

Migrant Networks and Illegal Drug Trafficking*

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Abstract

Does globalization also integrate illegal markets? Nearly \$2 trillion per year is generated by illicit smuggling across international borders, yet little is known about what forces shape this trade. In this paper, I use novel data on bilateral drug trafficking to study how migrant networks affect illegal drug flows. These data contain information on nearly 10,000 wholesale-level drug seizures in Spain which importantly include details on the country of origin of the drugs as well as the locality of the seizure. I first validate seizures as a proxy for true drug imports using measures of drug availability by province. In my baseline specification, I exploit variation across Spanish provinces in the size of migrant networks by origin country to estimate how bilateral migrant network size affects the likelihood and total value of drug seizures originating from the origin country. I control for origin country and destination province fixed effects and instrument for migrant network. I find that a 10% larger migrant network raises drug seizures by 12% on a bilateral link. Separately, at the province-level, I find that a larger share of migrants in the population raises the value of drugs trafficked into the province across all source countries. I present evidence that this effect is driven by the legal status of migrants and not differential preferences for illegal drugs by migrants.

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1 Introduction

Transnational crime, or the shipment of illegal goods across international borders, generates nearly \$2 trillion per year in revenue, amounting to almost 10% of world merchandise trade (Mavrellis, 2017). Much of this illegal trade generates negative externalities such as violence, and the consumption of such illicit goods often has negative consequences on individual health and productivity, as is the case with illegal drugs (NDIC, 2011). Despite the magnitude of illegal smuggling and its social consequences, little is known about what factors shape it.

In this paper, I explore the connection between globalization and transnational crime by looking at how migration affects illicit drug trafficking. Though this has been a question of significant contemporary political controversy, there exist no causal estimates on this relationship for two reasons. First, there is a notable lack of data on drug trafficking, an illegal and therefore hard-to-observe activity. Second, migration and drug trafficking may be endogenous. Without credible exogenous variation in migrant networks, it is difficult to rule out whether some unobserved factor is driving both migration and smuggling.

To make progress on the former issue, lack of data, I use a novel data set of international drug seizures at the *bilateral* level compiled by the United Nations Office of Drugs and Crime (UNODC). These data are unique in that they report the country from which drugs were trafficked, a field missing in data sets typically used to study illegal drug markets. I first validate these data by correlating local seizures with local drug availability using survey-based measures of local drug availability. I find that more seizures predict greater availability of illicit drugs, suggesting that seizures of illicit drugs are a valid proxy for actual smuggling flows. Leveraging these bilateral data on drug trafficking allows me to use a conventional gravity equation to estimate the effect of migrant networks on drug trafficking. Finally, the data report the location *within-country* of the drug seizure, allowing me to exploit variation at sub-national level.

To address endogeneity concerns, I include a standard set of controls in a gravity regression framework. These controls include origin and destination fixed effects, which include regional economic and institutional development as well as multilateral resistance terms, among others. Since I use within-destination-country variation, origin fixed effects also control for national-level drug, visa, and foreign policies vis-a-vis the origin country.

Nevertheless, there may still be unobserved bilateral factors, such as bilateral law enforcement intensity, which affects both migration and smuggling. For example, one locality's police force may discriminate against Moroccans more than another locality, thus resulting in less migration and fewer drug flows from Morocco into the region. To overcome such confounders, I adapt the leave-out push-pull instrument recently developed by Burchardi et al.

(2019) to my context. This instrument interacts the relative attractiveness of immigrant destinations—the pull factor—with the arrival of migrants from different origins—the push factor. For example, if many immigrants are arriving in Spain from Morocco in a decade, and many immigrants from other continents are settling in Barcelona in that decade, then the instrument will predict many Moroccans to flow into Barcelona in that decade.

I focus on the country of Spain, a major entry point for illegal drugs entering Europe, which has high-quality data on both bilateral drug seizures and migration at the sub-national level. The UNODC data covers many countries, but data are reported voluntarily by UN member states. Spain, however, reports high quality data on drug seizures to the UNODC consistently. I consider the period of 2011 to 2016 and exploit variation among Spain’s 52 provinces and a set of 107 origin countries for which I observe bilateral migrant stocks.

My baseline results show that migrant networks facilitate the flow of illegal drugs. I find that a 10% increase in the size of the bilateral migrant network raises bilateral drug seizures by 12%, a magnitude comparable to estimates of the effect of migrant networks on legal trade. However, this effect depends crucially on the legal status of the migrants, with more irregular (i.e. undocumented) migration raising drug seizures and more regular (i.e. legal) migration reducing drug seizures.

One drawback of bilateral-level estimation is that the reduced-form estimates capture both real changes in total imports as well as trade diversion. That is, drug smuggling may rise for bilateral links with a lot of migrants but overall the total amount of imports is unchanged as migration changes. I therefore also consider a destination-level specification where trade diversion is not of concern. I find that a 10% increase in the proportion of migrants in the local population in a province raises seizures of drugs imported into the province by 14%. This suggests that net of trade diversion, migrants still raise overall illegal drug imports.

Finally, I find that the effect I find is likely driven by supply-side factors, such as reductions in labor, information, and transaction costs rather than demand-side changes driven by migration. I rule out preference-driven explanations of my effects by pointing to survey tabulations showing immigrants use illegal drugs at about half the rate of the native-born. I also find that the legal status of migrants is important determinant of drug trafficking and origin countries which export significant quantities of drugs to countries around the world also export substantially more drugs to Spain when immigration rises from that origin to Spain.

This paper relates to several literatures. Research in criminology on the determinants of international drug trafficking is the most related to the present study. In particular, Berlusconi et al. (2017), Giommoni et al. (2017), and Aziani et al. (2019) use the UNODC

data to assess how bilateral migrant stock, among other factors, correlates with bilateral drug seizures. They consistently find that migrant stock is positively associated with drug trafficking. However, their analysis has three limitations. First, they do not use exogenous variation in migrant networks between countries, which may bias their results if unobserved bilateral factors, such as treaties 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 analysis is at the country-pair level, and thus even if they had included fixed-effects, unobserved national policies vis-a-vis a partner country may still bias the results.

This paper also relates to the extensive literature on the consequences of globalization. While many studies in economics have estimated positive effects of immigrants on *legal* trade¹, none have done so for *illegal* trade. Separately, there has been substantial interest in the effects of immigration on crime rates. I provide evidence for a new mechanism linking migration and crime, specifically that migrant connections to their home country facilitate smuggling. Most of these studies find that the effect of immigration on crime is generally small but depends on the formal labor market returns for migrants.² I find support for such a mechanism by finding that migrant legal status is a crucial determinant for drug trafficking.

In addition, this paper follows a strand of mostly theoretical papers on the economics of smuggling dating back to Bhagwati and Hansen (1973).³ More recent empirical work on smuggling has been done by Fisman and Wei (2009) on the smuggling and misinvoicing of cultural goods and Akee et al. (2014) on the determinants of human trafficking. I expand upon this literature by studying the smuggling of illegal drugs, one of the most important and consequential illegally smuggled goods.

This paper proceeds as follows. Section 2 discusses the potential mechanisms that drive migrant networks to have a positive effect on illegal trade. Section 3 introduces the data, some stylized facts, and validates the drug seizures data. Section 4 presents my empirical strategy, results, and some interpretation, with Section 5 exploring potential mechanisms. Section 6 concludes.

2 Mechanisms

Migration can facilitate the movement of illegal goods in three main ways: (i) by reducing trade costs, since most illegal drugs are not consumed in the same country in which they

¹See, for example, Gould (1994), Head and Ries (1998), Rauch and Trindade (2002), Combes et al. (2005), Cohen et al. (2017), and Parsons and Vézina (2018).

²See, for example, Spenkuch (2013), Bianchi et al. (2012), Bell et al. (2013), and Miles and Cox (2014).

³Other notable entrants in this literature are Grossman and Shapiro (1988) and Thursby et al. (1991).

are produced, (ii) by expanding the pool of people willing to engage in trafficking, since in many countries migrants face barriers to succeeding in the formal labor market, and (iii) by raising the demand for illegal drugs if migrants' preferences for drugs differ from those of the native-born.

The argument that migrant networks reduce trade costs of illegal goods follows that of why migrant networks increase 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 in the United Kingdom by Matrix Knowledge Group (2007), traffickers stressed the importance of recruiting workers from their social networks⁴ (with whom they are likely to share nationality), the importance of greater trust within nationality,⁵ and the helpfulness of living close to immigrants coming from source countries of illicit drugs in reducing search costs.⁶ 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).

Migration may also raise illegal drug trafficking if immigrants face barriers to access to legal jobs. In Spain, for example, many immigrants have overstayed their visas to live in the country but have not had their status regularized, thus disqualifying them from legal work opportunities (González-Enríquez, 2009). Such barriers have been found by Freedman et al. (2018) in the United States and by Mastrobuoni and Pinotti (2015) and Pinotti (2017) in Italy to significantly raise the participation of immigrants into criminal activity.

Finally, immigration may raise the demand for illegal drugs if they have stronger preferences for drugs relative to the native-born. However, there is scant evidence of this being the case and I rule it out in my subsequent empirical work in Section 5.

⁴"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)

⁵For example, "L-15 [a convicted drug trafficker] was from Ghana. In 2000 he was approached by a Ghanaian 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)

⁶For 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."

3 Data

3.1 Drug Trafficking Data Description

Having a credible measure of illegal drug flows is crucial to my analysis. Since direct measurement in an illegal market context is very challenging, I use an indirect measure of trafficking: the amount of drugs seized on a bilateral link, under the assumption that seizures are correlated with actual flows of illicit drugs.⁷ This approach is similar to other studies of illicit behavior where direct observation is difficult or impossible. For example, Dell (2015) uses local drug-related violence as a proxy for drug trafficking through a location.⁸

To proxy for drug trafficking flows, I use 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 a bilateral linkage for each seizure event.

Reporting drug seizures to the UNODC is voluntary, however, which leads to selection in which countries report, how often they report, and what fraction of drug seizures they report to the UNODC. To resolve this problem I focus on Spain, a country that reports a substantial number of drug seizures to the UNODC nearly every year (see Figure 1) and reports higher quality data than other countries.⁹

The data Spain reports to the UNODC comes from the Statistical 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 reporting agencies: the National Police, the national anti-smuggling agency (Guardia Civil), and the Customs and Excise Department. These agencies are reporting 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 for each drug seizure in the dataset is assigned based on subsequent investigation, and captures 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

⁷I discuss measurement error in the context of estimation in Section 4.

⁸Another example is Dube et al. (2016) who uses illegal crop eradication as a proxy for cultivation.

⁹For example, amount variables describing the hiding place of seized drugs, the installation in which they were seized, 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 most seizures of any country during this period, nearly 10,000. By contrast, the median number of seizures reported was 18 and the mean fraction of values of the aforementioned variables missing was 33%.

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. For the case of cargo ship containers, a range of documents are checked, 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 so-called “narco-boats” that transport hashish resin in the Strait of Gibraltar unless proven otherwise their country of origin is considered to be Morocco. 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 is determined based on information obtained from investigations that have been carried out. 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.¹⁰

To compute the value of illegal drug seizures, I use illegal drug prices reported by the Centre of Intelligence against Organized Crime at the Spanish Ministry of the Interior.¹¹

In Table 1, I show summary statistics of the 9,880 individual drug seizures for Spain for the study period. Three facts emerge: (i) nearly all drugs seized by Spanish authorities are cocaine or heroin, with negligible amounts of amphetamines and heroin; (ii) Africa and South America are the primary origins of these drugs, with North America also making up a non-trivial share; (iii) the distribution of drug seizure amounts is right skewed, with many moderate sized seizures (the median seizure value is \$43,796) and a few huge seizures (the mean seizure value is \$593,795). In addition, the set of countries from which Spain imports illegal drugs is highly concentrated for heroin, amphetamines, and cannabis, but disbursed for cocaine, as shown in Figure 2. Also, many provinces within Spain receive imports of illicit drugs, as shown in Figure 3.

3.2 Validation Exercise

I now turn to validating that the drug seizures data capture real drug smuggling flows. Given perfect information, I would correlate seizures with actual flows. However, I cannot directly observe real flows, so I turn to an alternative, albeit more indirect, method of validating the seizures data. This method estimates the predictiveness of drug seizures for drug availability at the destination level, rather than the bilateral level, since I observe the former but not

¹⁰The preceding discussion is based on responses to my own information requests from the Spanish Ministry of the Interior.

¹¹Specifically, these are prices in dollars for 2012 for heroin, cocaine, amphetamines, and cannabis as reported by Spain to the UNODC.

the latter.

I test how much seizures of drugs coming in from outside a region correspond to the availability of drugs in that region.¹² To build confidence that the seizures data do in fact capture local drug availability, I correlate the amount of drugs seized in a province and originating from a foreign country with survey-based measures of drug availability in the province using the Survey on Alcohol and Drugs in Spain (EDADES).

The EDADES is a nationally representative biennial survey on substance use in Spain of about 25,000 respondents per survey. Respondents are asked such questions as,

- “How easy is it for you to obtain [cannabis/cocaine/heroin] within the next 24 hours?”
- “Thinking about where you live, how important of a problem do you think illegal drugs are?”
- “How often in your neighborhood are there drugged people on the ground?”

I aggregate responses from the 2011, 2013, and 2015 survey rounds up to the province level and correlate these to measures of drug seizures from the UNODC over this period, also aggregated to the province in which the seizure occurred.

It is ambiguous a priori how drug seizures will vary with drug availability in a locale. Seizures may be negatively correlated to local drug availability if seizures serve as an effective deterrent and substantially reduce local drug supply. However, seizures may be factored into drug smugglers’ decisions and therefore have no deterrent value, which would result in a positive correlation between seizures and local drug availability. For example, in one study of a massive drug bust in the United States of nearly a third of the methamphetamine precursors in the country, Dobkin and Nicosia (2009) find that drug prices rose in the short run but had returned to the pre-seizure levels within 4 months; purity levels returned to their pre-seizure level within 18 months.

I find that seizures positively correlate with a wide range of measures of local drug availability. In Figure 4 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 find that the proportion of respondents saying it is “very easy” to obtain a drug correlates

¹²Some drugs are re-exported on to further destinations; as long as some of the inflows into a destination are consumed locally, seizures should positively correlate to local drug availability. In addition, marijuana may be produced locally, but this is estimated to be a tiny portion of the market by Alvarez et al. (2016).

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).

In Figure 5 I plot the correlation coefficients of various measures of local drug availability and use to the value of all seizures per capita. The measures of drug availability and use are the fraction of respondents replying (i) “very” to “How important of a problem do you think illegal drugs are?”, (ii) “frequently” or “very frequently” to the questions about how often they witness evidence of local drug use or sales in their neighborhood.¹³ For each survey question, seizures vary positively with local drug availability.

3.3 Other Data Sources

I also use data from more conventional sources.

To measure migrant stocks and flows, I use the 2001 and 2011 Spanish Census from the National Institute of Statistics via IPUMS (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 nationality countries differs for the two Census waves, I aggregate countries into the smallest consistent units allowable.

In my bilateral specification, I also control for distance in kilometers between the Spanish province and foreign countries taken from Peri and Requena-Silvente (2010).

4 Empirical Analysis

I am interested in the causal effect of migrant networks on drug trafficking. I explore this relationship in two ways. First, I estimate a gravity equation using data at the bilateral level, allowing me to assess the extent to which more migrants from an origin in a destination raises the amount of drugs trafficked on that bilateral link. Second, I estimate a destination-level specification, which is informative about how more migrants in a region overall raises illegal drug imports.

As an example of the gravity relationship which I explore with greater rigor in Section 4.2, I consider the case of Morocco, a major source of both immigrants and cannabis flowing into Spain. Spatially, there is substantial overlap between the migrant network and the location of seizures of cannabis coming from Morocco, as shown in Figure 6. To more formally

¹³Respondents 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.

evaluate the relationship between migrant networks and drug smuggling, I next estimate this relationship at the bilateral and destination levels in the country of Spain.

4.1 Spanish Context

Spain is an important entry point for many drugs sold in Europe; the value of total drug seizures in Spain amounts to nearly 4 percent of the total amount of illegal drugs consumed in Europe.¹⁴

Spanish drug policy focuses on “harm-reduction”. Both personal use of and production for personal use of drugs are permitted but drug dealing or trafficking is punished with severe prison sentences (Kleiman and Hawdon, 2011). In addition, while there is limited domestic production of marijuana, much of it is imported, and all cocaine and heroin are imported since they are produced in a select few countries in the world. In particular, cocaine is produced almost exclusively in Colombia, Bolivia, and Peru, while heroin is primarily produced in Afghanistan.¹⁵

Finally, as shown in Figure 7, Spain has experienced significant in-migration in the last three decades, with the proportion of migrants in the population rising from 2 percent to over 13 percent between 1991 and 2011.

4.2 Bilateral-level

Econometric Specification

I now turn to estimating the effect of bilateral migrant networks on bilateral drug trafficking. Ideally, I would regress actual illicit drug flows $X_{o,d}$ between origin country o and destination province d on migrant stocks. However, I cannot observe illicit drug flows, thus necessitating a latent variables approach. First, I note that bilateral drug seizures $S_{o,d}$, which I do observe, is equal to the product of enforcement intensity $E_{o,d} \in [0, 1]$ (also not observed) and actual drug flows; that is, $S_{o,d} = E_{o,d}X_{o,d}$. Next, taking logs, I note that $\ln X_{o,d} = \ln \frac{S_{o,d}}{E_{o,d}} = \ln S_{o,d} - \ln E_{o,d}$ such that $E_{o,d} \neq 0$. The assumption $E_{o,d} \neq 0$ implies that I assume bilateral pairs with no seizures must also have no illicit drug smuggling.

I estimate a gravity equation of the form,

¹⁴Using the UNODC data I calculate that Spain seized on average almost 1 billion dollars in illicit drugs between 2011 and 2016; the EMCDDA and Europol (2016) estimate the size of the entire European market to be over \$26 billion.

¹⁵No countries other than Colombia, Bolivia, and Peru are listed in official U.S. estimates of cocaine production. Afghanistan is estimated to produce 80% of world heroin, with Burma, Colombia, Guatemala, Laos, Mexico, and Pakistan making up the balance. See page 23 of U.S. State Department (2019).

$$\begin{aligned}\ln S_{o,d} - \ln E_{o,d} &= \alpha_o + \alpha_d + \beta g(M_{o,d}) + \delta \ln(Dist_{o,d}) + \tilde{\varepsilon}_{o,d} \\ \ln S_{o,d} &= \alpha_o + \alpha_d + \beta g(M_{o,d}) + \delta \ln(Dist_{o,d}) + \varepsilon_{o,d}\end{aligned}\tag{1}$$

where $g(M_{o,d})$ is some increasing function of the stock of migrants from o living in d , $Dist_{o,d}$ is the distance in km between o and d , α_o and α_d are origin and destination fixed effects, respectively, 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 . 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 economy of d .

I make two adjustments to Equation 1 for the empirical analysis. First, I calculate $g(M_{o,d})$ as the log of 1 plus the migrant stock measured in thousands, as this functional form follows from the specification tests suggested by Burchardi et al. (2019).¹⁶ Moreover, my results are robust to other functional forms as well as non-parametric estimation. Second, I replace the dependent variable $\ln S_{od}$ with $\ln(S_{od} + 1)$ or with a dummy for whether any seizure occurred to avoid dropping bilateral links with no seizures, as these make up more than half my sample.

Table 2 shows the estimated relationship between migrant stock and the likelihood of a seizure occurring on a bilateral link (column 1) and the log of 1 plus the amount of drugs seized on a link (column 2). I find that migrant network size is positively correlated with both the extensive margin and the amount of drugs trafficked.

Instrumental Variable Approach

There may be unobserved factors driving both migration and drug trafficking, such as bilateral enforcement intensity as demonstrated in Equation 1. For example, one province's police force may direct greater scrutiny towards particular nationalities relative to other Spanish provinces, which may reduce immigration and drug smuggling from that origin to the province. To obtain variation in migration exogenous to such concerns, I follow Burchardi

¹⁶See Figure 12, which plots the binscatter between the migrant stock and a dummy for any seizure occurring on a bilateral link. The figure shows a concave relationship between the two, suggesting a log functional form. In addition, similar to Burchardi et al. (2019), I estimate $\mathbf{1}[Seizures_{o,d} > 0] = \delta + \beta \ln(1 + \pi MigrStock_{o,d}^{2011}) + \varepsilon_{o,d}$ in non-linear least squares and obtain $\hat{\pi} = 0.002$, which suggests measuring migrant stock in thousands.

et al. (2019) and develop instruments for bilateral migrant stock using a set of leave-out push-pull instruments. These instruments produce exogenous variation in bilateral immigrant inflows. I use two decades of inflows during a period of unprecedented immigration into Spain to predict current bilateral migrant stocks.

The intuition of this instrument works by predicting bilateral migration flows from other bilateral migrant flows. For example, suppose we want to predict the number of Moroccans settling in the province of Granada. The instrument will do so by predicting Moroccans will settle in the province within Spain in which large numbers of migrants from other countries are also settling. Similarly, if many immigrants are settling in a particular province, then an immigrant arriving from a particular origin country 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 . The instrument predicts bilateral immigrant inflows and is defined as

$$\tilde{I}_{o,d}^{IV,t} = I_o^t \times \frac{I_d^t}{I^t}, \quad (2)$$

where I_o^t is the number of immigrants from origin o coming to Spain in decade t , I_d^t is the number of immigrants from all origins settling in destination province d in decade t , and I^t is the total number of immigrants arriving in Spain in decade t .¹⁷

However, if immigrant inflows are correlated between similar origin countries or between similar Spanish provinces, then predicting bilateral flows between o and d using equation 2 would fail the exclusion restriction. For example, if both Moroccan and Algerian immigrants go to the province of Granada due to their similar Mediterranean climates, then Moroccan migration to Granada will be predicted, by Algerian migration so long as Algerian migration to Granada is nontrivial, 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 variable defined as

$$I_{o,d}^{IV,t} = I_{o,-a(d)}^t \times \frac{I_{-c(o),d}^t}{I_{-c(o)}^t} \quad (3)$$

¹⁷An inflow is defined as a person interviewed for the 2001 or 2011 Spanish census with a nationality from another country who arrived in the 10 years prior to the survey.

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.

Results

Table 3 shows the estimation results for the instrumented gravity specification. Column 1 shows the first-stage, 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 1 on the extensive margin of drug trafficking while instrumenting for migrant stock using two decades of exogenous predicted immigrant inflows. The coefficient estimate of the effect of migrant network size on the likelihood of drug trafficking 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 migrant stock, 933, a 10% increase in bilateral migrant network size raises the likelihood that the link will be used for drug trafficking by 0.5 percentage points.¹⁸ Similarly, in column 3, the coefficient estimate of migrant network size on the log amount of drugs seized is 2.33 (SE=0.56), which implies that a 10% increase in migrant stock relative to the mean raises the amount of drugs trafficked by 12%.¹⁹ This is in line with other estimates in the literature examining the effect of migrant networks on legal trade.²⁰

Seizures and Enforcement Intensity

Robustness to Functional Form

In my main specification, equation 1, I measure the endogenous variable of interest, migrant network size, as the log of one plus the number of migrants measured in thousands, $g(M_{o,d}^{2011}) = \ln\left(1 + \frac{M_{o,d}^{2011}}{1000}\right)$ which follows from Burchardi et al. (2019) and the diagnostic test they use to obtain their functional form (i.e. non-linear least squares estimation of $\mathbf{1}[Seizures_{o,d} > 0] = \delta + \beta \ln\left(1 + \pi MigrStock_{o,d}^{2011}\right) + \epsilon_{o,d}$). I perform several robustness checks on my baseline functional form assumption.

First, I estimate my baseline specification across a range of functional forms of migrant network size, with results shown in Tables 8 and 9. In addition, I estimate $g(M_{o,d})$ from

¹⁸Using $\hat{\beta} = 0.105$ from column 2 in Table 3, we have: $\mathbb{1}\left[S_{o,d}^{2011-2016} > 0 | M_{o,d}^{2011} = 933\right] = 0.105 \left(\ln\left(1 + \frac{933 \times 1.1}{1000}\right) - \ln\left(1 + \frac{933}{1000}\right)\right) \approx 0.0049$.

¹⁹Using $\hat{\beta} = 2.331$ from column 3 in Table 3, we have: $\frac{S_{o,d}^{2011-2016}[M_{o,d}^{2011}=1.1 \times 933]}{S_{o,d}^{2011-2016}[M_{o,d}^{2011}=933]} - 1 = \exp\left(2.331 \left(\ln\left(1 + \frac{1.1 \times 933}{1000}\right) - \ln\left(1 + \frac{933}{1000}\right)\right)\right) - 1 = 0.116$.

²⁰See, for example, Parsons and Vézina (2018), who estimate the effect of a 10% increase in migrant stock raises the amount of legal trade by 4.5% to 13.8%.

Equation 1 non-parametrically following Chetverikov and Wilhelm (2017), which I depict in Figure 8, and also find that drug trafficking rises in migrant network size. Finally, I estimate my main effect with Generalized Method of Moments using moment conditions

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

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

for dependent variable $Y_{o,d} \in \{\ln(S_{o,d}+1), \mathbf{1}[S_{o,d} > 0]\}$ and instrument set $Z_{o,d} = (I_{o,d}^{IV,1991-2001}, I_{o,d}^{IV,2001-2011})$. Including a moment for the constant, this yields 163 moments. I cluster standard errors by province.

Table 4 shows the results. My estimates of (π_1, π_2) closely match my baseline functional form assumption of $\pi_1 = \pi_2 = \frac{1}{1000}$. 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 bilateral migrant stock relative to the mean raises the probability of a seizure occurring on a bilateral link by 1.1 percentage points and the value of drugs seized by 20 percent.

Robustness to Sample

I also estimate my baseline effects using a variety of samples. Figure 9 shows the distribution of β estimates from equation 1 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 β separately by type of drug. For cannabis and cocaine, I estimate positive and statistically significant effect sizes. For heroin and amphetamines, the effect is close to zero. However, heroin and amphetamines represent less than 1% of drugs seized by Spain as shown in Table 1 and therefore these estimates are based on very limited data.

Legal Trade

To gauge the magnitude of my effect size relative to the effect of migrant networks on legal trade, I also estimate the relationship between migrant networks and legal trade. I do this

via the Generalized Method of Moments with moment

$$E[(\ln(X_{o,d} + 1) - \delta_2 - \beta_2 \ln(1 + \pi_2 \text{MigrStock}_{o,d}^{2011})) \times Z_{o,d}] = 0$$

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

$$Z_{o,d} = \left(I_{o,d}^{IV,1991-2001}, I_{o,d}^{IV,2001-2011}, (I_{o,d}^{IV,1991-2001})^2, (I_{o,d}^{IV,2001-2011})^2, (I_{o,d}^{IV,1991-2001} \times I_{o,d}^{IV,2001-2011}) \right)'.^{21}$$

I estimate that a 10% rise in migrant network size increases legal trade by about 13%, a magnitude comparable to the effect of migrant networks on illegal drug smuggling.²²

4.3 Destination-level

Drug Seizures

One drawback of the above bilateral-level estimation is that it is not informative about the extent to which the effect of migrant networks on drug trafficking comes from overall increases in drug imports versus trade diversion. For example, trafficking may be higher for bilateral links with more migrants, but drug imports across all origins are not higher when more immigrants move to a province. To estimate the overall impact of migration on drug imports, I estimate a province-level specification.

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

$$\ln\left(\frac{S_d}{P_d}\right) = \alpha + \beta \ln\left(\frac{M_d}{P_d}\right) + \epsilon_d \quad (4)$$

for province population P_d . However, because there might be factors affecting both migration and drug smuggling into a province, I instrument using the previous leave-out push-pull summed across origins and normalized by population

$$I_d^{IV,t} = \sum_o I_{o,-a(d)}^t \times \frac{I_{-c(o),d}^t}{I_{-c(o)}^t} \times \frac{1}{P_d^t} \quad (5)$$

Table 5 shows the results of estimating this province-level specification. In column 1 I show the OLS result, which is that a 10% larger migrant stock in a province raises the amount of drugs seized in that province by over 15%. Column 2 shows the first stage regression, which

²¹With 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.

²²As shown in column 2 of Table 4, 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 $\frac{X_{o,d}^{2011}[M_{o,d}^{2011}=1.1 \times 963]}{X_{o,d}^{2011}[M_{o,d}^{2011}=963]} - 1 = \exp(1.36(\ln(1 + 0.012 \times (1.1 \times 963)) - \ln(1 + 0.012 \times 963))) - 1 = 0.127$.

is strongly positive. Column 3 shows the two-stage least squares, where I find that a 10% increase in migrant stock in a province raises drug smuggling into that province by 14% overall.

Drug Use

I also estimate the effect of additional immigration to a province on local drug use of the native-born. I do so by replacing the dependent variable in Equation 4 with the fraction of native-born adults who have used drugs, either ever in their life or in the last 12 months:

$$\frac{DrugUsers_d^{Native}}{P_d^{Native}} = \alpha + \beta \ln \left(\frac{M_d}{P_d} \right) + \epsilon_d \quad (6)$$

where $DrugUsers_d^{Native}$ is some measure of the number of native-born drug users in province d , P_d^{Native} is the native-born population of d , P_d is the population of d , and M_d is the number of migrants living in d . I instrument $\ln \left(\frac{M_d}{P_d} \right)$ using equation 5.

I graphically depict the results in Figure 11. 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 (across all drugs) by 11 percent.

This is also another check on the validity of the seizures data corresponding to increases in actual availability of drugs at the local level, and not merely variation in enforcement actions.

5 Understanding the Effect of Migrant Networks on Trafficking

Thus far I have documented a quantitatively large causal effect of migrant networks on drug trafficking. I now turn to exploring which mechanisms are driving this effect. Existing research on migration and legal trade suggests that migrant networks may affect drug trafficking in several ways, including (i) migrants bringing any potential preferences for drugs with them, (ii) generating social capital that creates an absolute advantage for organized criminal trafficking groups to smuggle drugs on a particular bilateral link, and (iii) differential economic opportunities available to migrants.

The following section presents evidence testing various predictions for these channels.

5.1 Preferences for Drugs

Atkin (2013) and Bronnenberg et al. (2012) suggest that migrants 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 migration. 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 migration.

First, I find that migrants consume drugs at a substantially lower rate than native-born Spaniards. Using the EDADES data introduced in Section 3.2 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 migrants are not driving increases in the local drug use prevalence.

Second, drugs are unlikely to be differentiable to consumers across trafficking origin. Illegal drugs are generally homogenous goods with little differentiation in the market except by the purity of the drug.

5.2 Legal Status of Migrants

Background

The legal status of migrants may be an important factor shaping the relationship between migrant networks and drug seizures. This may occur for three main reasons. First, legal status provides migrants easier access to the formal labor market, thus reducing the returns to criminal activity relative to the legal labor market. Second, legal status may change the punishment faced by the migrant for a given crime, as deportation or other legal sanctions may result from a crime committed by an irregular migrant. Finally, legal status may affect the way in which police can investigate crimes, since migrant enclaves with high rates of irregularity may be less likely to report crimes or tip off police to ongoing or future crimes.

In Spain, irregular migrants are defined as those living in the country without a residency permit. Irregular migrants generally enter Spain through legal means (González-Enríquez, 2009). These include migrants who overstay their tourist visas, stay in Spain beyond the terms of their temporary residence permits, and so forth.²³ Moreover, irregular migration is a common phenomenon in Spain among migrants. Surveys of migrants in Spain have found nearly 50% of migrants 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

²³Irregular migrants who enter Spain via either crossing the Strait of Gibraltar by boat or by sneaking into the Spanish North African cities of Ceuta or Melilla are a small fraction of irregular migrants, though they garner a disproportionate share of press coverage (González-Enríquez, 2009).

work permit but nevertheless began to work or look for a job.

Concurrent with high levels of irregularity has been Spain’s welcoming attitude to migrants more generally, and irregular migrants specifically. For example, the country regularly provided legal status to hundreds of thousands of irregular migrants in waves of regularizations between 2000 and 2005. In addition, irregular migrants 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 migrants to be observed in the official population registry, a fact which I will exploit to measure irregular migration prevalence at the bilateral level.²⁴

Measurement

To estimate the prevalence of irregular migrants at the origin country-destination province level, I take the difference between the number of persons appears 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 $Irregular\ Migrants_{od} = Population\ Registry\ Number_{od} - Residency\ Permits_{od}$ and then divide by total bilateral migrant stock to obtain the fraction of immigrants in the bilateral migrant network 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 40% of migrants living in Spain are irregular, a finding consistent with the estimate of González-Enríquez (2009) for 2008.

Estimation

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 migrant stock by regular and irregular status:

$$Y_{o,d} = \alpha_o + \alpha_d + \beta_{irregular} \ln \left(\frac{M_{o,d}^{irregular}}{1000} + 1 \right) + \beta_{regular} \ln \left(\frac{M_{o,d}^{regular}}{1000} + 1 \right) + \zeta \ln(Dist_{o,d}) + \varepsilon_{o,d} \quad (7)$$

²⁴The population registry is still not a perfect measure for several reasons. First, municipalities differ in their documentation requirements for registration and the degree to which they notify migrants that they must re-register every two years. In addition, according to González-Enríquez (2009), sex workers and migrants 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 migrant behaviors common across all provinces or destination province policies common across all origins will be controlled for by the origin and destination fixed effects.

To obtain exogenous variation in irregular and regular bilateral migrant stocks, 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 migrants with legal status L

$$I_{o,d}^{L,IV,D} = \frac{M_{o,-d}^{L,2011}}{M_{o,-d}^{2011}} \times I_{o,d}^{IV,D}$$

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

Table 6 shows the results for estimating equation 7. I find that a 10% increase in bilateral *regular* migrant stock reduces the likelihood of a drug seizure by 2.5 percentage points and a 10% increase in bilateral *irregular* migration raises the likelihood of a drug seizure by 3 percentage points²⁵ (column 2) and that a 10% increase in bilateral regular migrant stock reduces the value of drugs seized by 29%, while a 10% rise in the bilateral stock of irregular migrants raises the value of drugs seized by 60%²⁶ (column 4). Taken together, these results suggest migrant legal status is an important determinant of entry into crime. However, my identification strategy cannot separate the two channels of selection (that certain origin-destination pairs tend to select for more irregular migrants) and migration policy (the direct effect of legal status on drug trafficking).

5.3 Drug-Hubness of Origins

I next look at whether drugs being seized are coming from countries which are “hubs” of drug trafficking, that is, they export large amounts of illicit drugs. To do so, I interact my measure of migrant network size 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 frequently 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 7 I show the estimated coefficients. I find that origin country which are signifi-

²⁵Using $\hat{\beta}^{Reg} = -0.535$ from column 2 and mean value of bilateral migrant stock of 933, I find that $\mathbb{1}[S_{od}^{2011-2016} > 0 | M_{od}^{2011} = 933] = -0.535 (\ln(1 + \frac{933 \times 1.1}{1000}) - \ln(1 + \frac{933}{1000})) \approx 0.025$ and for $\hat{\beta}^{Irreg} = 0.627$, this is 0.030.

²⁶Using $\hat{\beta}^{Reg} = -7.364$ from column 4, we have: $\frac{S_{od}^{2011-2016}[M_{od}^{2011}=1.1 \times 933]}{S_{od}^{2011-2016}[M_{od}^{2011}=933]} - 1 = \exp(-7.364 (\ln(1 + \frac{1.1 \times 933}{1000}) - \ln(1 + \frac{933}{1000}))) - 1 \approx -0.293$. For irregular migration, this is 0.602.

cantly involved in drug trafficking, i.e. send substantial amount of illicit drugs to countries other than Spain, are more likely to export drugs to Spain when more migrants from those countries settle in Spain.

6 Conclusion

The effect of immigration on crime has long been a controversial political issue. In this paper, I contribute to this debate by estimating that migrant networks are an important determinant of international drug trafficking, on par with the effect of migrant networks on legal trade found in other studies. In addition, I find that this effect is driven by supply-side rather than demand-side forces, where immigrants reduce transaction costs across space but do not carry with them higher demand for drugs relative to the native-born.

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 and so on. Hence, generalizing welfare effects of immigration from just one outcome, as is the subject of the present study, is not warranted. Instead, future research should carefully weigh each effect of immigrants in a comprehensive framework.

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Table 1: Summary Statistics of Drug Seizures in Spain

Percent of value seized:	
Drug type:	
Amphetamines	0.2
Cannabis	44
Cocaine	56
Heroin	0.4
Origin Continent:	
Africa	43
Asia	0.7
Europe	0.4
North America	11
Oceania	0.0
South America	44
Percent of countries with >0 seizures	40
Value of amount seized (\$):	
Mean	593,795
Median	43,796
Maximum	192,700,768
Num. of seizures	9,880

Notes: This table presents summary statistics for the United Nations Office of Drugs and Crime Individual Drug Seizures dataset for Spain between 2011 and 2016.

Table 2: Relationship between Migrant Network Size and Drug Seizures

	(1) $\mathbb{1}\{S_{od}^{2011-2016} > 0\}$	(2) $\ln(S_{od}^{2011-2016})$
$\ln(M_{od}^{2011})$	0.138*** (0.0128)	1.946*** (0.246)
Ln distance	0.00505 (0.0276)	0.0690 (0.514)
Observations	5564	5564
R^2	0.417	0.461
Dep. var. mean	0.084	1.036
Origin FE	Y	Y
Dest. FE	Y	Y
Ln dist.	Y	Y

$S_{od}^{2011-2016}$ measured as dollars of drugs seized.

Standard errors clustered by 52 provinces in parentheses

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

Table 3: Effect of Migrant Network Size on Drug Seizures: Bilateral-Level

	(1)	(2)	(3)
	First-stage:	2SLS:	2SLS:
	$\ln(M_{o,d}^{2011})$	$\mathbb{1}\{S_{o,d}^{2011-2016} > 0\}$	$\ln(S_{o,d}^{2011-2016})$
$(I_{o,-a(d)} \times \frac{I_{-c(o),d}}{I_{-c(o)}})_{2001,2011}$	0.0000370** (0.0000140)		
$(I_{o,-a(d)} \times \frac{I_{-c(o),d}}{I_{-c(o)}})_{1991,2001}$	0.000154*** (0.0000258)		
$\ln(1 + \frac{M_{ad}^{2011}}{1000})$		0.106*** (0.0386)	2.343*** (0.557)
Observations	5564	5564	5564
R^2	0.698	0.046	0.060
Origin FE	Y	Y	Y
Dest. FE	Y	Y	Y
Ln dist.	Y	Y	Y
1st-stg F-stat.	24.0	24.0	24.0

Standard errors clustered by 52 provinces in parentheses

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

Table 4: Effect of Migrant Network Size on Drug Seizures: Bilateral-Level, GMM

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

Standard errors clustered by 52 provinces in parentheses

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

Table 5: Effect of Migration 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*** (0.578)		1.449** (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 6: Effect of Migrant Stock & Irregular Migration on Drug Seizures

	(1)	(2)	(3)	(4)
	Any Seizures 2011-2016 _{o,d}	Any Seizures 2011-2016 _{o,d}	Ln amt seized (\$) 2011-2016 _{o,d}	Ln amt seized (\$) 2011-2016 _{o,d}
$\ln \left(1 + \frac{M_{od}^{2011}}{1000} \right)$	0.152*** (0.0390)		3.423*** (0.505)	
$\ln \left(1 + \frac{M_{o,d}^{reg}}{1000} \right)$		-0.535*** (0.0912)		-7.364*** (1.169)
$\ln \left(1 + \frac{M_{o,d}^{irreg}}{1000} \right)$		0.627*** (0.0948)		10.00*** (1.107)
Observations	3365	3365	3365	3365
R ²	0.057	0.054	0.094	0.090
Origin FE	Y	Y	Y	Y
Dest. FE	Y	Y	Y	Y
Ln dist	Y	Y	Y	Y
1st-stg F-stat.	77.7	48.8	77.7	48.8

Standard errors clustered by 52 provinces in parentheses.

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

Table 7: Effect of Migrant Network Size by Origin Drug-Hubness

	(1)	(2)	(3)	(4)
	Any Seizures 2011-2016 _{o,d}	Ln amt seized (\$) 2011-2016 _{o,d}	Any Seizures 2011-2016 _{o,d}	Ln amt seized (\$) 2011-2016 _{o,d}
$\ln \left(1 + \frac{M_{od}^{2011}}{1000} \right)$	0.113*** (0.0376)	2.242*** (0.538)	0.146*** (0.0434)	3.313*** (0.628)
$\ln \left(1 + \frac{M_{od}^{2011}}{1000} \right) \times \% \text{ of seized drugs from o}$	0.0222 (0.237)	3.182 (3.643)		
$\ln \left(1 + \frac{M_{od}^{2011}}{1000} \right) \times \text{Drug hubness rank}$			-0.00140** (0.000670)	-0.0499*** (0.00999)
Observations	5564	5564	5564	5564
R^2	0.048	0.064	0.060	0.111
Origin FE	Y	Y	Y	Y
Dest. FE	Y	Y	Y	Y
Ln dist	Y	Y	Y	Y
1st-stg F-stat.	24.045	24.045	12.834	12.834

Standard errors clustered by 52 provinces in parentheses.

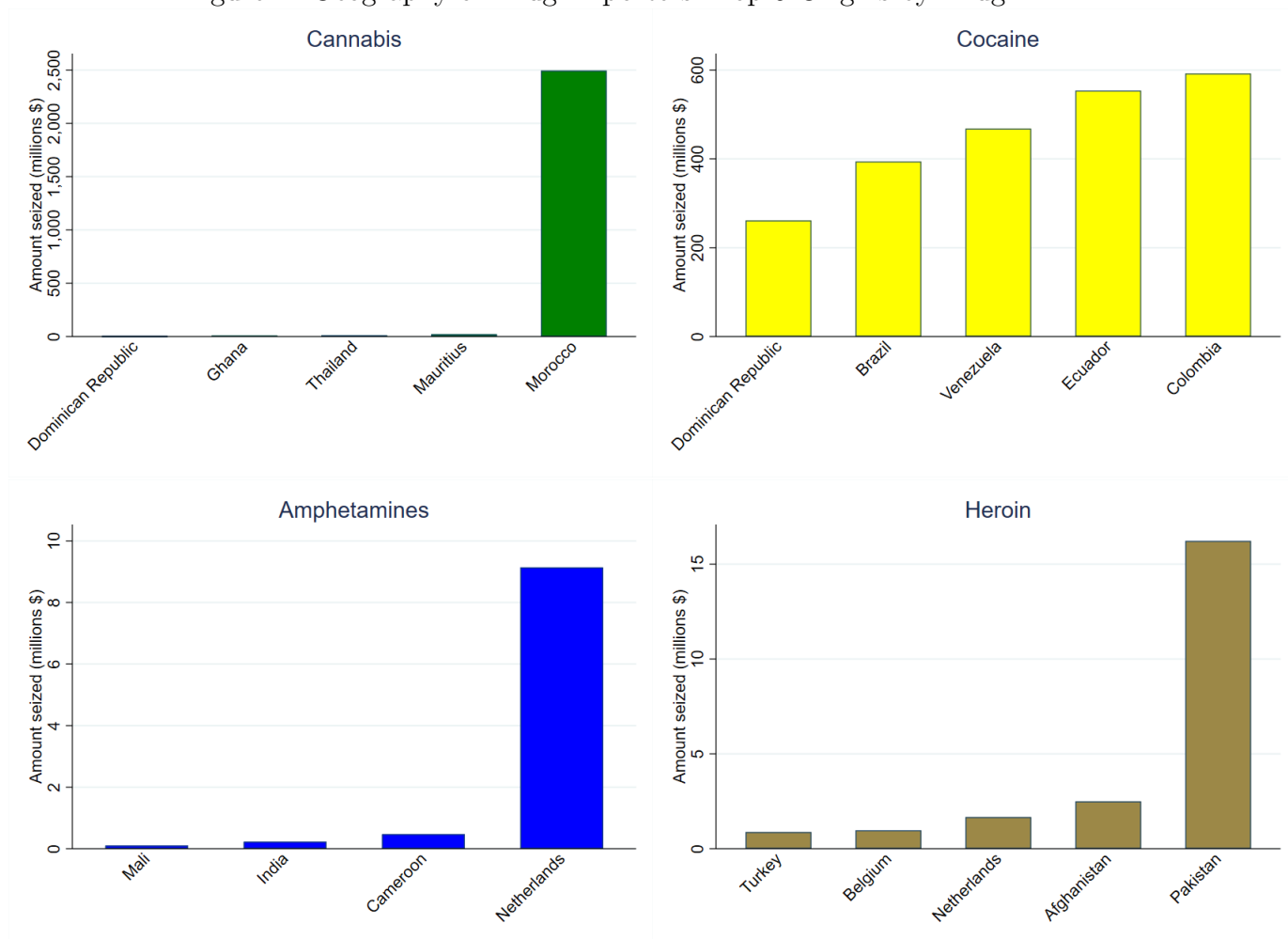
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Value of Drugs Seized in Spain



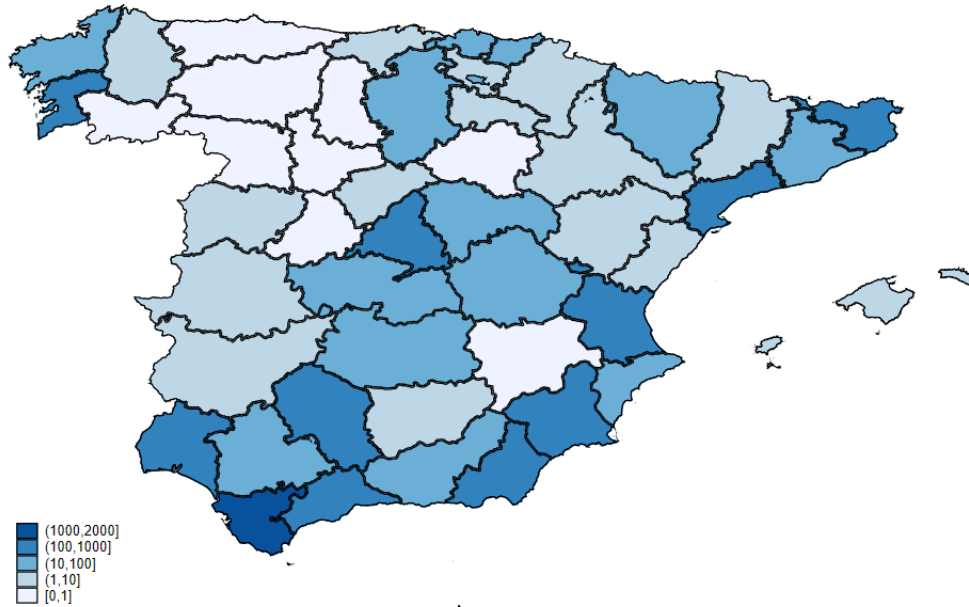
Notes: This figure shows the value of drugs trafficked from foreign countries seized over time by Spanish authorities as reported to the UNODC. Drug prices used are 2012 wholesale prices taken from a survey of Spanish drug prices reported to the UNODC.

Figure 2: Geography of Drug Exporters: Top 5 Origins by Drug



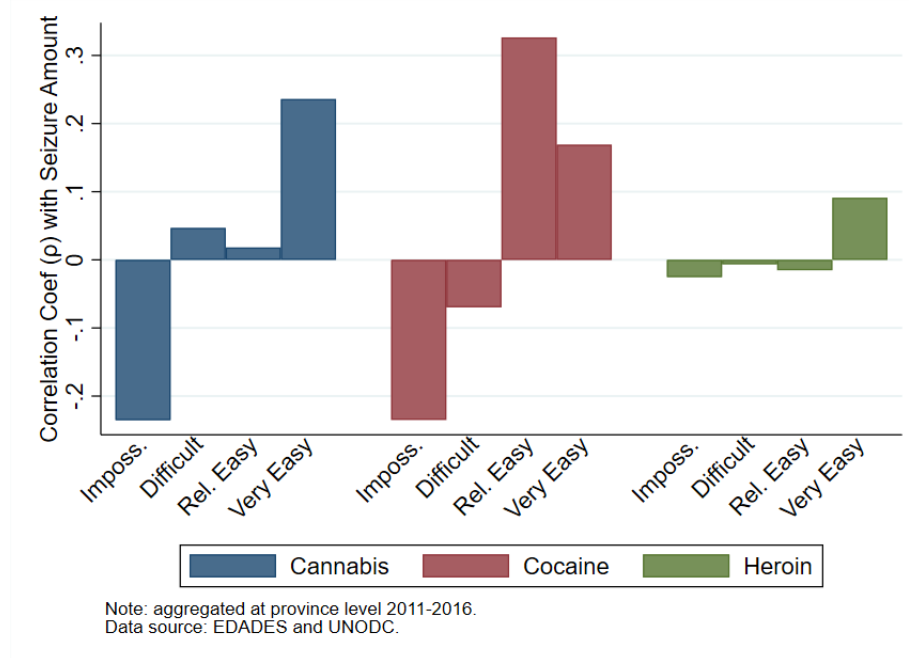
Notes: This figures shows the top 5 exporters of illegal drugs to Spain during 2011 through 2016 by drug as reported by Spain to the UNODC.

Figure 3: Geography of Drug Seizures in Spain
Avg Yearly Drug Seizures Per Capita (\$)



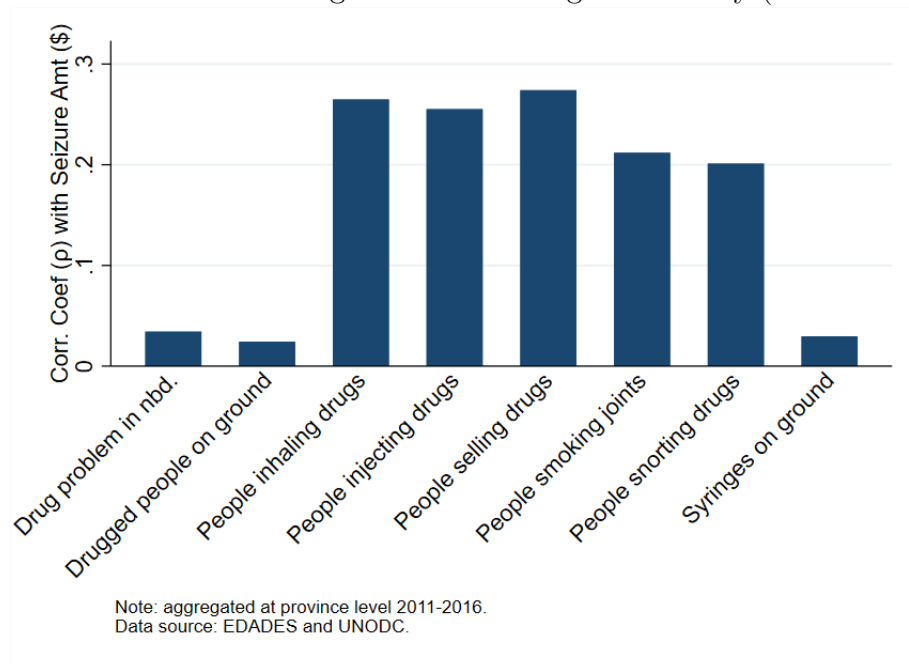
Notes: This figure shows the distribution of drug seizures (measured in dollars by the estimated wholesale value of seized drugs) per capita across Spanish provinces for seizures occurring between 2011 and 2016 as reported by Spain to the UNODC.

Figure 4: Correlation of Drug Seizures to Drug Availability by Drug



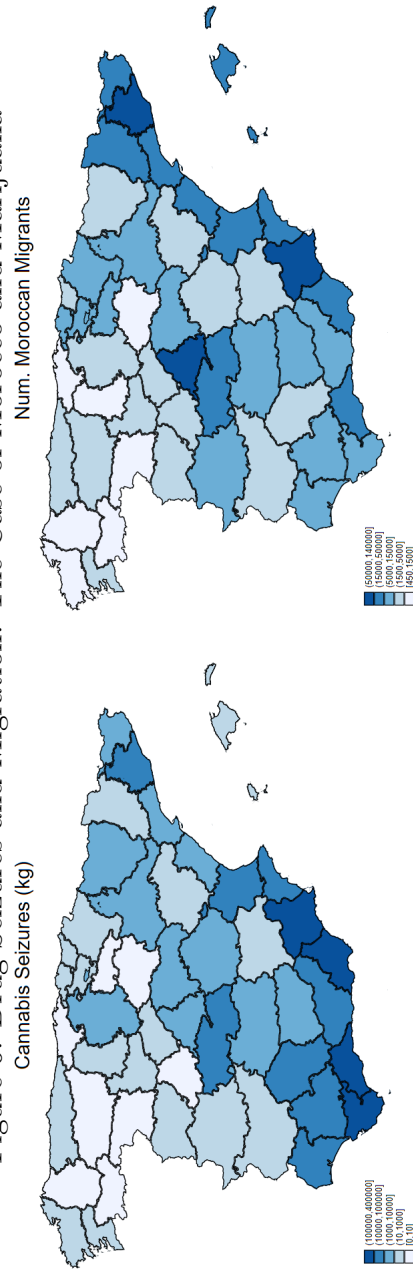
Notes: This figure shows the correlation coefficient between seizures per capita of a particular drug with the fraction of respondents in a province who report finding it impossible/difficult/relatively easy/very easy to obtain that drug within 24 hours averaged over the 2011, 2013, and 2015 waves of the EDADES survey. Amphetamines were not asked about until the 2013 survey, so I exclude them.

Figure 5: Correlation of Drug Seizures to Drug Availability (across all drugs)



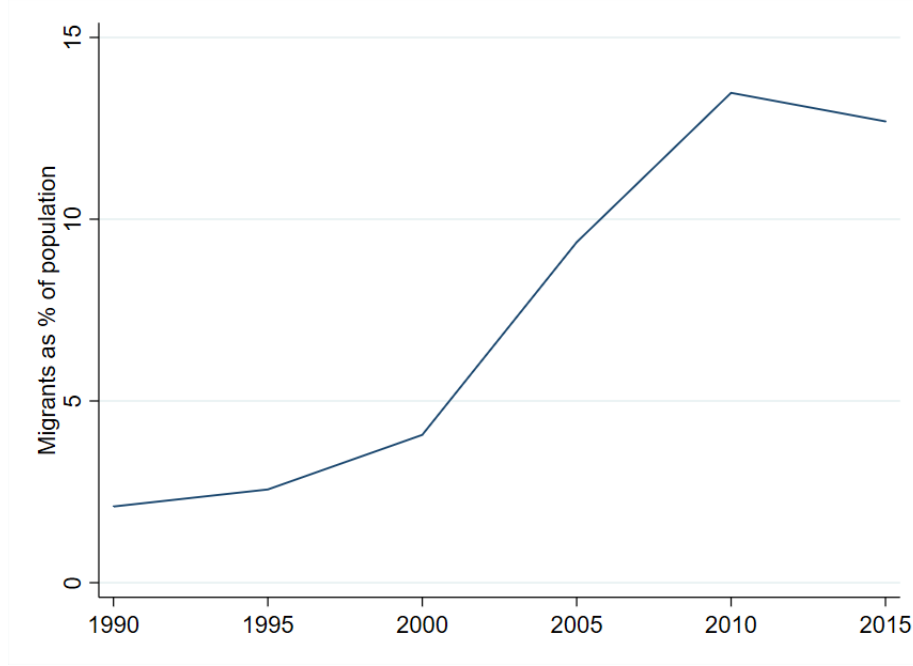
Notes: This figure plots the correlation coefficient between seizures (in dollars) per capita of all drugs (as appropriate) with the fraction of respondents in the province who reported observing the listed drug-related behaviors either “frequently” or “very frequently” or, for the first bar, “very”. 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.

Figure 6: Drug Seizures and Migration: The Case of Morocco and Marijuana



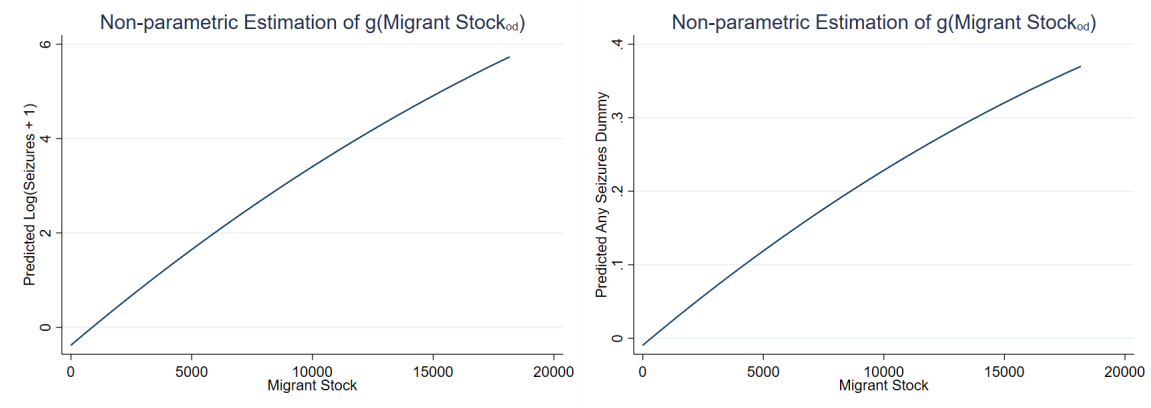
Notes: The figure on the left shows the distribution across Spanish provinces of seizures of marijuana between 2011 and 2016 originating from Morocco; the figure on the right shows the distribution across Spanish provinces of the number of individuals with Moroccan nationality in 2011.

Figure 7: 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.

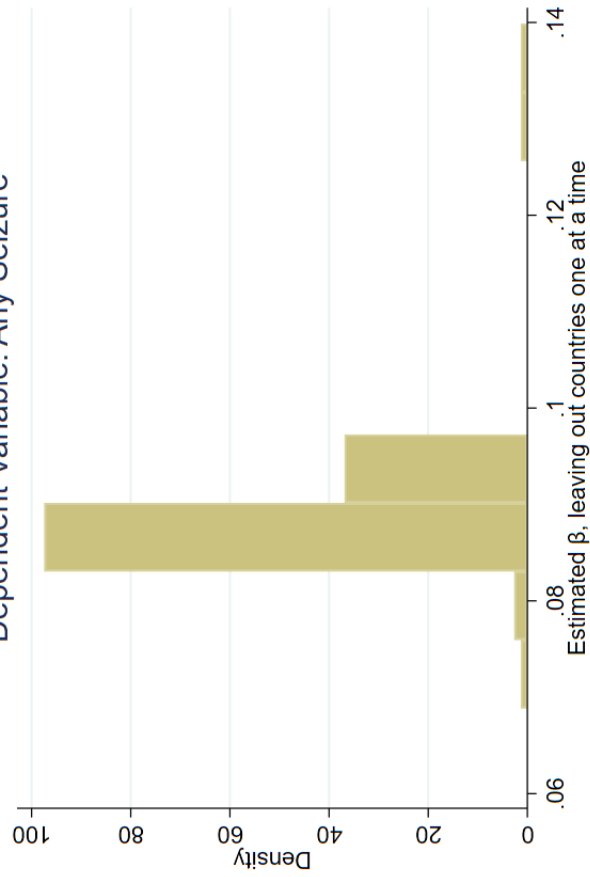
Figure 8: Non-Parametric Relationship Between Drug Seizures and Migrant Network Size



Notes: This figure shows the values of $\log(S_{od} + 1)$ (on the left), with S_{od} equal to the value of drugs seized in province d originating from country o , or $\mathbf{1}\{S_{od} > 0\}$ predicted from the non-parametrically estimated function $g(M_{od})$ from Equation 1 on the right. To estimate $g(\cdot)$, I used the Stata program `npiv` developed by Chetverikov et al. (2018).

Figure 9: Effect of Migrant Networks on Drug Trafficking: Dropping Origin Countries

Dependent Variable: Any Seizure



Dependent Variable: Ln (Value of Seizures + 1)

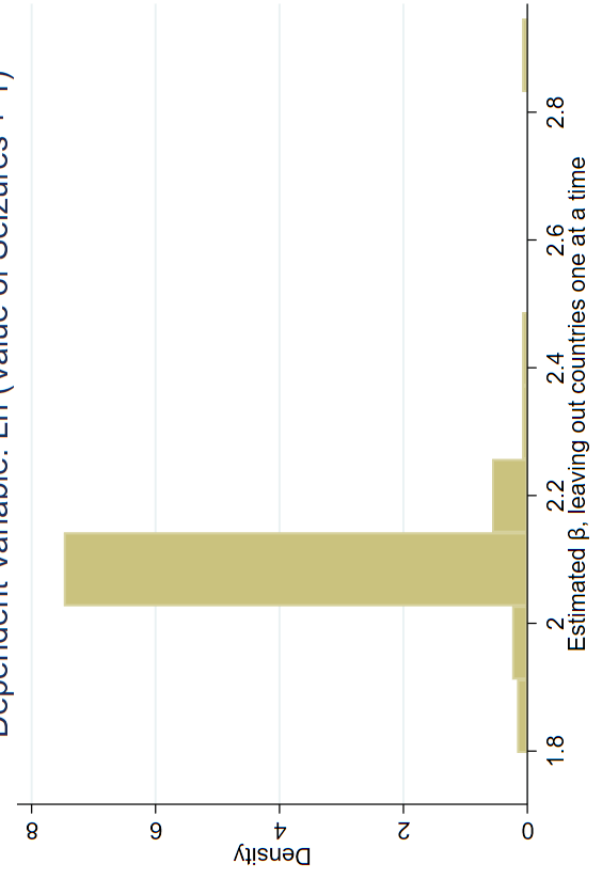


Figure 10: Effect of Migrant Networks on Drug Trafficking: By Drug

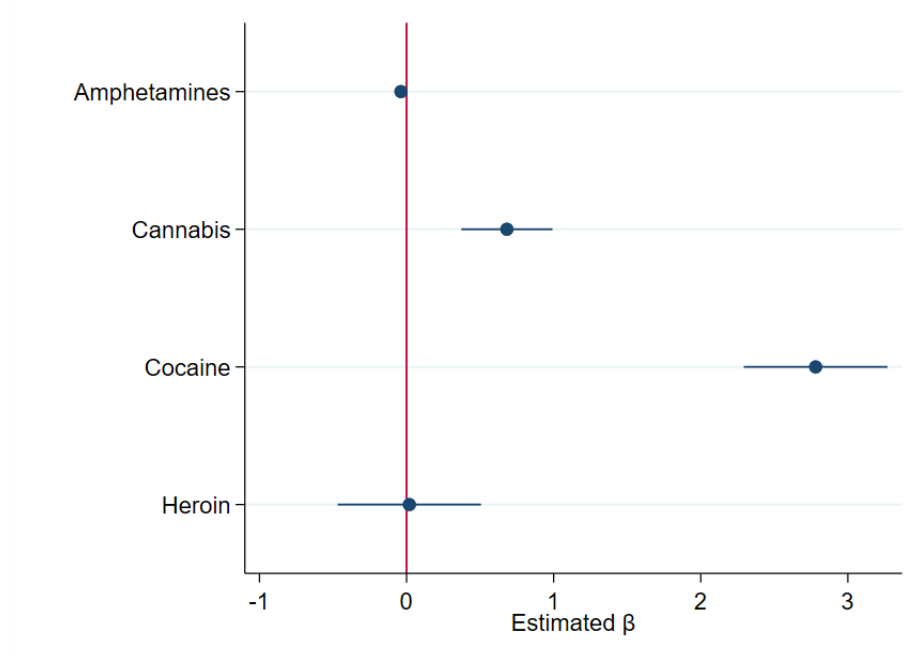
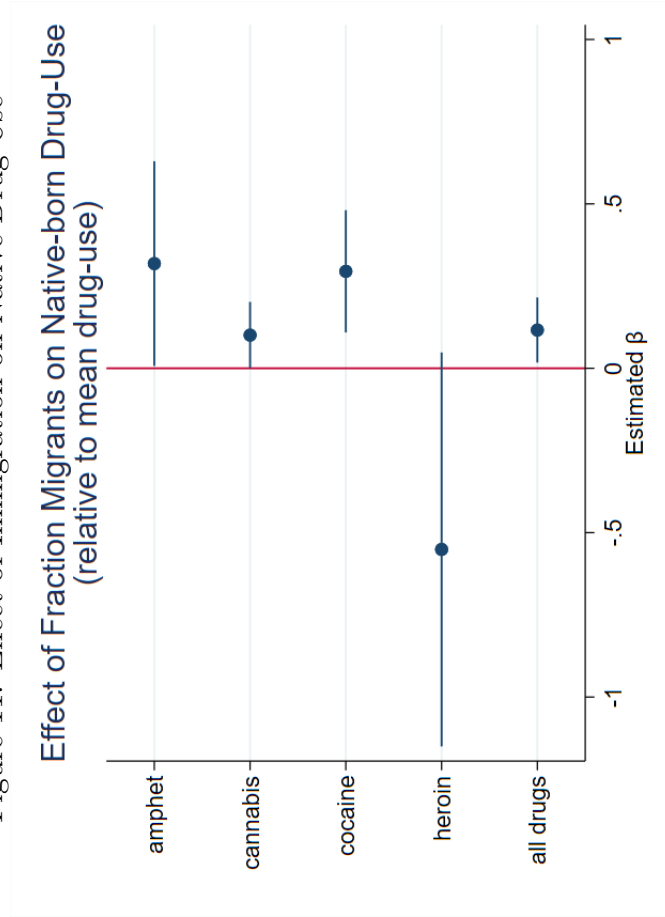


Figure 11: Effect of Immigration on Native Drug Use



Notes: This figure plots the coefficient estimates of β from Equation 6 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

Table 8: Robustness to Different Functional Forms, Any Seizure

	(1)	(2)	(3)
	Any Seizures	Any Seizures	Any Seizures
	2011-2016 _{o,d}	2011-2016 _{o,d}	2011-2016 _{o,d}
$M_{o,d}^{2011}$	0.00000436*		
	(0.00000253)		
$\ln \left(\frac{M_{o,d}^{2011}}{1000} \right) (-1 \text{ for } \infty)$		0.0891***	
		(0.0253)	
$(M_{o,d}^{2011})^{1/3}$			0.0142**
			(0.00598)
Observations	5564	5564	5564
R^2	0.011	-0.206	0.029
Origin FE	Y	Y	Y
Dest. FE	Y	Y	Y
Ln dist	Y	Y	Y
1st-stg F-stat.	283.263	7.382	51.901

Standard errors clustered by 52 provinces in parentheses

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

Table 9: Robustness to Different Functional Forms, Ln Amount of Seizure

	(1)	(2)	(3)
	Ln amt seized (\$) 2011-2016 _{o,d}	Ln amt seized (\$) 2011-2016 _{o,d}	Ln amt seized (\$) 2011-2016 _{o,d}
$M_{o,d}^{2011}$	0.0000985** (0.0000426)		
$\ln \left(\frac{M_{o,d}^{2011}}{1000} \right) (-1 \text{ for } \infty)$		1.971*** (0.354)	
$(M_{o,d}^{2011})^{1/3}$			0.314*** (0.0914)
Observations	5564	5564	5564
R^2	0.020	-0.842	0.016
Origin FE	Y	Y	Y
Dest. FE	Y	Y	Y
Ln dist	Y	Y	Y
1st-stg F-stat.	283.263	7.382	51.901

Standard errors clustered by 52 provinces in parentheses

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

Figure 12: Binscatter, Any Seizures on Migrant Stock

