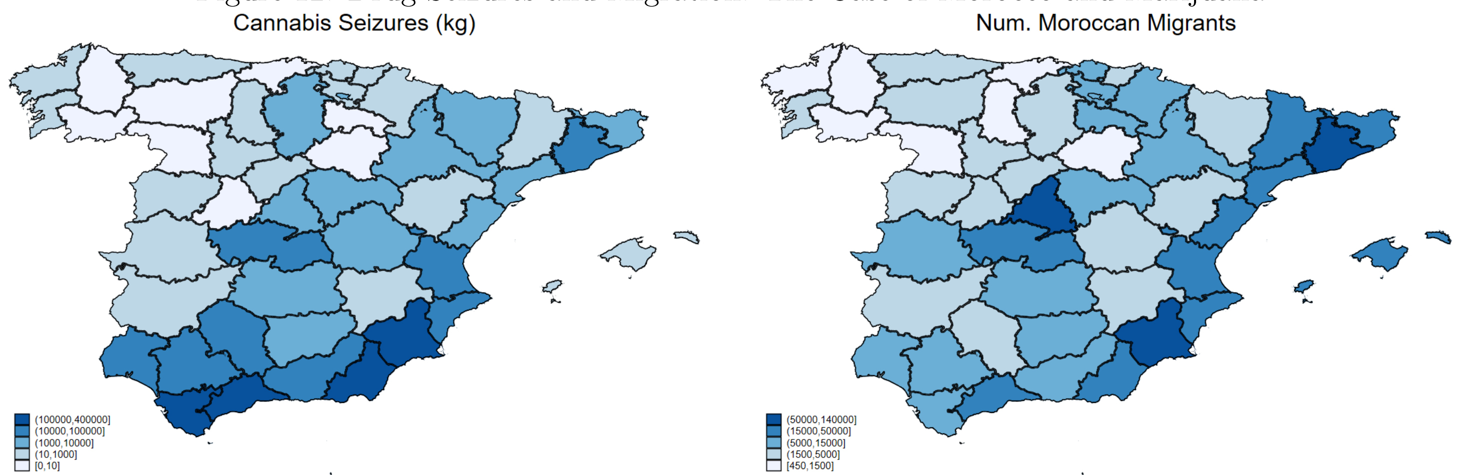
Notes: This figure plots the correlation coefficient between seizures (in dollars) per capita of all drugs (as appropriate) with the fraction of respondents in the province who reported observing the listed drug-related behaviors either "frequently" or "very frequently" or, for the first bar, "very". The behaviors listed are, from left to right: (i) "Thinking about where you live, how important of a problem do you think illegal drugs are?", (ii) "How often in your neighborhood are there drugged people on the ground?", (iii) "How often in your neighborhood are there people inhaling drugs in paper/aluminum?", (iv) "How often in your neighborhood are there people injecting drugs?", (v) "How often in your neighborhood are there people selling drugs?", (vi) "How often in your neighborhood are there people smoking joints?", (vii) "How often in your neighborhood are there people snorting drugs by nose?", (viii) "How often in your neighborhood are there syringes lying on the ground?". As appropriate, I drop marijuana from the drug seizures variable in the correlation, specifically for the questions on people snorting or injecting drugs or syringes being on the ground. 90% confidence intervals are shown in red. Estimated on a cross-section of 52 Spanish provinces.

Figure 11: Drug Seizures and Number of immigrants Raw Correlation



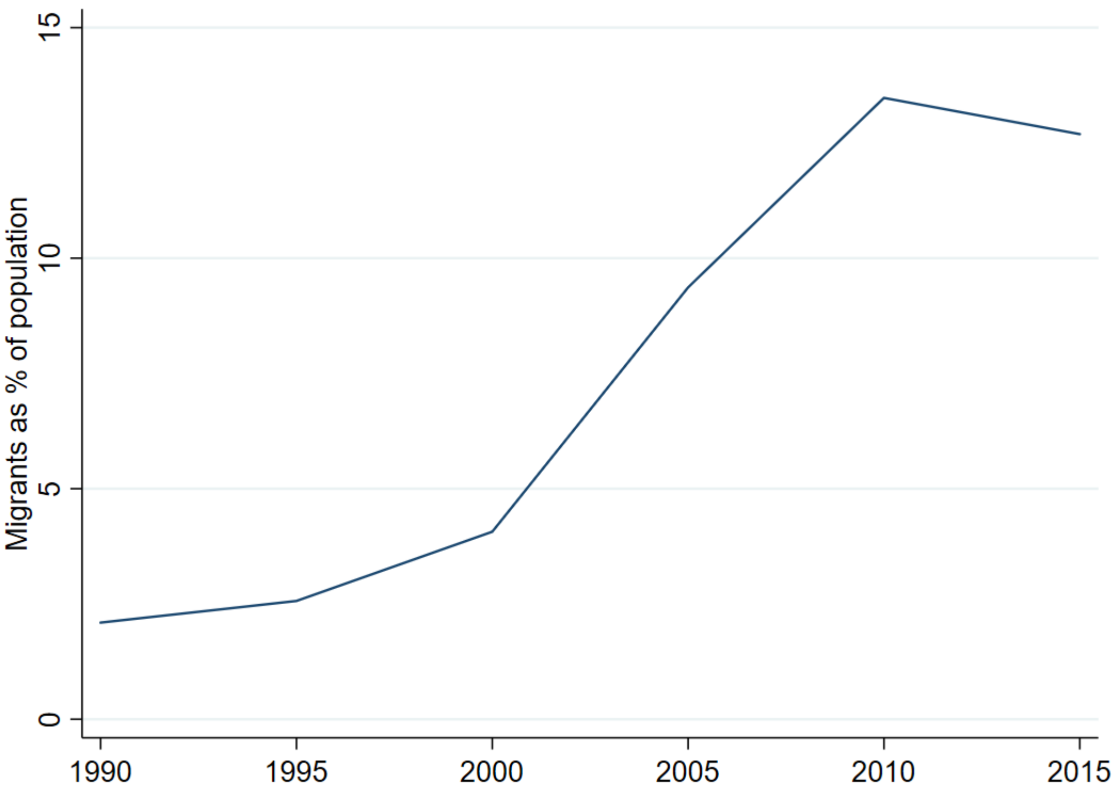
Notes: The figure on the left shows the unconditional scatter plot of the bilateral log value of drug imports seized on the x-axis with the bilateral log number of immigrants measured in 2011 on the y-axis. The figure on the same but using the log value of drugs seized intended for re-export.

Figure 12: Drug Seizures and Migration: The Case of Morocco and Marijuana



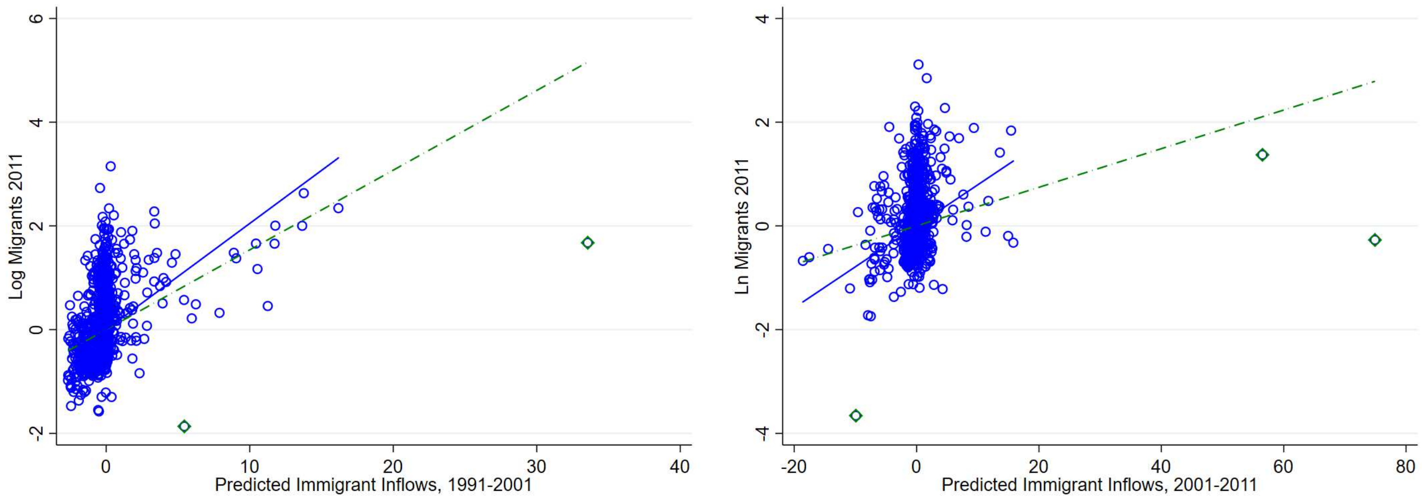
Notes: The figure on the left shows the distribution across Spanish provinces of seizures of marijuana between 2011 and 2016 originating from Morocco; the figure on the right shows the distribution across Spanish provinces of the number of individuals with Moroccan nationality in 2011.

Figure 13: Migration into Spain, 1990-2015



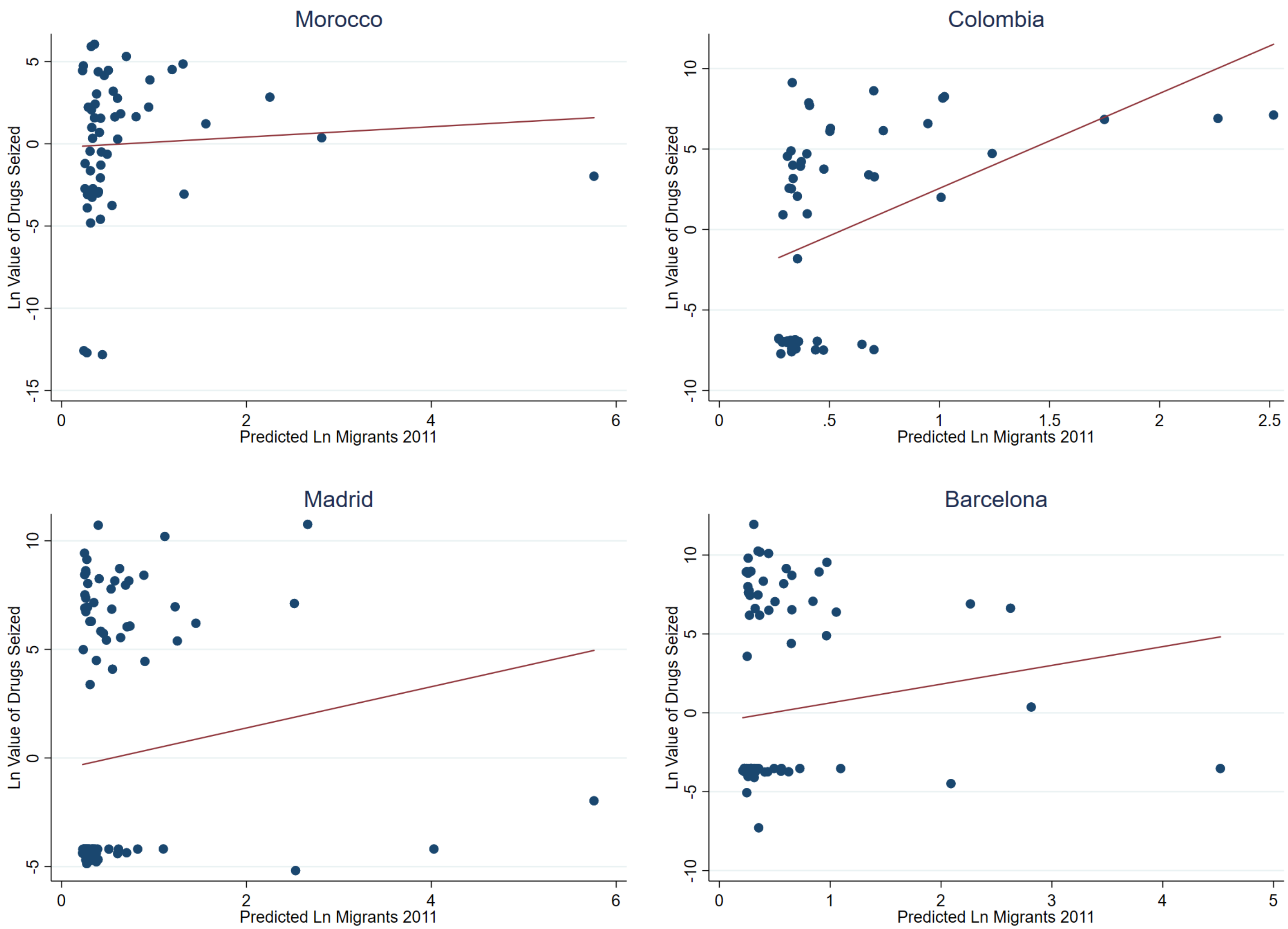
Notes: This figure shows the fraction of the Spanish population born in another country over time. The data are reported by the World Bank but come from the United Nations Population Division.

Figure 14: First-Stage Fit



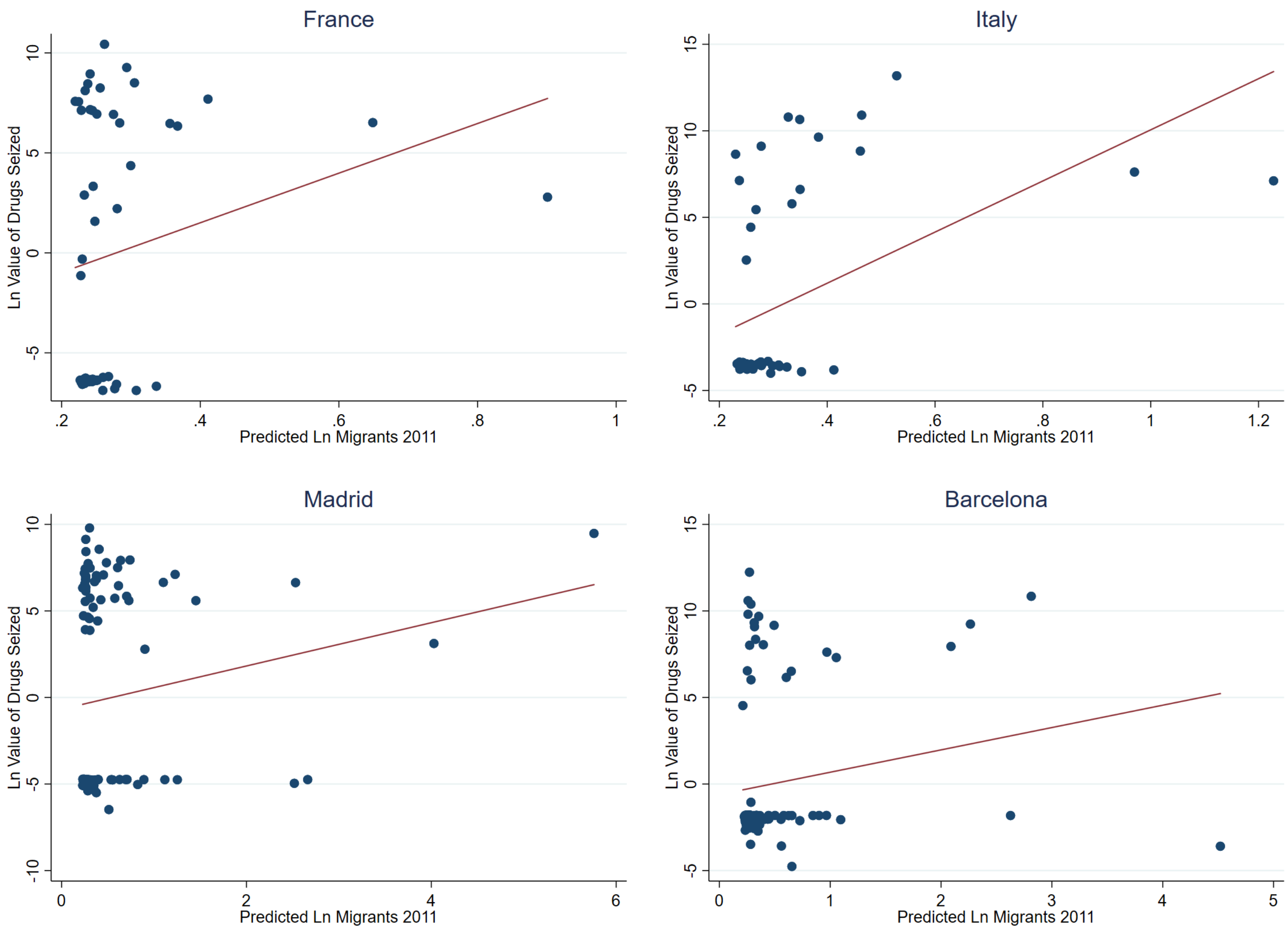
Notes: The figure shows the conditional scatter plots of *Log Migrants* 2011 with the instruments for immigrant inflows in the decade 1991 to 2001 (on the left) and 2001 to 2011 (on the right). Both *Log Migrants* 2011 and the predicted inflows are residualized on origin and destination fixed effects, log distance, and on the instrument from the left-out decade.

Figure 15: Migrants and Drug Trafficking Imports



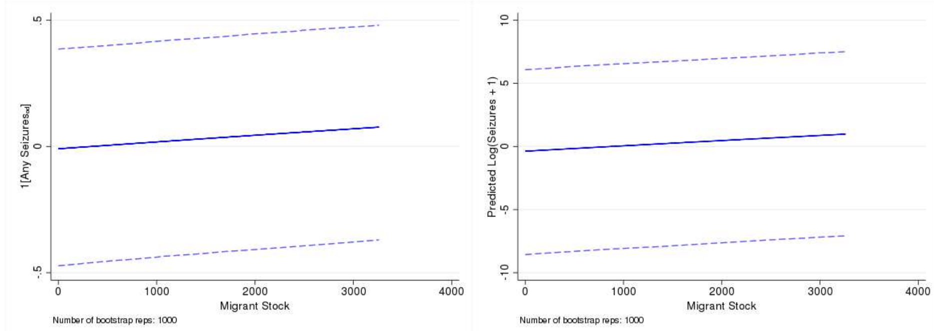
Notes: The figure shows the conditional scatter plots of predicted *Log Migrants* 2011 with the log value of imported drugs seized for origins Morocco and Colombia and separately for provinces Madrid and Barcelona. Data are conditional on origin and destination fixed effects and log distance.

Figure 16: Migrants and Drug Trafficking Exports



Notes: The figure shows the conditional scatter plots of predicted *Log Migrants* 2011 with the log value of imported drugs seized for origins France and Italy and separately for provinces Madrid and Barcelona. Data are conditional on origin and destination fixed effects and log distance.

Figure 17: Non-Parametric Relationship Between Import Drug Seizures and Bilateral Immigrant Population



Notes: This figure shows the values of the dummy variable $\mathbf{1}\{S_{od} > 0\}$ (left) or $\log(S_{od} + 1)$ (right) predicted from the non-parametrically estimated function $g(M_{o,d})$, as in $f(S_{o,d}) = \alpha_o + \alpha_d + g(M_{o,d}) + \delta \ln(Dist_{o,d}) + \varepsilon_{o,d}$. S_{od} is equal to the value of drugs seized in province d originating from country o. For estimation I used the Stata program `npiv` developed by Chetverikov et al. (2018).

Figure 18: Effect of Bilateral Immigrant Population on Drug Trafficking: Dropping Origin Countries

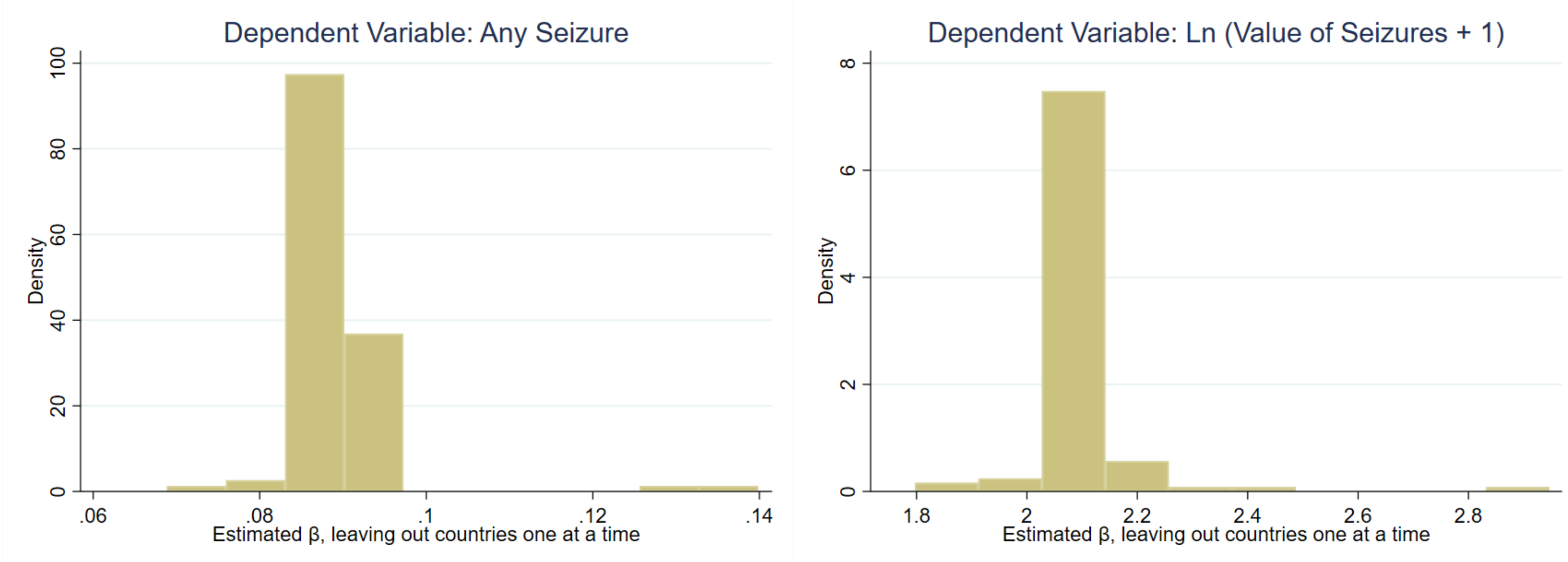


Figure 19: Effect of Bilateral Immigrant Population on Drug Trafficking: By Drug

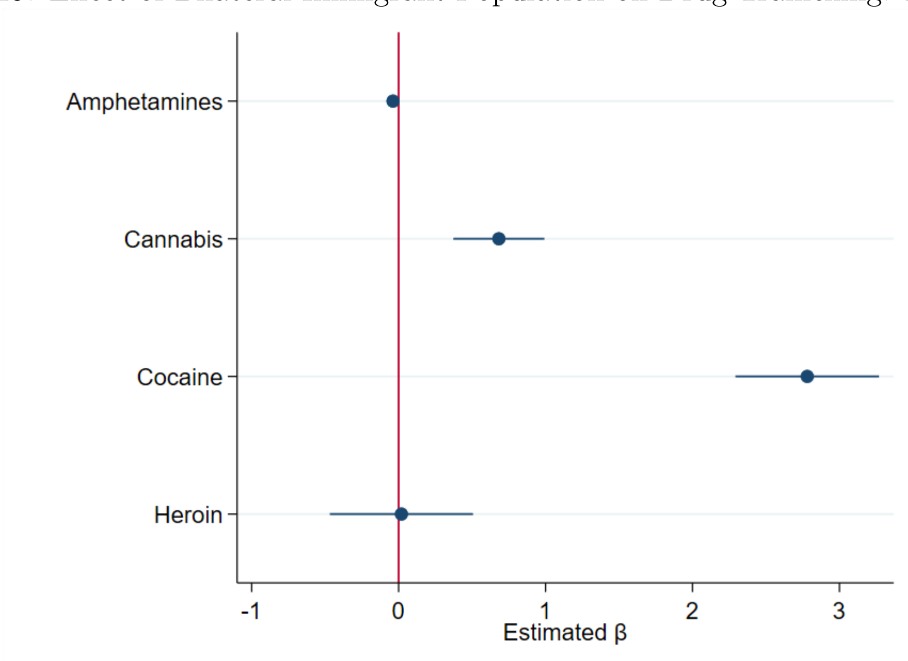


Figure 21: Effect of 2005 Immigrant Regularization on Work Permits, Naturalizations

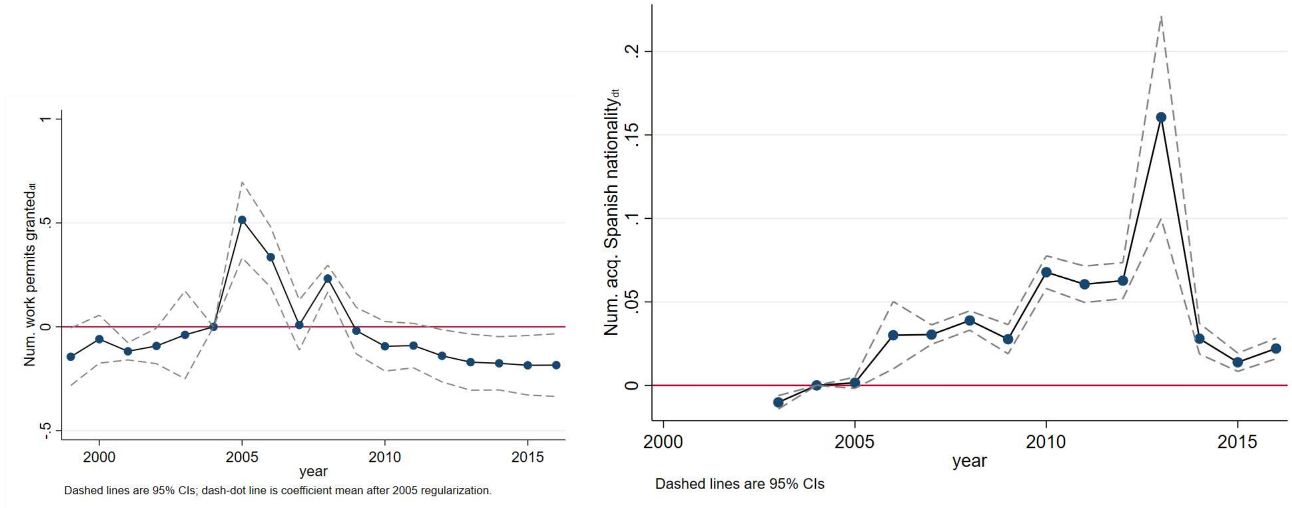


Figure 22: Effect of 2005 Immigrant Regularization on Drug Seizures

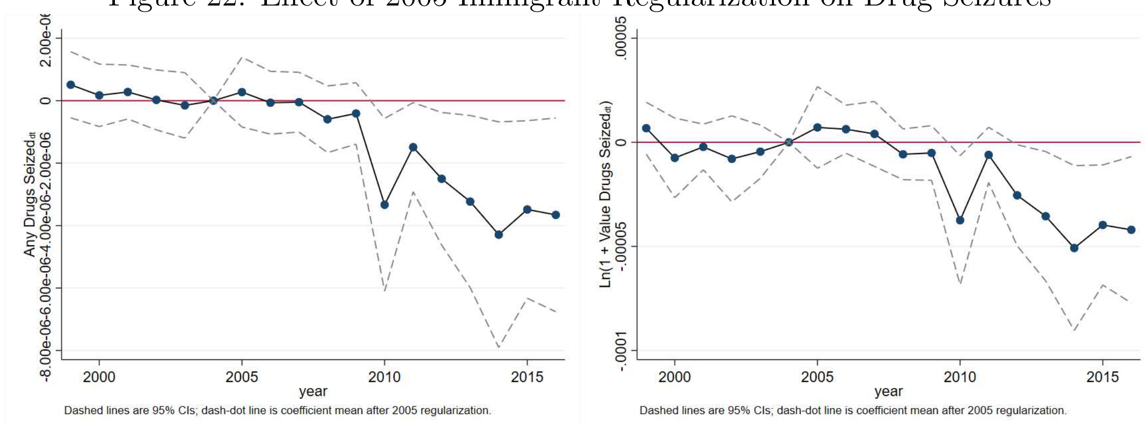


Figure 23: Effect of 2005 Immigrant Regularization on Seizures by Drug

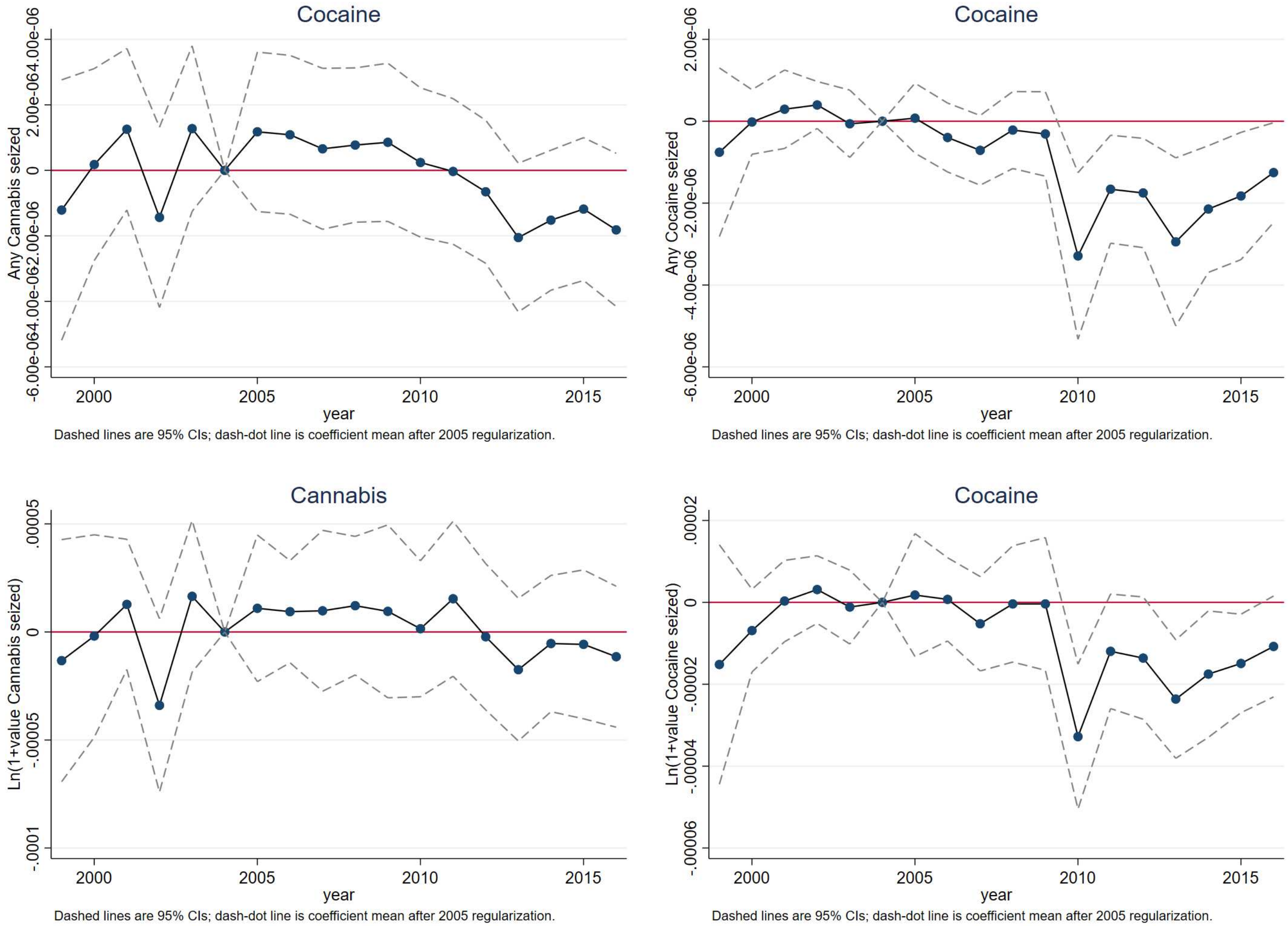


Figure 24: Effect of 2005 Immigrant Regularization on Naturalizations by Continent

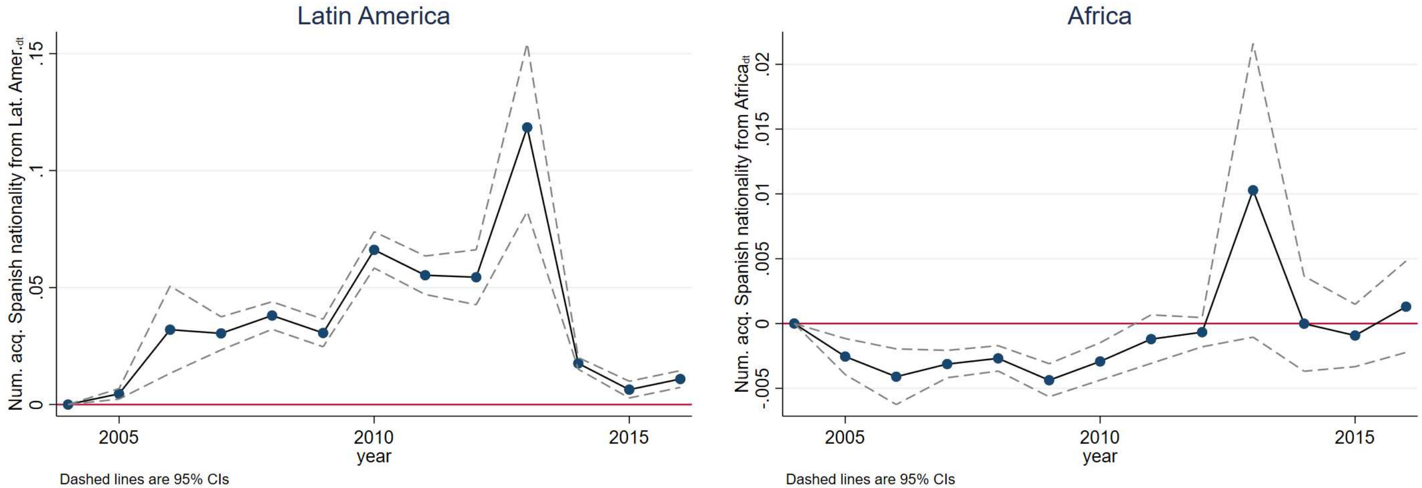
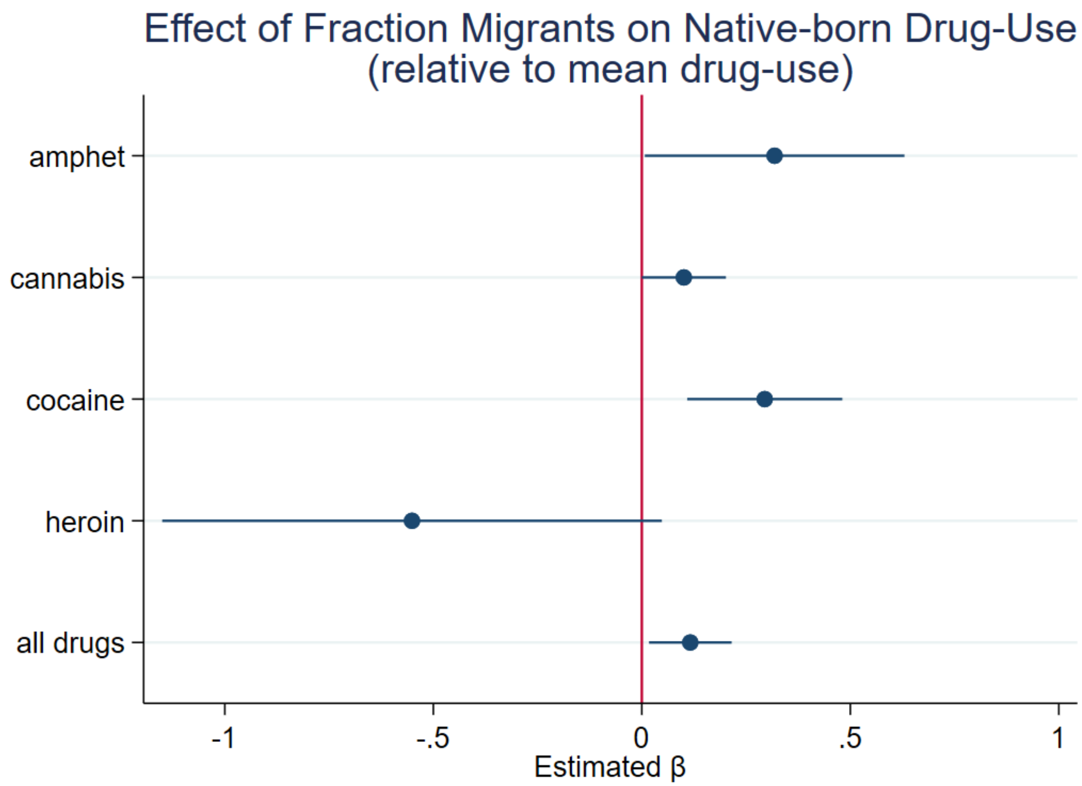


Figure 20: Effect of Immigration on Native Drug Use



Notes: This figure plots the coefficient estimates of β from Equation **??** for each drug (the top four estimates: amphetamines, cannabis, cocaine, and heroin) and for any drug (the last estimate). The effect sizes are normalized by the national average drug use prevalence for each drug type.

Appendix

A Theory

In this section I briefly lay out a theoretical justification for the bilateral and province level regressions discussed above. This theory allows me to provide a structural interpretation to the estimated coefficients from section 3.

Setup. Illegal drug varieties are indexed by $\omega \in [0, 1]$ with region d's efficiency in producing variety ω denoted as $z_d(\omega)$. Aggregate consumption of illegal drugs in province d is defined as

$$C_d = \left[\int_0^1 q_d(\omega)^{(\eta-1)/\eta} d\omega \right]^{\eta/(\eta-1)} \tag{A.1}$$

for elasticity of substitution $\eta > 0$ and the quantity of each drug variety $q_d(\omega)$. Following Eaton and Kortum (2002), I assume region d's production efficiency distribution is Frèchet

$$F_d(z) = e^{-T_d z^{-\theta}} \tag{A.2}$$

where $T_d > 0$ and $\theta > 1$ and Z_d has a geometric mean $exp(\gamma/\theta)T_d^{1/\theta}$ where γ is Euler's constant.

In terms of prices, the cost of good ω produced in o and delivered to d is the realization of the random variable

$$P_{od} = \frac{w_o \tau_{od}}{Z_o}$$

for average input wages w_o and bilateral trade costs $\tau_{o,d} \geq 1$ (with $\tau_{dd} = 1$ for all d).

Gravity. Denote by $X_{o,d}$ the flow of illegal drugs from origin country o to destination d. Then I have the gravity equation

$$\ln X_{o,d} = \delta_o + \delta_d + \theta \ln \tau_{o,d}$$

where for bilateral immigrant population $M_{o,d}$,

$$\ln \tau_{o,d} = \alpha_0 \ln t_{o,d} - \alpha_1 \ln M_{o,d} \tag{A.3}$$

where $t_{o,d}$ are bilateral trade costs when bilateral immigrant population is zero. Hence, we have

$$\ln X_{o,d} = \delta_o + \delta_d + \theta\alpha_0 \ln t_{o,d} - \theta\alpha_1 \ln M_{o,d}$$

In practice, bilateral trade costs (when bilateral immigrant population is zero) can be expressed as

$$\ln t_{o,d} = f(gravity_{o,d}) + \tilde{\varepsilon}_{o,d}$$

where $f(gravity_{o,d})$ incorporates the standard bilateral gravity variables—geographic or cultural closeness—and $f(\cdot)$ is a standard functional form. Hence, we obtain our estimating equation

$$\ln X_{o,d} = \delta_o + \delta_d + f(gravity_{o,d}) + \beta_2 \ln M_{o,d} + \varepsilon_{o,d} \tag{A.4}$$

where $\varepsilon_{od} \equiv \theta\alpha_0\tilde{\varepsilon}_{o,d}$ and the same applies for $f(\cdot)$ and where $\beta_2 \equiv -\theta\alpha_1$. The unobservable bilateral links that shape trade flows, captured by $\varepsilon_{o,d}$, also shape bilateral migration. Hence, estimating (A.4) using OLS will yield a biased estimate of β_2 (the combination of the trade elasticity and the impact of migration on trade costs). However, with a valid instrument, we can estimate this combination.

Consumption. Following Eaton and Kortum (2002), I have

$$C_d = \frac{1}{\gamma}\left(\frac{T_d}{\pi_{d,d}}\right)^{\frac{1}{\theta}} \tag{A.5}$$

where the share of imports to d coming from o is

$$\pi_{od} = \frac{T_o(w_o\tau_{o,d})^{-\theta}}{\sum_{o'} T_{o'}(w_{o'}\tau_{o',d})^{-\theta}}$$

Assuming $\tau_{d,d} = 1$, I have that

$$\pi_{dd} = \frac{T_d(w_d)^{-\theta}}{\sum_o T_o(w_o\tau_{o,d})^{-\theta}} \tag{A.6}$$

Combining the equations A.5 and A.6,

$$C_d = \frac{1}{\gamma} w_d \left(\sum_o T_o(w_o\tau_{o,d})^{-\theta}\right)^{\frac{1}{\theta}}$$

We are interested in understanding the impact of a small change in the vector $\{M_{od}\}_o$ on consumption in d. We assume that $dT_o = 0$ for all $o \neq d$. Log differentiating the previous expression yields

$$d \ln C_d = d \ln w_d + \frac{\pi_{d,d}}{\theta} d \ln T_d - \sum_o \pi_{o,d} d \ln \left(w_o \tau_{o,d} \right)$$

Now assuming that d is a small economy such that $dw_o = 0$ for all $o \neq d$, we obtain

$$d \ln C_d = (1 - \pi_{d,d}) d \ln w_d + \frac{\pi_{d,d}}{\theta} d \ln T_d - \sum_{o \neq d} \pi_{od} d \ln \tau_{o,d}$$

Starting from the previous expression, substitute in equation A.3 for $d \ln \tau_{o,d}$ to obtain

$$d \ln C_d = (1 - \pi_{d,d}) d \ln w_d + \frac{\pi_{d,d}}{\theta} d \ln T_d - \sum_{o \neq d} \pi_{od} \left(\alpha_0 d \ln t_{od} - \alpha_1 d \ln M_{o,d} \right)$$

and setting $d \ln t_{od} = 0$ (i.e., assuming no change in the impact of time-invariant gravity variables) yields

$$d \ln C_d = (1 - \pi_{d,d}) d \ln w_d + \frac{\pi_{d,d}}{\theta} d \ln T_d + \alpha_1 \sum_{o \neq d} \pi_{o,d} d \ln M_{o,d} + \varepsilon_d$$

where $\varepsilon_d \equiv -\alpha_0 \sum_{o \neq d} \pi_{o,d} d \ln \tilde{\varepsilon}_{o,d}$.

To obtain a cross-sectional estimating equation comparable to what I estimate at the province level, I integrate up to obtain

$$\ln C_d - B_0 = (1 - \pi_{dd})(\ln w_d + B_1) + \frac{\pi_{d,d}}{\theta}(\ln T_d + B_2) + \alpha_1 \sum_{o \neq d} \pi_{o,d}(\ln M_{o,d} + B_o) + \int \varepsilon_d$$

$$\ln C_d = (1 - \pi_{d,d}) \ln w_d + \frac{\pi_{d,d}}{\theta} \ln T_d + \alpha_1 \sum_{o \neq d} \pi_{o,d} \ln M_{o,d} + (\frac{B_2}{\theta} - B_1)\pi_{d,d} + \alpha_1 \sum_{o \neq d} B_o \pi_{o,d} + \epsilon_{od}$$

Consider the case of cocaine, where there is no domestic production, i.e. $T_d = 0$, which implies $\pi_{d,d} = 0$. Then we have

$$\ln C_d = \ln w_d + \alpha_1 \sum_{o \neq d} \pi_{o,d} \ln M_{o,d} + \alpha_1 \sum_{o \neq d} B_o \pi_{o,d} + \tilde{\epsilon}_{od}$$

Finally, to relate consumption as defined in equation A.5 to empirically observed measures of drug consumption $\tilde{C}_d$, I assume

$$\ln C_d = -\rho_0 + \rho_1 \ln \tilde{C}_d$$

Then we have

$$\ln \tilde{C}_d = \rho_0 + \frac{1}{\rho_1} \ln w_d + \frac{\alpha_1}{\rho_1} \sum_{o \neq d} \pi_{o,d} \ln M_{o,d} + \frac{\alpha_1}{\rho_1} \sum_{o \neq d} B_o \pi_{o,d} + \tilde{\epsilon}_{o,d}$$

B Additional Empirical Analyses

B.1 2004 Madrid Bombing Event Study

I also explore the short-run effects of a major event in Spain: the 2004 Madrid train bombings. Carried out by a Moroccan immigrant and funded by drug trafficking, the bombings killed 193 people, injuyed about 2,000, and were a major international news story. Due to the connection between the bombings and Moroccan drug trafficking, enforcement intensity directly specifically at Moroccan smuggling may have suddenly increased, while the number of Moroccan immigrants (in the short-run) changed only minimally.

To assess whether this change in enforcement intensity caused a notable increase in drug seizures, I estimate

$$Y_{o,d,t} = \alpha_{o,d} + \alpha_t + \sum_{t \neq Mar.\ 2004} \theta_t \times M^{2003}_{Morocco,d} + \epsilon_{o,d,t}$$

where $o \in \{Moroccan, non-Moroccan\}$, d is Spanish province, t denotes year-month, and $Y_{o,d,t} \in \{\ln(S_{o,d,t,} + 1), \mathbf{1}\{S_{o,d,t} > 0\}\}$. The vector $\{\theta_t\}$ will capture the extent to which the number of Moroccan immigrants induces larger changes in enforcement intensity.

I plot the event study graphs in Figure A.2. I find no statistically significant structural break in seizures. One caveat for this approach is that if drug traffickers also suddenly change their trafficking behavior and routes to avoid increased enforcement intensity, the same pattern may result.

B.2 Drug-Hubness of Origins

To understand the degree to which the immigrant-trafficking relationship is heterogenous by origin country, I look at whether drugs being seized are coming from countries which are "hubs" of drug trafficking, that is, countries which export large amounts of illicit drugs. To do so, I estimate equation 2 but interact my measure of bilateral immigrants with a measure of the extent to which an origin country is a drug hub, defined as either the fraction of total world drug seizures coming from the origin country or the rank order thereof.

Data on world bilateral drug seizures are similarly taken from the UNODC dataset on individual drug seizures that I use for Spain. One drawback of these data for countries other than Spain, however, is that reporting of drug seizures to the UNODC is less frequenty and high quality than in Spain. Nevertheless, no alternative data source on country-pair drug trafficking exists so I pursue this analysis using these imperfect data.

In Table A.3 I show the estimated coefficients. I find that origin countries which are significantly involved in drug trafficking, i.e. send a substantial amount of illicit drugs to countries other than Spain, are more likely to export drugs to Spain when more immigrants from those countries settle in Spain.

C Additional Tables and Figures

Table A.1: Robustness to Different Functional Forms, Any Seizure

	(1) Drug seizures (any)	(2) Drug seizures (any)	(3) Drug seizures (any)
$M_{o,d}^{2011}$	0.00000431*		
	(0.00000250)		
$\ln\left(\frac{M_{o,d}^{2011}}{1000}\right)$ (-1 for ∞)		0.0884***	
		(0.0250)	
$\left(M_{o,d}^{2011}\right)^{1/3}$			0.0140**
			(0.00590)
Observations	5564	5564	5564
R^2	0.011	-0.211	0.028
Origin FE	Y	Y	Y
Dest. FE	Y	Y	Y
Ln dist	Y	Y	Y
1st-stg F-stat.	311.683	7.257	50.487

Standard errors clustered by 52 provinces in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.2: Robustness to Different Functional Forms, Ln Amount of Seizure

	(1) Drug seizures (ln value)	(2) Drug seizures (ln value)	(3) Drug seizures (ln value)
$M_{o,d}^{2011}$	0.0000978**		
	(0.0000423)		
$\ln\left(\frac{M_{o,d}^{2011}}{1000}\right)$ (-1 for ∞)		1.960***	
		(0.350)	
$\left(M_{o,d}^{2011}\right)^{1/3}$			0.312***
			(0.0904)
Observations	5564	5564	5564
R^2	0.021	-0.845	0.018
Origin FE	Y	Y	Y
Dest. FE	Y	Y	Y
Ln dist	Y	Y	Y
1st-stg F-stat.	311.683	7.257	50.487

Standard errors clustered by 52 provinces in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.3: Effect of Bilateral Immigrant Population by Origin Drug-Hubness

	(1) Drug seizures (any)	(2) Drug seizures (ln value)	(3) Drug seizures (any)	(4) Drug seizures (ln value)
Log Migrants 2011	0.112***	2.225***	0.143***	3.285***
	(0.0371)	(0.530)	(0.0431)	(0.625)
Log Migrants 2011 × % of seized drugs from o	0.0193	3.113		
	(0.238)	(3.659)		
Log Migrants 2011 × Drug hubness rank			-0.00137*	-0.0498***
			(0.000692)	(0.0103)
Observations	5564	5564	5564	5564
R^2	0.046	0.065	0.058	0.113
Origin FE	Y	Y	Y	Y
Dest. FE	Y	Y	Y	Y
Ln dist	Y	Y	Y	Y
1st-stg F-stat.	23.854	23.854	11.819	11.819

Standard errors clustered by 52 provinces in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure A.1: Binscatter, Any Seizures on Bilateral Immigrant Population

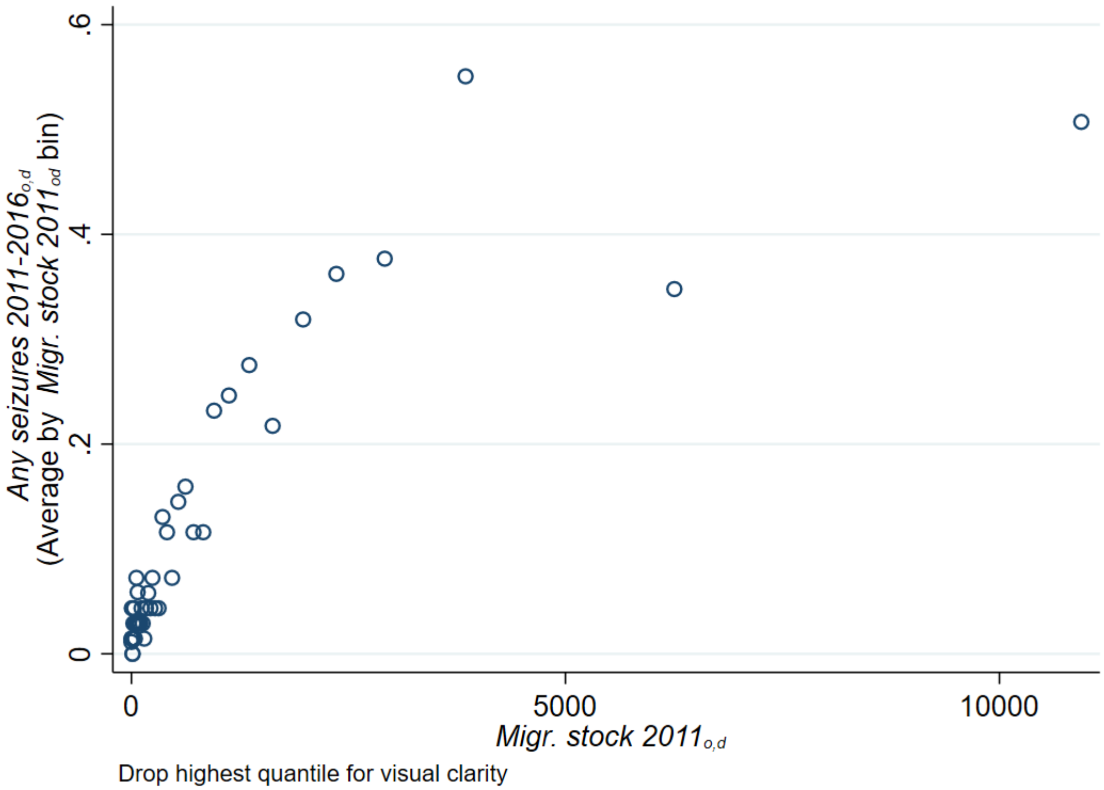
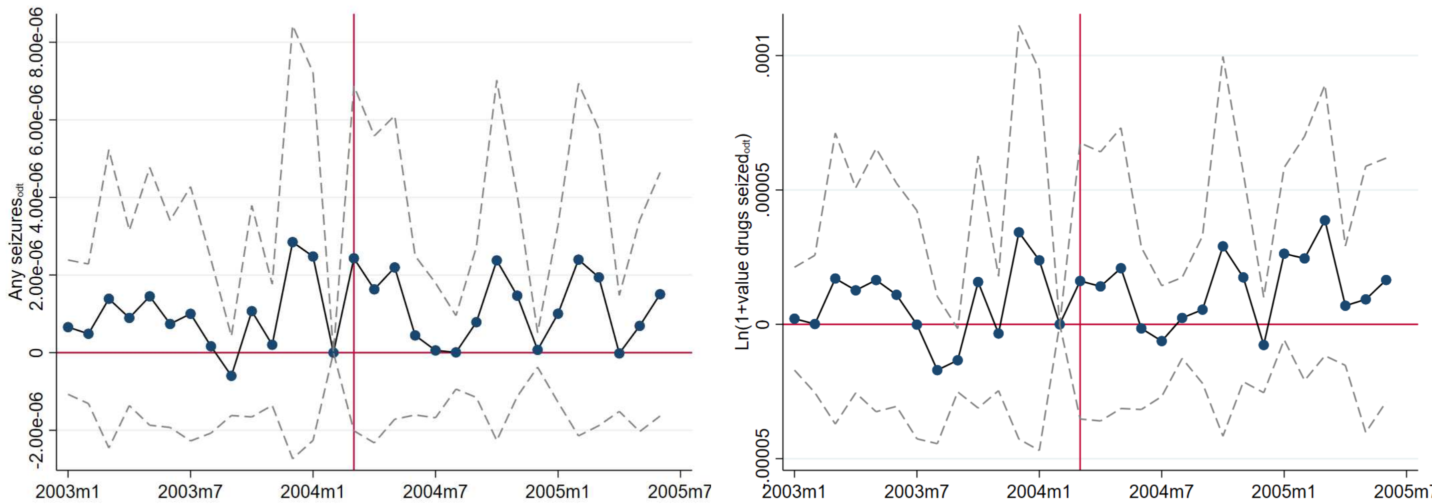


Figure A.2: Effect of 2005 Bombing on Seizures from Morocco



Notes: This figure shows event study plots of the effect of the 2004 Madrid train bombings on seizures of drugs coming from Morocco. I control for year-month and province-by-origin fixed effects, where origins are aggregated into two groups: Moroccan or non-Moroccan. The year-month coefficients plotted are interacted with the number of Moroccan immigrants present in the province in 2003.