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Immigration, integration, and the informal economy in OECD countries*

Oussama Ben Atta† Isabelle Chort‡ Jean Noël Senne§

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Abstract

This article assesses the impact of immigrant and asylum seeker inflows on the size of the informal sector in host countries from a macroeconomic perspective. We use two indicators of informality provided by Medina and Schneider (2019) and Elgin and Oztunali (2012) combined with migration data from the OECD International Migration Database and data on asylum seeker flows from the UNHCR for the period 1997-2017. We estimate a first-difference model, instrumenting immigrant and asylum seeker flows by their predicted values derived from the estimation of a pseudo-gravity model. Results suggest that both immigrant and asylum seeker inflows increase the size of the informal sector at destination, but the size of the effect is very small: a one percentage point increase in the stock of immigrants as a share of population leads to an increase of the informal sector as a share of GDP of 0.05-0.06 percentage points. Unsurprisingly, the effect is about four times larger for asylum seeker flows, but remains economically insignificant. We investigate several potential channels, and find that integration policies do matter. We find no impact of imported norms or institutions, but rather that the effect is larger in destination countries with a large informal sector. A larger diversity in incoming flows is associated with a smaller impact on the informal sector. Finally, we document the dynamics with a VAR model.

Keywords : migration, informal economy, asylum seekers, integration policies, shadow economy

JEL classification : F22 ; E26 ; J46 ; K37

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1 Introduction

Periodically, inflows of immigrants or asylum seekers receive high media coverage in developed countries. Massive inflows of refugees and immigrants are traditionally fed by conflicts, as recently experienced in Europe in the aftermath of wars in Syria and more recently in Ukraine, but new push-factors are also emerging, as a consequence of climate change. In many host countries, public opinion is sensitive to politically-oriented xenophobic ideologies that exploit fears and lack of information of natives. In anticipation of an expected surge of immigrants or displaced population the question of the impact of incoming flows of population on host economies remains highly relevant. Researchers have long shown that far from being a burden for destination countries, immigrants contribute positively to various aspects of host economies. However, a major dimension largely remains in the shadows: very little is known regarding the impact of immigration on the shadow economy. The term here refers to all economic activities that remain unregistered, rather than criminal activity. The lack of studies on the impact of migrant or refugee inflows on the informal sector may be partly explained by the difficulty to measure the informal economy. This is yet a key issue, as it relates to both labor market outcomes and the integration of newcomers, and their contribution to public finance through the issue of fiscal evasion.

We provide in this paper a macroeconomic analysis of the impact of migrant and refugee inflows on informality in OECD countries over a 20 year period (1997-2017). We use two alternative measures of the informal sector, developed by Medina and Schneider (2019) and Elgin and Oztunali (2012), that we combine with migration data from the International Migration Database (IMD) provided by the OECD and asylum seeker flow data gathered by the UNHCR.

We estimate the impact of both immigrants and asylum seekers flows on the size of the informal sector in destination countries using migrant and asylum seekers flows as a proxy for variations in stocks and estimate a first-difference model to net out the effect of time-invariant destination-specific factors. Our main empirical model is similar to the approach chosen by Bell et al. (2013) to analyze the impact of immigrants on crime in the U.K.. We address the issue of the potential endogeneity of immigrant and asylum seeker flows by using an instrumental variable approach. We instrument actual migrant flows by predicted flows obtained from the estimation of a gravity based equation using the full dyadic structure of the IMD database. As an alternative strategy, we estimate a panel fixed-effects model on flow data. Last, we combine this analysis with a VAR model approach similar to that of d'Albis et al. (2019) to investigate the dynamics of the response of informality to immigration shocks.

We find that migrant and asylum seeker inflows both increase the size of the informal sector in the host country GDP, but the magnitude of estimated coefficient is very small. We explore different channels for this impact: the role of integration policies at destination, the quality of institutions in both destination and origin countries, and the characteristics of migrant waves. We find no evidence that this effect is due to migrants importing institutions and norms. By contrast, our findings suggest that integration policies and institutions at destination mostly matter. Our results are driven by destination countries with a larger informal sector and targeted integration policies reduce the estimated effect. Panel fixed-effects estimations on flow data confirm the small and positive impact of immigration and asylum seeker flows on informality. Impulse-response functions obtained from the VAR model suggest in addition that the impact is long lasting as it remains significant for 10 to 15 periods.

Our results emphasize the role of institutions and integration policies in host countries: the impact of immigration flows is intrinsically linked to the question of the integration of immigrants and asylum seekers and their capacity to enter the formal labor market. Immigrants are more likely to contribute to the growth of the informal sector in countries that pass restrictive integration laws or where the informal sector is already large.

This paper relates to three different strands of the literature. First, it contributes to the literature that investigates the impacts of immigrant flows on destination countries. Recent macroeconomic studies suggest that the impact of immigration is largely positive on different dimensions. Using data on OECD countries, Docquier et al. (2014) find that immigration has a positive effect on the wages of less-educated natives. Aubry et al. (2016) find substantial welfare gains of immigration in OECD countries that are mainly due to market size effects, ie an increase in the number of varieties available to consumers. Other channels for the positive effects of immigration on destination countries are knowledge diffusion, as documented by Bahar and Rapoport (2018). Using panel VAR methods, d'Albis et al. (2019) find a positive effect of immigration on fiscal balance. Our contribution in this article is to explore the impact of immigration on the size of the informal sector with a macroeconomic approach, which has not been studied yet. Micro-economic studies on this issue are scarce: in the U.S. context, Bohn and Owens (2012) find that immigration is positively associated with informal labor in specific sectors (construction and landscaping). Bosch and Farré (2010) show that immigration in Spain in the 2000s is highly correlated with unregistered unemployment. Altındağ et al. (2020) exploit the massive and sudden wave of refugees from Syria taking refuge in Turkey and find that this inflow generated an increase in the activity of firms in the informal sector.

This paper thus connects to the literature that analyses the determinants and correlates of informality. Most recent macroeconomic studies on this issue use the measures of

the informal sector developed by Medina and Schneider (2019), and Elgin and Oztunali (2012) who provide consistent yearly series for a large number of countries. Most papers in this area focus on the role of institutions (Dreher et al., 2009; Dreher and Schneider, 2010) or political environment (Elbahnasawy et al., 2016). Teobaldelli and Schneider (2013) focus on the influence of direct democracy, while Berdiev et al. (2018) link the question of informality to that of economic freedom. With a more direct connection to the topic of this article, Berdiev and Saunoris (2018) show that globalisation, approximated by an index that synthesizes three forms of globalisation - economic, political, and social (Dreher, 2006) - decreases the size of the informal sector, with a more prominent effect of political globalisation. We show in this paper that immigration flows rather tend to increase the size of the informal sector, but this effect is dependent on the level of informality and integration policies in destination countries.

As a third contribution our paper points to the role of immigration policies and migrant integration in that they alter the impact of immigration on destination countries' economic outcomes. Our findings are consistent with previous works on the detrimental effect of administrative delays in the treatment of asylum demands on the integration of refugees (Ukrayinchuk and Havrylchyk, 2020). Using survey data on 22 European countries Helbling et al. (2020) find little support to the popular assumption that restrictive immigration policies would foster the integration of immigrants. They indeed find that restrictive immigration policies are associated with a better economic integration for specific subgroups of migrants only, whereas restrictive immigration policies are correlated with a lower level of political integration for all groups of migrants. We add to this literature by showing that more restrictive policies tend to reduce the integration of immigrants and asylum seekers into the formal sector.

The remainder of the paper is organized as follows: Section 2 details the empirical strategy, discusses the identification assumptions, and presents the different econometric models that are estimated. Section 3 presents the data. Estimation results are reported and discussed in Section 4. Finally, Section 5 concludes.

2 Empirical strategy

2.1 Main econometric model

We first intend to estimate the impact of an increase in the stock of migrants or asylum seekers on the size of the informal sector. Our baseline empirical model is very similar to the one used by Bell et al. (2013) who study the impact of immigration on crime in the U.K. We write variations in the size of the informal sector as a linear function of

variations in the stock of either immigrants or asylum seekers and a set of controls:

$$\Delta Informal_{j,t} = \beta \Delta M_{j,t} + \sum_{k} \delta_k \Delta X^k_{j,t-1} + D_t + \epsilon_{j,t} \quad (1)$$

$\Delta Informal_{j,t}$ is the change in the size of the informal sector as a share of the GDP for host country j from year $t-1$ to year t. We use two different measures of the informal sector, derived from Medina and Schneider (2019) and Elgin and Oztunali (2012), as detailed in Section 3.2 below. $\Delta M_{j,t}$ is the change in the stock of immigrants or asylum seekers between period $t-1$ and t. Following Bell et al. (2013), we proxy changes in stocks from $t-1$ to t by new inflows in t.[1] We additionally control for first-differenced time-varying characteristics of destinations that are determinants of the size of the informal sector (Dreher and Schneider, 2010; Torgler et al., 2010; Dreher et al., 2014; Elbahnasawy et al., 2016; Elbahnasawy, 2021). For all the variables included in our set of controls X, we control for the difference between $t-2$ and $t-1$ to limit reverse causality concerns. The vector X includes government expenditures (as a share of GDP) to control for government size. As noted by Berdiev and Saunoris (2018), the effect of government size on the informal economy is ambiguous: larger public expenditures may signal a greater human and financial capacity to limit the size of the informal sector, but a larger government may also mean more administrative complexity that could increase informal activities. Government expenditures may also be correlated with the quality of institutions, which is a key determinant of the size of the informal sector (Dreher et al., 2009; Teobaldelli and Schneider, 2013; Goel and Saunoris, 2014). Second, we account for the impact of international trade by considering the degree of trade openness. We define trade openness as the sum of exports and imports of goods and services as a share of GDP. The association between trade and informality is unclear from both theoretical empirical perspectives (Goldberg and Pavcnik, 2003), but macro evidence suggests that trade liberalization is associated with a growth of the informal sector (Fugazza and Fiess, 2010). Next, we control for investment through physical capital accumulation using gross capital formation as a share of GDP. The informal sector being less capital-intensive than the formal sector, an increase in investment may reduce the relative size of the informal sector. Labor market conditions are captured by the unemployment rate. Finally, we control for inflation, measured by the consumer price index. High inflation rates are expected to increase the relative size of the informal sector, in particular through tax evasion (Bittencourt et al., 2014).

[1] Note that this approach tends to overestimate the actual change in the stock of migrants or asylum seekers as it does not account for return migration, or change in status after obtaining nationality or refugee protection.

Although GDP is commonly included as a determinant of the size of the informal sector in the empirical literature, we choose not to include GDP growth in our main specification because many countries at least partially correct official GDP figures to take into account the size of the informal sector (Dreher et al., 2014). As a result, official GDP figures and measures of the informal sector are likely to be spuriously correlated. However this choice to exclude GDP growth from the set of controls does not impact our findings and our results are robust to adding GDP growth from $t-2$ to $t-1$ to our set of controls (see Appendix Table 11). D_t are year fixed-effects and $\epsilon_{j,t}$ is the error term clustered at the country level.[2]

Our choice of a first-difference model is first justified by the stationarity properties or our dependent variables. Ignoring the non-stationarity of time series may lead to spurious regression results. Results from a panel unit root test based on individual Augmented Dickey-Fuller (ADF) regressions (Im et al., 2003) reported in Appendix Table 9 show that our two informal economy measures are non stationary. The same test however concludes that the unit-root hypothesis can be rejected for the first-difference of the two variables. By estimating a first-difference model, we are thus able to address this non stationarity issue.[3]

Second, as argued by Aleksynska and Tritah (2015), based on Wooldridge (2010), the choice of a first-difference model may be justified by the time persistence of migration due to network effects (Pedersen et al., 2008).

In order to assess the causal impact of migrant or asylum seeker inflows on the size of the informal sector, we need to address several identification issues. First, reverse causality issues may emerge if countries with a large and dynamic informal sector are attractive to migrants and asylum seekers. In addition, our results may be biased by the omission of unobserved characteristics of host countries determining both the size of the informal economy and migrant or asylum seeker inflows. Since model 1 is estimated in first-differences, time-invariant factors that are specific to each destination country and that affect the size informal economy and migrant or asylum seeker inflows are differenced out. However, the first-difference model does not capture time-varying unobserved confounding factors. We present in the next section the instrumental variable strategy that we use to address potential endogeneity issues.

[2]Given the relatively small size of our sample of countries (34), there may be a concern that our estimated standard errors maybe too small. We thus additionally provide the estimates p-value for our coefficients with a small-sample correction using the Stata *boottest* command

[3]While first introduced in studies based on time series, the detection of non-stationarity has become a matter of great importance in panel data analysis since the seminal works of Levin and Lin (1992) and Quah (1994). The advantage of panel data in the detection of unit roots is linked to the increase in the number of observations owing to the double dimension: individual and time. Non-stationarity may lead to spurious results, as it may indicate relationships between variables when they do not exist. By definition, a data series is defined as non-stationary if its statistical properties are time dependent.

2.2 Identification strategy: zero-stage gravity equation

We follow Alesina et al. (2016) and Docquier et al. (2020) and estimate a gravity model to predict the bilateral flows of immigrants and asylum-seekers. This strategy, initially used in the trade literature, has been widely applied to the analysis of migration flows (Felbermayr et al., 2010; Aleksynska and Tritah, 2015; Docquier et al., 2016; Bove and Elia, 2017; Bahar and Rapoport, 2018). We estimate the following *zero-stage* gravity equation: .

$$M_{i,j,t} = \gamma Z_{i,j,t} + D_i + D_j + D_t + \varepsilon_{i,j,t} \tag{2}$$

$M_{i,j,t}$ alternately represents migrant and asylum-seeker inflows from origin country i to OECD destination country j in year t. The vector $Z_{i,j,t}$ includes time-invariant dyadic variables that are traditional determinants of migration: the log of capital-to-capital distance between i and j, and binary variables taking value one if i and j are in a colonial relationship or share a common language (if at least 9% of the populations of i and j share a common language).[4] In addition, we include in the vector Z a time-varying binary variable for conflicts at origin, as well as its interaction with all three dyadic variables. The conflict variable is constructed using the index of civil war combat deaths provided by the Uppsala Conflict Data Program (Davies et al., 2022): our binary variable is equal to one for origin i and year t if more than 25 civil war deaths were registered in country i and civil year t. Our identification strategy relies on the reasonable assumption that civil conflicts at origin are independent from economic conditions at destination. The rationale behind the interaction between the conflict variable and the geographic and cultural controls is twofold. Those interaction terms generate additional time-varying regressors that allow us to obtain predictions of yearly flows that do not solely rely on the time-varying conflict variable.[5] Second, this specification is more flexible in that it allows conflicts at origin to alter the impact of distance, colonial links or common language on bilateral migration flows. D_j, D_i and D_t are destination, origin and year fixed effects, and $\varepsilon_{i,j,t}$ is the error term. Standard errors are clustered at the country dyad i, j level. We use the same set of variables to predict both migrant flows and asylum seeker flows. One limitation of this approach for asylum seeker flows is the globalisation of refugee flows, highlighted by Devictor et al. (2021). The interaction terms between conflicts and dyadic variables allow us to partly capture the weaker influence of geographic controls at the end of the period.

[4] Geographical and cultural bilateral data are taken from the CEPII database (Head et al., 2010).

[5] Bahar and Rapoport (2018) generate time-variation in their model by simply interacting time-invariant dyadic determinants of migration with time period dummies but they exploit only two time periods while we use yearly data over 30 years.

Because of the high proportion of zeroes in our dependent variables, we follow Silva and Tenreyro (2006) and estimate Equation 2 with a Pseudo-Poisson Maximum Likelihood (PPML) estimator. Estimation of equation 2 provides us with the predicted values of yearly bilateral inflows of migrants (resp. asylum seeker) $\hat{M}_{i,j,t}$

We then aggregate predicted bilateral flows across origin countries and construct the yearly predicted value of total inflows of immigrants (or asylum seekers) $\hat{M}_{j,t} = \sum_{i \neq j} \hat{M}_{i,j,t}$ in each OECD country j included in our sample.

We divide this predicted amount of migrants $\hat{M}_{j,t}$ by destination country population to obtain the predicted share $\hat{m}_{j,t}$ of migrant (respectively asylum seekers) inflows in host country's population. $\hat{m}_{j,t}$ is then used as an instrument for the share of migrant (resp. asylum seekers) inflows $m_{j,t}$ in our main model.

Estimation results of Equation 2 for immigration and asylum seeker flows are reported in Appendix Table 10. Appendix Figure 2 illustrates the strong positive correlation between observed migrant (resp. asylum seeker flows) and their prediction based on the pseudo-gravity model. The Kleibergen-Paap F (KPF) statistic for weak identification that is reported in each second-step result table is well above the critical values provided by Stock and Yogo (2002), suggesting that our instrument is not weak.

The identification of a causal effect of migrant or asylum seeker inflows on the size of the informal economy relies on the assumption that our instrument is orthogonal to $\epsilon_{j,t}$. In other words, relative geography variables that are used to predict migrant and asylum seeker flows should have no direct impact on the size of the informal economy. They may affect the informal economy only through their impact on incoming flows, once including controls for potential confounding factors. One such likely confounding factor is international trade, however we control for trade openness in our main model. Moreover all time-invariant destination specific characteristics that could jointly affect countries' attractiveness to immigrants and the size of their informal sector are controlled for by first-differencing all variables in our main model. Finally the effects of shocks common to all destination countries such as the 2008 Global Financial Crisis are captured by year dummies.

2.3 Fixed-effects model

To assess the robustness of our results to different specifications, we estimate an alternative version of our baseline model, in which we investigate the impact of a change in either migrant or asylum seeker *inflows*, instead of a change in their *stock*, on the size of

the informal sector. We estimate the following panel fixed-effects model:

$$Informal_{j,t} = \gamma m_{j,t} + \sum_k \kappa_k X^k_{j,t-1} + D_j + D_t + \nu_{j,t} \tag{3}$$

The dependent variable is one of the two above described measures of the size of the informal sector as a share of GDP in country j and year t. $m_{j,t}$ are migrant (resp. asylum seekers) inflows in year t as a share of the population in destination country j. $X^k_{j,t-1}$ is the same set of lagged control as in Equation 1, D_j and D_t are destination country and year fixed-effects, and $\nu_{j,t}$ is the error term.

To overcome endogeneity issues, we use the same instrumental variable strategy as described in Section 2.2 above. $m_{j,t}$ is instrumented by its predicted value obtained from the estimation of the pseudo-gravity model (Equation 2).

Country fixed-effects included in Equation 3 allow us to net out the effect of time-invariant destination countries' characteristics, which is achieved through first-differencing in our baseline model. The γ coefficient here captures the impact of a change in migrant (resp. asylum seeker) inflows. Estimation results are reported and discussed in Section 4.3.

2.4 VAR model

We complement our empirical analysis with a study of the dynamic relations between migrants or asylum seeker inflows and the informal economy. We estimate a panel vector autoregression (VAR) model that is specified as follows:

$$\begin{aligned} Y_{jt} &= A(L)Y_{jt} + D_j + D_t + \lambda_j t + \eta_{jt} \\ &= \sum_{s=1}^{p} A_s Y_{jt-s} + D_j + D_t + \lambda_{jt} + \eta_{jt} \end{aligned} \tag{4}$$

where Y_{jt} is a vector of K endogenous variables. More specifically in our setting K is equal to four and Y_{jt} is the following system:

$$Y_{jt} = [log(1 + m_{jt}), log(g_{jt}), log(y_{jt}), log(i_{jt})] \tag{5}$$

where m_{jt} are migrant (resp. asylum seekers) inflows as a share of population in destination country j, g_{jt} is the per capita government expenditures, y_{jt} is the per capita real GDP and i_{it} is the per capita informal economy. All variables are in log. L is the lag operator, and A_s with $1 \leq s \leq p$ are the $(K \times K)$ related matrices of coefficients. D_j are

destination country fixed-effects, D_t are year fixed effects, and $\lambda_j t$ are country-specific time trends. Lastly, $\eta_{jt} = (\eta_{jt}^1, ..., \eta_{jt}^K)$ is the $(K \times 1)$ vector of residuals.

To account for the bias induced by the finite time dimension (Nickell, 1981), we use the bias-corrected fixed effects estimator developed by Hahn and Kuersteiner (2002).[6] In order to be able to estimate a panel VAR model, we restrict our sample to the subset of countries for which data are available over the entire period. We end up with a sample of $N = 22$ countries and $T = 21$ periods when we focus on migration flows and $N = 26$ and $T = 21$ when we analyze asylum seeker flows.We therefore estimate Equation 4 using the implementable version of Kiviet (1995) biais-corrected fixed effects estimator provided by Hahn and Kuersteiner (2002). Based on the Akaike information criterion (AIC) and Bayesian information criterian (BIC), our panel VAR includes only first-order lags. This leads us to re-write the model presented in Equation 4 as follows:

$$Y_{jt} = AY_{jt-1} + D_j + D_t + \lambda_j t + \epsilon_{jt} \tag{6}$$

Our identification strategy is based on the Cholesky decomposition. In other words, we need to impose a recursive ordering in the VAR structure to identify orthogonal shocks. The Cholesky decomposition relies on the assumption that variables ordered first in the VAR affect other variables contemporaneously, whereas variables that follow can affect those ordered before only with a lag. Consistent with the literature that applies VAR models to immigration issues, we order migration variables first in our recursive identification (d'Albis et al., 2019, 2021). This ordering implies that migration may influence contemporaneous economic outcomes in destination countries but only react to them with a one-year delay. Such a choice may be justified by the fact that migration is a lengthy process, as the decision to migrate is commonly driven by the prevailing economic situation in the destination country during the previous years (Mayda, 2010). An additional rationale supporting our identification scheme is linked to the administrative delays imposed to migration plan. Migration to OECD countries most often requires the acquisition of a visa or a residence permit, which usually entails a lengthy process. Although current economic conditions at destination may affect without delay the decision to migrate, migration plans are likely to be achieved with delay due to administrative and logistic constraints (Czaika and de Haas, 2017). Regarding the remaining variables in the recursive scheme, government expenditures come second, followed by GDP per

[6]Other studies that estimate macro panel VAR models rely on the generalized method of moments technique in order to deal with the Nickell bias (see for instance Rousseau and Wachtel (2000) Love and Zicchino (2006), or Acheampong (2018)). However, the GMM estimators were designed for datasets with a large cross-sectional dimension relative to the time dimension. In particular, Hahn and Kuersteiner (2002) conduct Monte Carlo experiments and show that the efficiency of the bias-corrected estimator measured by the root mean squared error (RMSE) often dominates that of the GMM estimator.

capita, and the informal economy per capita. Note that since our migration (respectively asylum seeker) variable is ordered first in the identification scheme, the sequence of the remaining variables does not matter for the analysis of the response of informality to migration shocks.

3 Data

3.1 Migration and asylum seekers

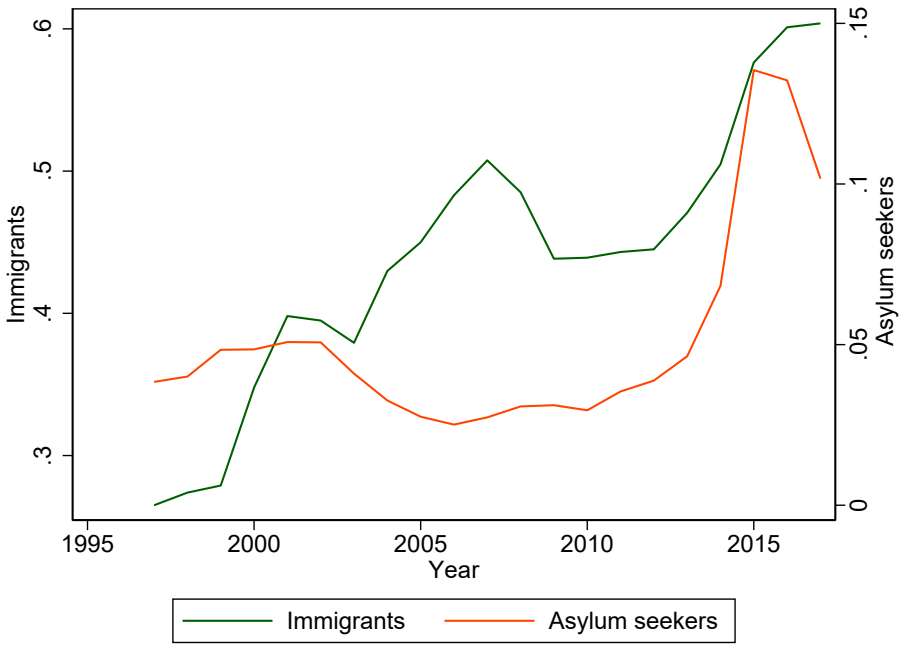
We employ data on international migrants and asylum seekers flows from the OECD International Migration Database (IMD). The IMD has been used extensively in the migration literature (Coniglio and Pesce, 2015; Adsera and Pytlikova, 2015). It contains annual data for international migration and asylum seekers flow to OECD destinations from about 200 origin countries from 1995 onwards. International migrants are defined as foreign-born individuals, and flow data are gathered from national population registers or residence and/or work permits. In addition, the OECD IMD contains information on asylum seekers for each country of origin and destination that are gathered from records provided by the United Nations High Commissioner for Refugees (UNHCR). These are commonly first instance applications made at or within asylum country borders, as notified by governments to the UNHCR. The main advantage of the IMD database is the availability of data on migration flows and asylum seekers on an annual basis that allows us to study the dynamics of the migration process.

Our final sample consists of 34 OECD countries for which data on migrant and asylum seekers flows are available. In particular, our sample includes 9 OECD non-European countries : Australia, Canada, Chile, Israel, Japan, Mexico, New Zealand, Turkey and the United States ; and 25 European countries : Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Italy, Latvia, Luxembourg, Netherlands, Norway, Spain, Slovakia, Slovenia, Sweden, Switzerland, Poland, Portugal and the United Kingdom. Our sample includes major destinations of international migrants. According to the United Nations (2017) estimates for 2015, 45% of all international migrants lived in one of the OECD countries that is included in our sample.

Using population data from the World Development Indicators database, we compute for each destination the share of immigrants/asylum seekers inflows in the total population. Figure 1 depicts the evolution of migrant and asylum seeker inflows to selected OECD countries over the period 1997-2017. What is clearly shown is the fairly large increase in migration flows over the past two decades. This is due to a number of events

such as military conflicts in Afghanistan and Iraq, the Balkans' ethnic conflicts, the Arab spring in Middle Eastern and North African countries as well as political turmoil in sub-Saharan African and central Asian countries. In our sample, the average migration flow as a share of host population is 0.66%, with a lowest value of 0.02% for Mexico and a highest one of about 3% for Luxembourg. For asylum-seekers inflows, the average ratio is 0.09%.

Figure 1: Immigrants and asylum seekers inflows to OECD countries



Data source : OECD-IMD

3.2 Measures of the informal economy

Measuring the informal economy is a complex issue, as it cannot be directly observed. Indeed, the notion of informal or shadow economy covers economic activities that are not officially registered (Elgin and Oztunali, 2012).[7] As recalled by Medina and Schneider (2019), the informal economy should not be confused with illegal activities such as drug trafficking or corruption: the informal economy mainly refers to legal activities that are unrecorded for monetary, regulatory or institutional reasons. We use in this paper the data series provided by Elgin and Oztunali (2012) and Medina and Schneider (2019) that provide yearly estimates of the informal economy for a large set of countries over

[7]More precisely, Elgin and Oztunali (2012) choose to use a definition of the informal economy as "economic activities that take place outside the framework of bureaucratic public and private sector establishments."

the last decades. Although they agree on a similar definition of the informal economy, Elgin and Oztunali (2012) and Medina and Schneider (2019) adopt different approaches to approximate its size. Medina and Schneider (2019) builds on Schneider et al. (2010) and use a structural equation model (MIMIC) to estimate the size of the informal sector. The informal sector is modelled as a latent unobservable variable, correlated with a number of observable indicators and caused by a set of factors that include trade openness, unemployment, government size, fiscal freedom, rule of law, control of corruption, and government stability. The so called indicator variables selected by the authors are the share of currency in broad money, labor force participation, and the size of the economy proxied by nighttime light intensity. Medina and Schneider (2019) provide estimates of the size of the informal economy as a share of GDP for 158 countries, that include all destination countries contained in our sample, from 1991 to 2015. The second dataset that we use comes from Elgin and Oztunali (2012) who estimate a micro-founded two-sector (official and informal) dynamic general equilibrium model. They produce estimates of the size of the informal economy in 161 countries over 1950-2017.[8] Although early contributions in empirical economics related to the informal sector used alternative measures of the informal sector, using in particular electricity consumption (Chong and Gradstein, 2007), recent articles addressing the issue of informality from a macroeconomic perspective use either one or both of the two indicators presented above (Biswas et al., 2012; Gutiérrez-Romero, 2021; Goel and Saunoris, 2014; Elbahnasawy et al., 2016; Berdiev et al., 2020; Elbahnasawy, 2021).

One reassuring point is that in spite of their divergent methodological grounds the two measures of the informal economy that we use are strongly correlated: the raw correlation coefficient is 0.93 in our sample. The average size of the informal economy in our sample is 15.6 percent of GDP, with a large heterogeneity across countries. The estimated size of the informal sector ranges from a minimum of 5.1% in Switzerland up to 30% in Turkey.

3.3 Integration policies and additional data sources

To the extent that inflows of migrants and asylum seekers impact the size of the informal sector, their relation is likely to depend on the type of integration policies in destination countries. In what follows, we describe the two indices that we use to measure integration policies in OECD countries.

Comparing migrant integration policies across time and space is a major empirical challenge (Rayp et al., 2017). In this paper, we rely on data produced by two different projets. We first use the DEMIG POLICY database compiled as part of the Determinants

[8] Elgin and Oztunali (2012) provides data series for 1950-2009 only, but the authors shared with us estimates of the informal economy for 2010-2017.

of International Migration (DEMIG) project (De Haas et al., 2015). It provides the description of the direction and magnitude of 6,500 changes in immigration policies in 45 countries, forming the largest change-tracking database completed to date[9]. The DEMIG data provide information on changes in the restrictiveness of the legal framework regarding migration policies, categorized in different areas and policy tools. DEMIG further categorizes policy changes depending on their magnitude using a four level scale. We construct two different measures of integration policy changes adapted to the two types of flows that we study: migrants, and asylum seekers. As concerns migrants, we focus on policy changes related to employer liabilities and work visa/permit. For asylum seekers, we focus on policy changes that specifically target "*refugees, asylum seekers, and other vulnerable people*". For both migrants and asylum seekers we construct two binary variables that take the value one for more and less restrictive policies respectively, and limit our analysis to major policy changes that refer to the top level of the above mentioned four-level scale.

Second, we use information provided by the Migrant Integration Policy Index (MIPEX).[10] MIPEX data contains an assessment of migrant integration in eight areas [11] for 52 countries, including all OECD countries, over the 2007-2019 period. The index ranges from 0 to 100 with higher values indicating better integration. In our case, the main shortcoming of this index is its limited time span. However, for any given country there is small variation in the MIPEX index over the period. For instance, for France, the index value of 51 is identical for the years 2007 to 2019. In Germany, over the same time period, the index increased from 57 in 2007 to 58 in 2019. We take for each country the average value of the MIPEX over the entire period and create a binary variable equal to one for countries with an average value of the index that is above the sample median.

All the variables used as controls in our regressions come from the World Bank's World Development Indicators (WDI) database.

[9]Nevertheless, the DEMIG database does not contain information for Estonia and Latvia that are included in our initial sample. As a result, in the estimates aiming to investigate the heterogeneous effects of migrant inflows depending on policy changes, both the number of countries and periods are reduced.

[10]See https://www.mipex.eu/

[11]These areas are labor market mobility, family reunion, education, health, permanent residence, political participation, access to nationality and anti-discrimination.

4 Results

4.1 Immigration, asylum seekers, and the informal economy

We present estimation results of equation 1 in Table 1. The dependent variable is alternatively the first-difference of the size of the informal sector as a share of GDP provided by Medina and Schneider (2019) (in columns (1) and (3)), and Elgin and Oztunali (2012) (in columns (2) and (4)). We explore separately the impact of immigration and asylum seekers inflows considered as a proxy for first-differenced stocks of migrants and asylum seekers, respectively. Our equation includes year fixed-effects, and a set of first-differenced country level controls measured as a share of country GDP, namely government expenditures, trade openness, gross capital accumulation, as well as inflation and unemployment rates.

The main explanatory variable is immigration flows as a share of total population at destination in columns (1) and (2) and asylum seekers flows as a share of population in columns (3) and (4). Immigration and asylum seeker flows are instrumented by predicted flows resulting from the estimation of a gravity model, as detailed in Section 2.2.

We find positive and significant coefficients on immigrant and asylum seeker inflows, whatever the informality measure is used as dependent variable. These findings suggest that an increase in the stock of either migrants or asylum seekers increases the share of the informal sector in destination country's GDP. Coefficients on asylum seeker flows are about four times larger than those on immigration flows. This result is not surprising given labor market restrictions imposed on asylum seekers in host countries (Fasani et al., 2021, 2022; Brell et al., 2020). However, if the coefficients are all significant, estimated effects are very small: a one percentage point increase in the stock of immigrants as a share of population leads to an increase of the informal sector as a share of GDP of 0.05 to 0.06 percentage points, depending on the index that is used. As a reference point, in 2016 the stock of foreign-borns amounted to 11.9% of the population in France, 12.7% in Spain and 13.7% in the U.K.[12] A one percentage point increase in immigrant flow as a share of the population would represent a 8.4% increase in the stock of foreigners in France, a 7.8% increase in Spain, and a 7.3 increase in the U.K. The informal sector, as estimated by Medina and Schneider (2019) represents 12.5% of GDP for France over 1997-2017, 21.4% for Spain, and 10.1% in the U.K. Therefore in all three cases, a large increase in the stock of migrants would result in an economically negligible expansion of the informal sector.

Larger estimated coefficients on the asylum seeker flow variable suggest that asylum

[12]The same figures for foreigners are 7.0%, 9.5% and 9.0% respectively.

seekers have a greater impact on the informal sector than migrants, but this impact is still limited. A one percentage point increase in the stock of asylum seekers as a share of the population would be equivalent to four times the mean yearly value of asylum seeker flows (0.25%) observed for France over 1997-2017.

Table 1: Immigrant/Asylum seekers flows and informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.064***	0.048***		
	(0.018)	(0.016)		
Asylum seekers flow share $_t$			0.262**	0.242***
			(0.120)	(0.067)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615
F statistic KPW	9,851.95	9,851.95	404.82	404.82

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Immigration data source: OECD

4.2 Channels and interpretations

4.2.1 Integration policies

Table 2 analyzes the role played by immigration-related policies at destination. We interact migrant and asylum seeker flow variables with two binary variables that capture positive and negative changes in the degree of restrictiveness of immigration policies. We construct these two variables using the classification and coding of host countries' policies provided by the DEMIG project (see Section 3.3 above). As regards migrant flows (col. (1) and (2)), we focus on policy changes defined as major in the DEMIG database, in areas that are expected to have a direct impact on migrants' employment and labor market insertion and that correspond to the employer liabilities and work visa/permit categories in the DEMIG classification. For asylum seeker flows, we construct different binary variables based on major policy changes that apply specifically to asylum seekers and refugees. The coefficient on the non interacted immigration or asylum seekers flow share represents the impact of inflows in the absence of change in relevant policies at destination.

Table 2: Immigrants/Asylum seekers flows, policies and informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_{t-1}$	0.069**	0.063***		
	(0.031)	(0.024)		
Immigration flow share in $_{t-1}$ x more restrictive policy in $_{t-1}$	0.034	0.088***		
	(0.062)	(0.033)		
Immigration flow share in $_{t-1}$ x less restrictive policy in $_{t-1}$	-0.024*	-0.005		
	(0.013)	(0.008)		
Asylum seekers flow share $_{t-1}$			0.149	0.465***
			(0.190)	(0.113)
Asylum seekers flow share $_{t-1}$ x more restrictive policy in $_{t-1}$			0.642*	0.390
			(0.330)	(0.424)
Asylum seekers flow share $_{t-1}$ x less restrictive policy in $_{t-1}$			0.112	-0.187*
			(0.178)	(0.110)
More restrictive policy in $_{t-1}$	-0.041	-0.014	-0.049	-0.030
	(0.043)	(0.027)	(0.051)	(0.070)
Less restrictive policy in $_{t-1}$	0.031	-0.010	-0.008	0.025
	(0.022)	(0.014)	(0.038)	(0.026)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	466	466	497	497

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Immigration data source: OECD

Results from Table 2 suggest that policy changes in host countries influence the integration of asylum seekers and migrants and their impact on the informal sector. Although results slightly differ depending on the measure of the informal sector, estimation results consistently suggest that the impact of inflows on the size of the informal sector is either magnified by more restrictive policies (in col. (2) and (3)), or reduced by less restrictive policies (col. (1) and (4)).

We explore further the effect of integration policies in Table 3 by using the migrant integration policy index (MIPEX). We interact our flow variables with a binary indicator equal to one for countries with an average value of the MIPEX over 2007-2017 above the sample median. As discussed above, the MIPEX varies little over time. Index mean values over 2007-2017 may thus be extrapolated over the entire period. For this reason, and in order to avoid halving our sample size, we estimate our baseline model augmented with this interaction term over the whole period (1997-2017). The MIPEX is coded on a 0-100 scale, and the mean value of the index is 45 for countries below the median, and 68 for countries above the median.[13] Results unambiguously show that the positive impact of migrant and asylum seekers inflows on the size of the informal sector is driven by countries that perform poorly in terms of migrant integration. In this group of countries, that include countries as diverse as Greece, Japan, Poland or Denmark, a one percentage point increase in migrant and asylum seeker inflows increases the size of the informal sector as a share of the GDP by 0.13-015 and 0.33-0.41 percentage points respectively. In

[13]MIPEX values for countries in our sample are reported in Table 12.

the group of countries with values of the integration index above the sample median, the impact of migrant inflows is 5 to 6 times smaller (between 0.02 and 0.03 percentage point depending on the index) and less significant, as indicated by the p-value reported at the bottom of the table. For asylum seeker, a one percentage point increase in the stock of asylum seekers, as a share of host population is associated with a 0.33 to 0.41 percentage point increase in the informal sector in countries characterized by an integration index below the median, whereas it has no significant effect on informality in the group of countries with an integration index above the median.

Table 3: Immigrant/Asylum seekers flows and informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index		
Immigration flow share $_t$	0.145***	0.135***		
	(0.037)	(0.024)		
Immigration flow share $_t$ × Integration above median	-0.117***	-0.116***		
	(0.041)	(0.027)		
Asylum seekers flow share $_t$			0.329**	0.408***
			(0.162)	(0.089)
Asylum seekers flow share $_t$ × Integration above median			-0.155	-0.321***
			(0.213)	(0.115)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615
Sum coeff.	0.028	0.019	0.174	0.087
P-value	0.071	0.042	0.255	0.154
F statistic KPW	3,214.49	3,214.49	41.64	41.64

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Immigration data source: OECD

4.2.2 Quality of institutions

Informality at origin The transfers of norms by immigrants from destination back to their origin country is well documented in the literature (Docquier et al., 2020; Spilimbergo, 2009; Valette, 2018). The reverse may also be true, although studies that investigate the potential import of corruption (Bologna Pavlik et al., 2019) or terrorism (Forrester et al., 2019) by immigrants at destination find no empirical evidence of such transfers. In Table 4 we thus explore another possible channel for the impact of migrant and asylum seekers inflows on informality related to such transfers. Immigrants from countries with a high level of informality would import this informality at destination. To test this channel, we include in our model an additional variable reflecting the change in a composite informality index that reflects informality at origin for each country of origin weighted by the share of migrants from this country. Formally, our index writes:

$$\Delta\text{M\&S informality index at origin}_{j,t} = \sum_i I_{i,t}^{M\&S} \frac{Y_{ij,t}}{Y_{j,t}} - \sum_i I_{i,t-1}^{M\&S} \frac{Y_{ij,t-1}}{Y_{j,t-1}}$$

with $I_{i,t}^{M\&S}$ the index of informality from Medina and Schneider (2019) origin country i for year t, $Y_{ij,t}$ migrant or asylum seeker flows from country i to destination j in t, and $Y_{j,t}$ total migrant or asylum seeker inflows to destination j for year t.

After controlling for the change in the size of the immigrant or asylum seeker stock proxied by new inflows, we find that a change in the potentially imported informality has no impact on informality at destination, the coefficient on the informality index at origin being non significantly different from zero in all four regressions. This finding suggests that institutions or norms at origin are unlikely to explain the impact of migrants and asylum seekers on informality at destination.

Table 4: Asylum seekers flows and informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.059***	0.046***		
	(0.017)	(0.015)		
Asylum seekers flow share $_t$			0.254**	0.206***
			(0.111)	(0.064)
Δ M&S informality index at origin	0.030	-0.002	0.031	0.002
	(0.027)	(0.004)	(0.029)	(0.004)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	569	569	548	548
F statistic KPW	9,275.27	9,275.27	378.84	378.84

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Immigration data source: OECD

Informality at destination We explore in this section the role played by institutions at destination. The quality of institutions is a major determinant of the size of the informal sector (Friedman et al., 2000; Dreher and Schneider, 2010; Dreher et al., 2009; Teobaldelli, 2011; Goel and Saunoris, 2014). As such, it is likely to affect newcomers' integration at destination and their participation to the informal sector. We test the heterogeneous impact of migrant and asylum seeker inflows on informality depending on the quality of host country's institutions by interacting our flow variables with a binary variable that equals one for countries with an average level of informality over the 1997-2017 period that is above the sample median. Results are reported in Table 5, and suggest that the impact of migrant and asylum seeker flows on informality is driven by destinations where the informal sector is the largest. In the case of migrant flows, results differ depending on the informality indicator that is chosen as a dependent variable: while the coefficient on the interaction term is not significantly different from zero in column (1) for the informality indicator from Medina and Schneider (2019), it is positive and significant in column (2). As for asylum seeker flows, the coefficient on the interaction is

positive and very close in size in the two specifications, but it is significant at conventional levels only in column (4).

Table 5: Immigrant/Asylum seekers flows and informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.037***	0.016		
	(0.010)	(0.011)		
Immigr. $_t$ x Inf above median	-0.014	0.070**		
	(0.044)	(0.032)		
Asylum seekers flow share $_t$			-0.023	0.024
			(0.125)	(0.053)
Asyl. $_t$ x Inf above median			0.384	0.369***
			(0.288)	(0.123)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615
Sum coeff.	0.023	0.086	0.361	0.392
P-value	0.583	0.003	0.168	0.000

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Immigration data source: OECD

4.2.3 Characteristics of migrant waves

Table 7 investigates the effects of the characteristics of migrant waves, and in particular their concentration in terms of origins. More concentration, or less diversity, may give rise to ethnic networks (Dagnelie et al., 2019) and enclaves that could contribute to the growth of the informal sector (Awaworyi Churchill and Danquah, 2022; Lassen, 2007). We first test this assumption by exploring the heterogeneity in the impact of migrants and asylum seeker flows on informality in countries depending on the average origin composition of flows that they receive. We compute the Herfindahl fractionalization index of flows in terms of origin for each destination and year, and define a binary variable equal to one for countries with an average value of the fractionalization index over the observation period that is above the sample median. Results are reported in Table 7 and suggest that inflows have a larger impact on informality only in countries hosting migrants and asylum seekers that are more concentrated in terms of origins.

In a second approach, we include in our model the first-differenced Herfindahl fractionalization index of flows in terms of origin. Results reported in Table 7 suggest that once controlling for variations in the stock or immigrants or asylum seekers, an increase in the diversity index may be associated with a larger informal sector. However the coefficient is not significant in specifications that use as a dependent variable the index developed by Elgin and Oztunali (2012).

Table 6: Immigrant/Asylum seekers flows and informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.072***	0.055***		
	(0.018)	(0.018)		
Immigr. $_t$ x Diversity above median	-0.058**	-0.049**		
	(0.026)	(0.025)		
Asylum seekers flow share $_t$			0.393**	0.370***
			(0.193)	(0.091)
Asyl. $_t$ x Diversity above median			-0.322	-0.308***
			(0.233)	(0.119)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Immigration data source: OECD

Table 7: Immigrant/Asylum seekers flows and informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.057***	0.048***		
	(0.016)	(0.015)		
Asylum seekers flow share $_t$			0.242**	0.243***
			(0.118)	(0.067)
Δ Diversity index	1.155**	0.079	1.435***	-0.101
	(0.565)	(0.092)	(0.515)	(0.070)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Immigration data source: OECD

4.3 Alternative model: Fixed-effects estimates

As a second approach, we estimate a fixed-effect model using the share of immigrant (respectively asylum seeker) flow in total host population. Results are reported in Table 8. We find in all specifications a positive and significant coefficient on the immigrant or asylum seeker flow variable, which suggests that an increase in the flow of immigrants or asylum seekers with respect to the population in the country of destination increases the size of the informal sector in the country. Results are consistent whatever the measure of informality that is chosen. Time invariant destination characteristics are accounted for by country fixed-effects. Although estimated coefficients in this fixed effect model cannot be directly compared to those of our main (first-difference) model, the magnitude of the effect of migrant and asylum seeker flows is very limited. For example, a one percentage point increase in the flow of immigrants as a share of the total population entails a 1.6 percentage point increase of the size of the informal sector as a share of the population. To put this figure into perspective, in France the share of immigrants in

the population strongly increased from 2010 to 2015, jumping from 0.22 to 0.36% of the population, which represents a 160% increase. According to our estimates, in order to generate a 1.6 percentage point increase in the size of the informal sector, France should have experienced a 550% increase in immigrant inflows as a share of its population (from 0.22% of the population to 1.22% of the population).

Table 8: Immigration/asylum seekers flows and informal sector, fixed-effect model (IV) (1997-2017)

	(1)	(2)	(3)	(4)
	Medina and Schneider (2019) index		Elgin and Öztunali (2012) index	
Immigration flow share $_t$	1.637***		1.147***	
	(0.503)		(0.281)	
Immigration flow share $_{t-1}$		1.580***		1.102***
		(0.468)		(0.256)
Controls	Yes	Yes	Yes	Yes
Destination country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	610	601	610	601
F statistic KPW	20.28	24.19	20.28	24.19
	(1)	(2)	(3)	(4)
	Medina and Schneider (2019) index		Elgin and Öztunali (2012) index	
Asylum seekers flow share $_t$	1.716***		1.790**	
	(0.659)		(0.709)	
Asylum seekers flow share $_{t-1}$		1.309**		1.159**
		(0.544)		(0.508)
Controls	Yes	Yes	Yes	Yes
Destination country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	644	636	644	636
F statistic KPW	22.84	23.43	22.84	23.43

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Immigration data source: OECD

4.4 Dynamic effects: VAR approach

In this section, we present the estimates obtained from the panel VAR model described in Section 2.4 through a discussion of the impulse response functions. Our objective is to estimate the dynamic effects of a migration shock on the informal economy in OECD destination countries. As explained above, we estimate a panel VAR model using the bias-corrected fixed effects estimator provided by Hahn and Kuersteiner (2002).

The impulse response functions are represented in Appendix Figures 4 to 5. Since the variables are in log, the responses are expressed in percentages. We first observe that immigration or asylum seeker flows (expressed as a share of total population at destination) monotonically respond to their own shock. This is shown in all models provided in figures 4-5. The increase remains significant for approximately ten years. Regarding the economic consequences, we observe that a migration or asylum seeker inflow shock results in a significant increase in government expenditures that peaks four

years after the shock for immigrants and five years for asylum seekers. Similar findings of a positive reaction of government expenditures to a migration shock were obtained by d'Albis et al. (2019). Consistent with previous contributions (Ortega and Peri, 2014), our results also show that following a migration shock, the response of GDP per capita is positive and significant.

Focusing on our own contribution, we find that a positive shock to immigrant inflows leads to a significant increase in the size of the informal sector. The effect is instantaneous, is maximum two to four years after the shock, and remains significantly different from zero for about ten to fifteen years depending on the measure of informality that is used. As for asylum seeker flows, impulse response functions shown in Figures 6 and 5 display a similar pattern but the effect is not significant the very year of the shock. The difference between the response of the informal sector to the arrival of migrants and asylum seekers may be explained by the fact that asylum seeker enter the informal sector later, after a period of adaptation or language acquisition to the country of destination, or after emergency assistance expires.

5 Conclusion

We empirically investigate in this paper the impact of immigrant and asylum seeker flows on the size of the informal sector in destination countries, with a macroeconomic approach. We focus in our main analysis on OECD countries over 1997-2017. We find that an increase in the stock of immigrants or asylum seekers significantly increases the size of the informal sector at destination. However, the magnitude of the effect is small: a one percentage point increase in the flow of immigrants (respectively asylum seekers) as a share of host population leads to an increase of the informal sector as a share of GDP of 0.05-0.06 (respectively 0.24-0.26) percentage points. Note that the median value for the flow of immigrant is 0.66% of the host population in our sample, the median value for the flow of asylum seeker is 0.09% of the population, and the median size of the informal sector is 15.6% of GDP. We then explore the mechanisms that explain this positive impact of incoming flows on the informal sector. We find evidence of an impact of immigration and integration policies in destination countries: The effect tends to be larger when more restrictive policies regarding employer liabilities or work or visa permits are implemented, and is reduced by less restrictive policies. In addition, the effect of immigration is two to three times larger in countries characterized by a low value of the MIPEX migrant integration index than in countries with an integration index above the median. In the latter group of countries, the impact of asylum seeker flows becomes insignificant. Second, we question the role of norm transfers by immigrants, and investigate the impact

of informality in countries of origin of migrants and asylum seekers on informality at destination. We find however no evidence of an impact of the level of informality at origin, suggesting that informality is not imported by immigrants. Conversely, we find that institutions at destination do matter, in that the impact of immigrant and asylum seeker inflows of informality is driven by countries where the size of the informal sector is above the median. We analyse in addition the impact of the diversity of migrant or asylum seeker waves, and find that they tend to have a larger effect on the informal sector when they are more concentrated in terms of origin. Finally, we explore the dynamics of the relationship between immigration and asylum seeker inflows on the informal sector with a VAR model. The analysis of the impulse-response functions suggest that a shock in immigrant or asylum seeker inflows generates a positive response of the informal sector that is maximum two to four years after their arrival but remains significant up to 10 years after the initial shock.

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Appendix

Table 9: Panel unit-root Im et al. (2003) test

Variables		Without trend	With trend
Informal economy - M&S	*Levels*	0.796	-0.668
	Differences	-15.589***	-12.659***
Informal economy - E&O	*Levels*	-0.717	3.494
	Differences	-3.738***	-3.569***

*** p<0.01

Table 10: Zero-stage regressions (1997-2017)

	(1) Bilateral immigrants flows	(2) Bilateral asylum-seekers flows
Log of distance	-1.016***	-1.106***
	(0.054)	(0.104)
Common language	1.331***	1.035***
	(0.105)	(0.212)
Colonial relationship	0.699***	0.040
	(0.142)	(0.242)
War in origin country	-1.493	5.768***
	(1.215)	(0.908)
Log of distance × War in origin country	0.213	-0.617***
	(0.139)	(0.105)
Common language × War in origin country	-0.392*	-0.463***
	(0.200)	(0.180)
Colonial relationship × War in origin country	0.114	-0.031
	(0.247)	(0.314)
Origin-country fixed effects	Yes	Yes
Destination-country fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	144795	141855

Standard errors in parentheses clustered at the destination-origin country pair level. * p<0.10, ** p<0.05, *** p<0.01.
The table reports results using the PPML estimator. Data sources: OECD, CEPII & Upssala Conflict Data.

Table 11: Immigrant/Asylum seekers flows and informal sector controlling for lagged GDP, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.064***	0.043***		
	(0.016)	(0.012)		
Asylum seekers flow share $_t$			0.251**	0.220***
			(0.123)	(0.054)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615
F statistic KPW	7,800.59	7,800.59	398.72	398.72

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Immigration data source: OECD

Table 12: Migrant integration policy index (MIPEX) values over 2007-2017

Country	**MIPEX mean value**
SWE	86.66
PRT	83.64
FIN	81.57
CAN	80.16
NZL	76.90
USA	73.43
NOR	73.13
BEL	71.04
AUS	65.67
NLD	61.35
GBR	61.02
IRL	59.86
DEU	57.61
ITA	56.83
FRA	56.64
ESP	56.61
MEX	56.36
LUX	55.57
CHL	54.47
ISR	51.22
SVN	50.55
HUN	50.25
ISL	48.64
DNK	46.96
GRC	46.63
CHE	44.97
CZE	44.70
JPN	44.20
EST	43.65
POL	41.75
SVK	40.36
AUT	38.35
LVA	36.42
TUR	27.04

Figure 2: First Stage

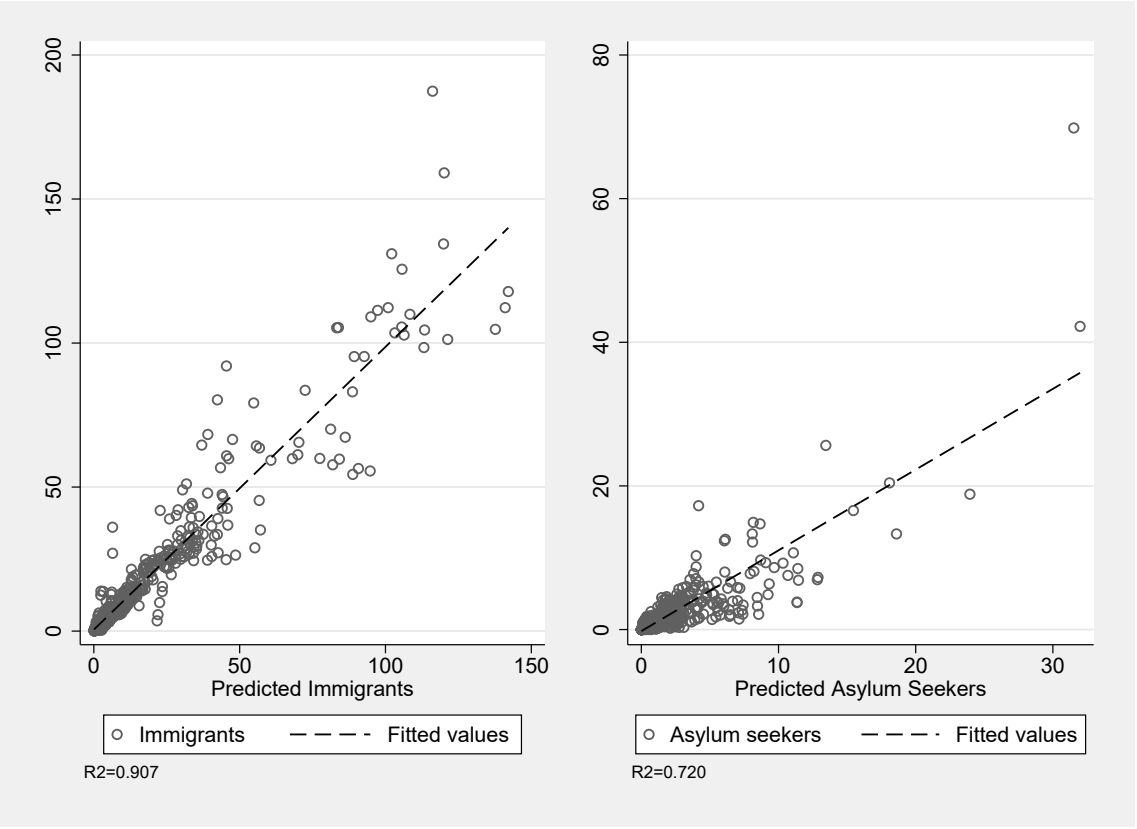
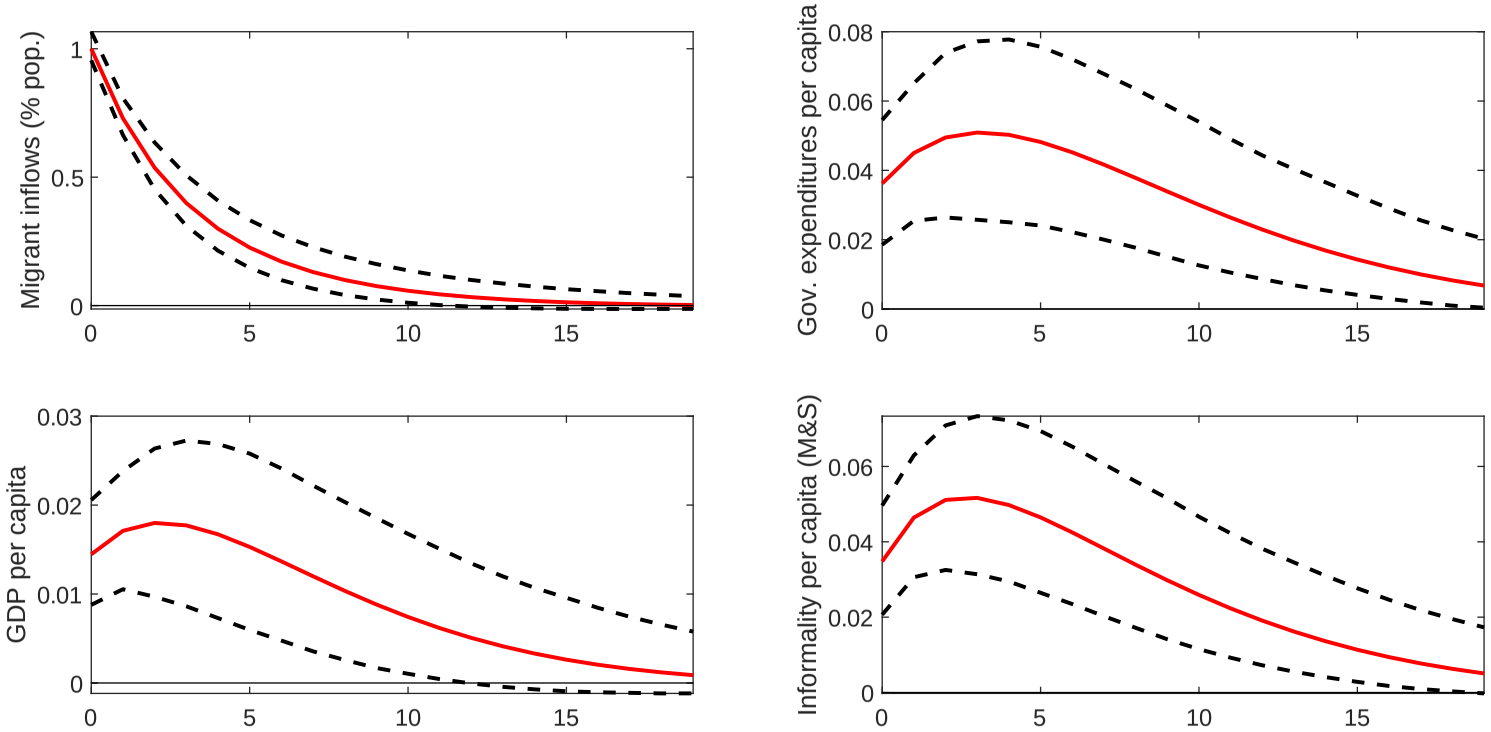
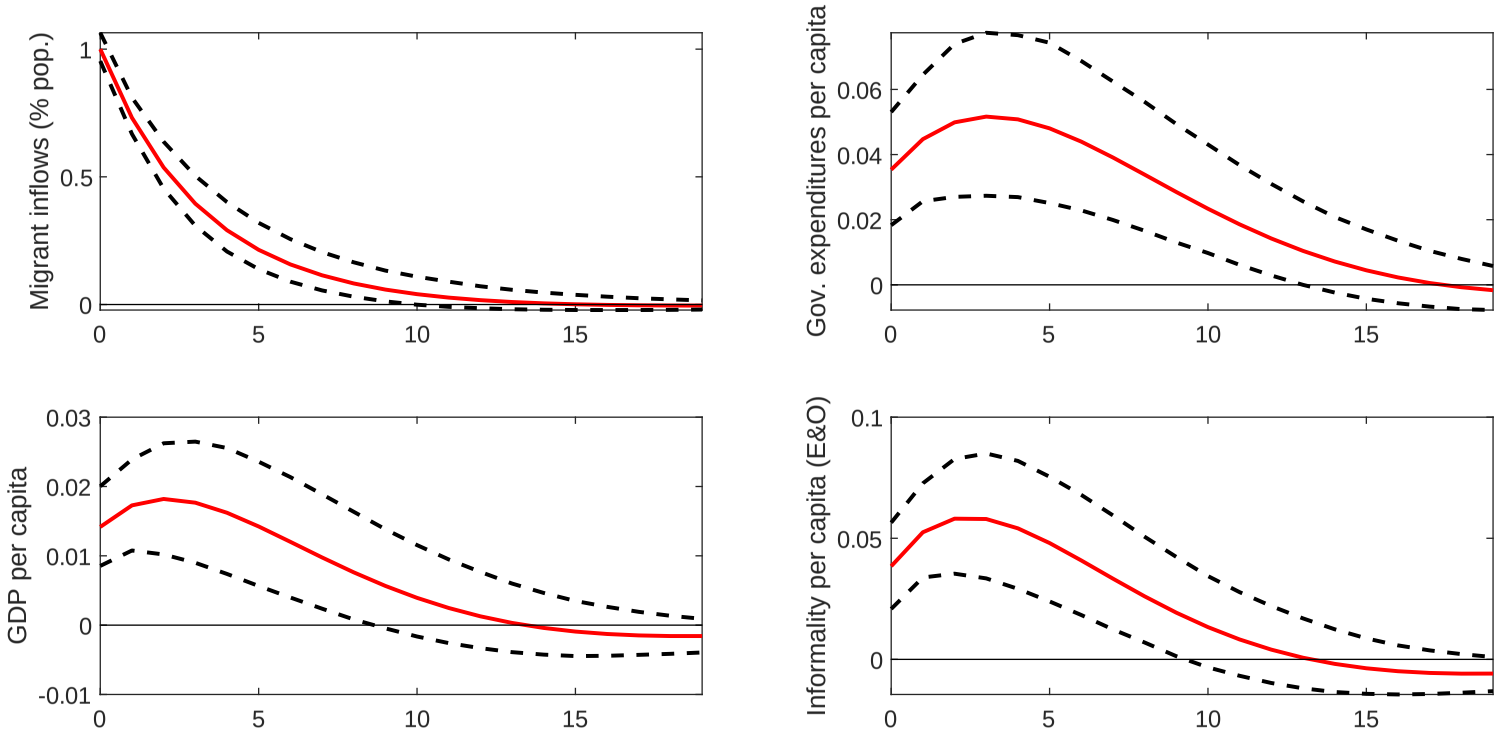


Figure 3: Responses to migration shock



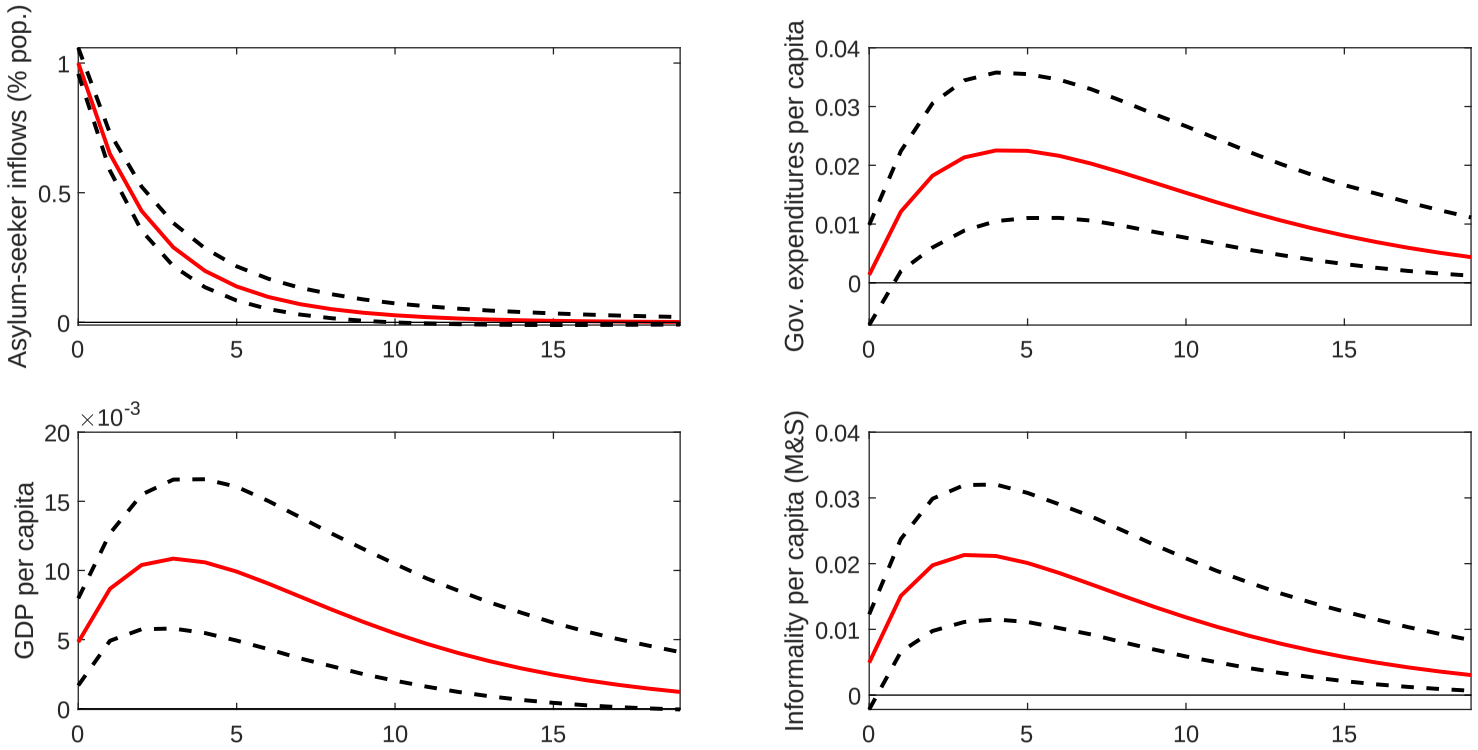
Notes. The solid lines provide the impulse responses to migration shock. Dashed lines provide the 90% confidence intervals generated by Monte Carlo with 5000 replications. Informal economy measure is provided by Elgin and Oztunali (2012).

Figure 4: Responses to migration shock



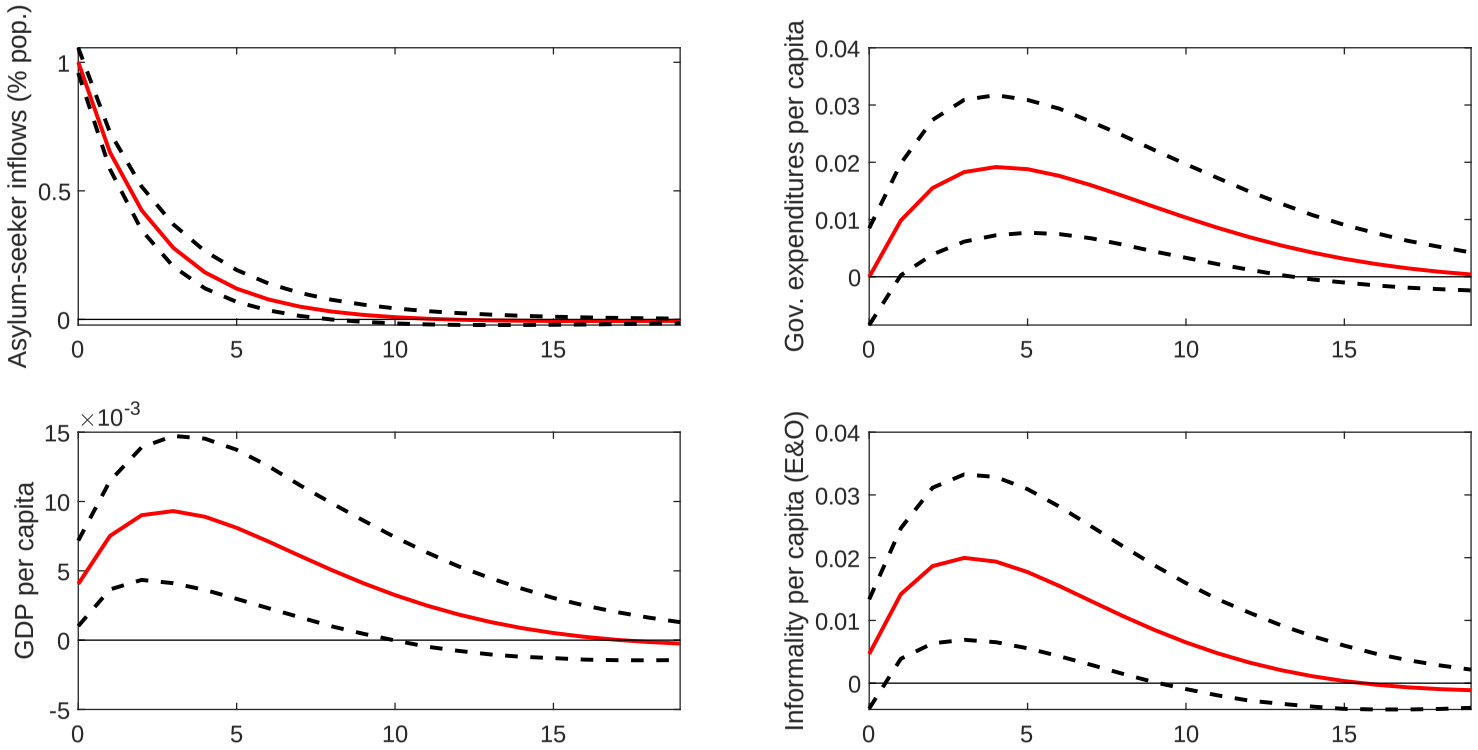
Notes. The solid lines provide the impulse responses to migration shock. Dashed lines provide the 90% confidence intervals generated by Monte Carlo with 5000 replications. Informal economy measure is provided by Medina and Schneider (2019).

Figure 5: Responses to asylum-seeker shock



Notes. The solid lines provide the impulse responses to asylum-seeker shock. Dashed lines provide the 90% confidence intervals generated by Monte Carlo with 5000 replications. Informal economy measure is provided by Elgin and Oztunali (2012).

Figure 6: Responses to asylum-seeker shock



Notes. The solid lines provide the impulse responses to asylum-seeker shock. Dashed lines provide the 90% confidence intervals generated by Monte Carlo with 5000 replications. Informal economy measure is provided by Medina and Schneider (2019).

Immigration, integration, and the informal economy in OECD countries*

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Abstract

This article assesses the impact of immigrant and asylum seeker inflows on the size of the informal sector in host countries from a macroeconomic perspective. We use two indicators of informality provided by Medina and Schneider (2019) and Elgin and Oztunali (2012) combined with migration data from the OECD International Migration Database and data on asylum seeker flows from the UNHCR for the period 1997-2017. We estimate a first-difference model, instrumenting immigrant and asylum seeker flows by their predicted values derived from the estimation of a pseudo-gravity model. Results suggest that both immigrant and asylum seeker inflows increase the size of the informal sector at destination, but the size of the effect is very small: a one percentage point increase in the stock of immigrants as a share of population leads to an increase of the informal sector as a share of GDP of 0.05-0.06 percentage points. Unsurprisingly, the effect is about four times larger for asylum seeker flows, but remains economically insignificant. We investigate several potential channels, and find that integration policies do matter. We find no impact of imported norms or institutions, but rather that the effect is larger in destination countries with a large informal sector. Finally, we estimate a VAR model and find that the impact of inflows on informality is long-lasting.

Keywords : migration, informal economy, asylum seekers, integration policies, shadow economy

JEL classification : F22 ; E26 ; J46 ; K37

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1 Introduction

Periodically, inflows of immigrants or asylum seekers receive high media coverage in developed countries. Massive inflows of refugees and immigrants are traditionally fed by conflicts, as recently experienced in Europe in the aftermath of wars in Syria and more recently in Ukraine, but new push-factors are also emerging, as a consequence of climate change. In many host countries, public opinion is sensitive to politically-oriented xenophobic ideologies that exploit fears and lack of information of natives. In anticipation of an expected surge of immigrants or refugees the question of the impact of incoming flows of population on host economies remains highly relevant. Researchers have long shown that far from being a burden for destination countries, immigrants contribute positively to various aspects of host economies. However, a major dimension largely remains in the shadows: very little is known regarding the impact of immigration on the shadow economy. The term here refers to all economic activities that remain unregistered, rather than criminal activity. The lack of studies on the impact of migrant or refugee inflows on the informal sector may be partly explained by the difficulty to measure the informal economy. This is yet a key issue, as it relates to both labor market outcomes and the integration of newcomers, and their contribution to public finance through the issue of fiscal evasion.

We provide in this paper a macroeconomic analysis of the impact of migrant and asylum seeker inflows on informality in OECD countries over a 20 year period (1997-2017). We use two alternative measures of the informal sector, developed by Medina and Schneider (2019) and Elgin and Oztunali (2012), that we combine with migration data from the International Migration Database (IMD) provided by the OECD and asylum seeker flow data gathered by the UNHCR.

We estimate the impact of both immigrants and asylum seekers on the size of the informal sector in destination countries using migrant and asylum seeker flows as a proxy for variations in their stocks and estimate a first-difference model to net out the effect of time-invariant destination-specific factors. Our main empirical model is similar to the approach chosen by Bell et al. (2013) to analyze the impact of immigrants on crime in the U.K.. We address the issue of the potential endogeneity of immigrant and asylum seeker flows by using an instrumental variable approach. We instrument actual flows by predicted flows obtained from the estimation of a gravity based equation using the full dyadic structure of the IMD database. As an alternative strategy, we estimate a panel fixed-effects model on flow data. Last, we combine this analysis with a VAR model approach similar to that of d'Albis et al. (2019) to investigate the dynamics of the response of informality to immigration shocks.

We find that migrant and asylum seeker inflows both increase the size of the informal sector in the host country GDP, but the magnitude of estimated coefficient is very small. We explore different channels for this impact: the role of integration policies at destination, the quality of institutions in both destination and origin countries, and the characteristics of migrant waves. We find no evidence that the impact of inflows on informality is due to migrants importing institutions and norms. By contrast, our findings suggest that integration policies and institutions at destination have a major role. Our results are driven by destination countries with a larger informal sector, and targeted integration policies reduce the estimated effects. Panel fixed-effects estimations on flow data confirm the small and positive impact of immigration and asylum seeker flows on informality. Impulse-response functions obtained from the VAR model suggest in addition that the impact is long lasting as it remains significant for 10 to 15 periods.

Our results emphasize the role of institutions and integration policies in host countries: the impact of immigration flows is intrinsically linked to the question of the integration of immigrants and asylum seekers and their capacity to enter the formal labor market. Immigrants are more likely to contribute to the growth of the informal sector in countries that pass restrictive integration laws or where the informal sector is already large.

This paper relates to three different strands of the literature. First, it contributes to the literature that investigates the impacts of immigrant flows on destination countries. Recent macroeconomic studies suggest that the impact of immigration is largely positive on different dimensions. Using data on OECD countries, Docquier et al. (2014) find that immigration has a positive effect on the wages of low-educated natives. Aubry et al. (2016) find substantial welfare gains of immigration in OECD countries that are mainly due to market size effects, ie an increase in the number of varieties available to consumers. Other channels for the positive effects of immigration on destination countries are knowledge diffusion, as documented by Bahar and Rapoport (2018). Using panel VAR methods, d'Albis et al. (2019) find a positive effect of immigration on fiscal balance. Our contribution in this article is to explore the impact of immigration on the size of the informal sector with a macroeconomic approach, which has not been studied yet. Even micro-economic studies on this issue are scarce: in the U.S. context, Bohn and Owens (2012) find that immigration is positively associated with informal labor in specific sectors (construction and landscaping). Bosch and Farré (2010) show that immigration in Spain in the 2000s is highly correlated with unregistered unemployment. Altındağ et al. (2020) exploit the massive and sudden wave of refugees from Syria taking refuge in Turkey and find that this inflow generated an increase in the activity of firms in the informal sector.

This paper thus connects to the literature that analyses the determinants and correlates of informality. Most recent macroeconomic studies on this issue use the measures of

the informal sector developed by Medina and Schneider (2019), and Elgin and Oztunali (2012) who provide consistent yearly series for a large number of countries. Most papers in this area focus on the role of institutions (Dreher et al., 2009; Dreher and Schneider, 2010) or political environment (Elbahnasawy et al., 2016). Teobaldelli and Schneider (2013) question the influence of direct democracy, while Berdiev et al. (2018) link the question of informality to that of economic freedom. With a more direct connection to the topic of this article, Berdiev and Saunoris (2018) show that globalisation, approximated by an index that synthesizes three forms of globalisation - economic, political, and social (Dreher, 2006) - decreases the size of the informal sector, with a more prominent effect of political globalisation. We show in this paper that immigration flows rather tend to increase the size of the informal sector, but this effect is dependent on the level of informality and integration policies in destination countries.

As a third contribution our paper points to the role of immigration policies and migrant integration in that they alter the impact of immigration on destination countries' economic outcomes. Our findings are consistent with previous works on the detrimental effect of administrative delays in the treatment of asylum demands on the integration of refugees (Ukrayinchuk and Havrylchyk, 2020). On a slightly different note, using survey data on 22 European countries Helbling et al. (2020) find little support to the popular assumption that restrictive immigration policies would foster the integration of immigrants. They indeed find that restrictive immigration policies are associated with a better economic integration for specific subgroups of migrants only, whereas restrictive immigration policies are correlated with a lower level of political integration for all groups of migrants. We add to this literature by showing that more restrictive policies tend to reduce the integration of immigrants and asylum seekers into the formal sector.

The remainder of the paper is organized as follows: Section 2 details the empirical strategy, discusses the identification assumptions, and presents the different econometric models that are estimated. Section 3 presents the data. Estimation results are reported and discussed in Section 4. Finally, Section 5 concludes.

2 Empirical strategy

2.1 Main econometric model

We first intend to estimate the impact of an increase in the stock of migrants or asylum seekers on the size of the informal sector. Our baseline empirical model is very similar to the one used by Bell et al. (2013) who study the impact of immigration on crime in the U.K. We write variations in the size of the informal sector as a linear function of

variations in the stock of either immigrants or asylum seekers and a set of controls:

$$\Delta Informal_{j,t} = \beta \Delta M_{j,t} + \sum_{k} \delta_k \Delta X^k_{j,t-1} + D_t + \epsilon_{j,t} \quad (1)$$

$\Delta Informal_{j,t}$ is the change in the size of the informal sector as a share of the GDP for host country j from year $t-1$ to year t. We use two different measures of the informal sector, derived from Medina and Schneider (2019) and Elgin and Oztunali (2012), as detailed in Section 3.2 below. $\Delta M_{j,t}$ is the change in the stock of immigrants or asylum seekers between period $t-1$ and t. Following Bell et al. (2013), we proxy changes in stocks from $t-1$ to t by new inflows in t.[1] We additionally control for first-differenced time-varying characteristics of destinations that are determinants of the size of the informal sector (Dreher and Schneider, 2010; Torgler et al., 2010; Dreher et al., 2014; Elbahnasawy et al., 2016; Elbahnasawy, 2021). For all the variables included in our set of controls X, we control for the difference between $t-2$ and $t-1$ to limit reverse causality concerns. The vector X includes government expenditures (as a share of GDP) to control for government size. As noted by Berdiev and Saunoris (2018), the effect of government size on the informal economy is ambiguous: larger public expenditures may signal a greater human and financial capacity to limit the size of the informal sector, but a larger government may also mean more administrative complexity that could increase informal activities. Government expenditures may also be correlated with the quality of institutions, which is a key determinant of the size of the informal sector (Dreher et al., 2009; Teobaldelli and Schneider, 2013; Goel and Saunoris, 2014). Second, we account for the impact of international trade by considering the degree of trade openness. We define trade openness as the sum of exports and imports of goods and services as a share of GDP. The association between trade and informality is unclear from both theoretical empirical perspectives (Goldberg and Pavcnik, 2003), but macro evidence suggests that trade liberalization is associated with a growth of the informal sector (Fugazza and Fiess, 2010). Next, we control for investment through physical capital accumulation using gross capital formation as a share of GDP. The informal sector being less capital-intensive than the formal sector, an increase in investment may reduce the relative size of the informal sector. Labor market conditions are captured by the unemployment rate. Finally, we control for inflation, measured by the consumer price index. High inflation rates are expected to increase the relative size of the informal sector, in particular through tax evasion (Bittencourt et al., 2014).

[1] Note that this approach tends to overestimate the actual change in the stock of migrants or asylum seekers as it does not account for return migration, or change in status after obtaining nationality or refugee protection.

Although GDP is commonly included as a determinant of the size of the informal sector in the empirical literature, we choose not to include GDP growth in our main specification because many countries at least partially correct official GDP figures to take into account the size of the informal sector (Dreher et al., 2014). As a result, official GDP figures and measures of the informal sector are likely to be spuriously correlated. However this choice to exclude GDP growth from the set of controls does not impact our findings and our results are robust to adding GDP growth from $t-2$ to $t-1$ to our set of controls (see Appendix Table 11). D_t are year fixed-effects and $\epsilon_{j,t}$ is the error term clustered at the country level.[2]

Our choice of a first-difference model is first justified by the stationarity properties or our dependent variables. Ignoring the non-stationarity of time series may lead to spurious regression results. Results from a panel unit root test based on individual Augmented Dickey-Fuller (ADF) regressions (Im et al., 2003) reported in Appendix Table 9 show that our two informal economy measures are non stationary. The same test however concludes that the unit-root hypothesis can be rejected for the first-difference of the two variables. By estimating a first-difference model, we are thus able to address this non stationarity issue.[3]

Second, as argued by Aleksynska and Tritah (2015), based on Wooldridge (2010), the choice of a first-difference model may be justified by the time persistence of migration due to network effects (Pedersen et al., 2008).

In order to assess the causal impact of migrant or asylum seeker inflows on the size of the informal sector, we need to address several identification issues. First, reverse causality issues may emerge if countries with a large and dynamic informal sector are attractive to migrants and asylum seekers. In addition, our results may be biased by the omission of unobserved characteristics of host countries determining both the size of the informal economy and migrant or asylum seeker inflows. Since model 1 is estimated in first-differences, time-invariant factors that are specific to each destination country and that affect the size informal economy and migrant or asylum seeker inflows are differenced out. However, the first-difference model does not capture time-varying unobserved confounding factors. We present in the next section the instrumental variable strategy that we use to address potential endogeneity issues.

[2]Given the relatively small size of our sample of countries (34), there may be a concern that our estimated standard errors maybe too small. We thus additionally provide the estimates p-value for our coefficients with a small-sample correction using the Stata *boottest* command

[3]While first introduced in studies based on time series, the detection of non-stationarity has become a matter of great importance in panel data analysis since the seminal works of Levin and Lin (1992) and Quah (1994). The advantage of panel data in the detection of unit roots is linked to the increase in the number of observations owing to the double dimension: individual and time. Non-stationarity may lead to spurious results, as it may indicate relationships between variables when they do not exist. By definition, a data series is defined as non-stationary if its statistical properties are time dependent.

2.2 Identification strategy: zero-stage gravity equation

We follow Alesina et al. (2016) and Docquier et al. (2020) and estimate a gravity model to predict the bilateral flows of immigrants and asylum-seekers. This strategy, initially used in the trade literature, has been widely applied to the analysis of migration flows (Felbermayr et al., 2010; Aleksynska and Tritah, 2015; Docquier et al., 2016; Bove and Elia, 2017; Bahar and Rapoport, 2018). We estimate the following *zero-stage* gravity equation: .

$$M_{i,j,t} = \gamma Z_{i,j,t} + D_i + D_j + D_t + \varepsilon_{i,j,t} \tag{2}$$

$M_{i,j,t}$ alternately represents migrant and asylum-seeker inflows from origin country i to OECD destination country j in year t. The vector $Z_{i,j,t}$ includes time-invariant dyadic variables that are traditional determinants of migration: the log of capital-to-capital distance between i and j, and binary variables taking value one if i and j are in a colonial relationship or share a common language (if at least 9% of the populations of i and j share a common language).[4] In addition, we include in the vector Z a time-varying binary variable for conflicts at origin, as well as its interaction with all three dyadic variables. The conflict variable is constructed using the index of civil war combat deaths provided by the Uppsala Conflict Data Program (Davies et al., 2022): our binary variable is equal to one for origin i and year t if more than 25 civil war deaths were registered in country i and civil year t. Our identification strategy relies on the reasonable assumption that civil conflicts at origin are independent from economic conditions at destination. The rationale behind the interaction between the conflict variable and the geographic and cultural controls is twofold. Those interaction terms generate additional time-varying regressors that allow us to obtain predictions of yearly flows that do not solely rely on the time-varying conflict variable.[5] Second, this specification is more flexible in that it allows conflicts at origin to alter the impact of distance, colonial links or common language on bilateral migration flows. D_j, D_i and D_t are destination, origin and year fixed effects, and $\varepsilon_{i,j,t}$ is the error term. Standard errors are clustered at the country dyad i, j level. We use the same set of variables to predict both migrant flows and asylum seeker flows. One limitation of this approach for asylum seeker flows is the globalisation of refugee flows, highlighted by Devictor et al. (2021). The interaction terms between conflicts and dyadic variables allow us to partly capture the weaker influence of geographic controls at the end of the period.

[4] Geographical and cultural bilateral data are taken from the CEPII database (Head et al., 2010).

[5] Bahar and Rapoport (2018) generate time-variation in their model by simply interacting time-invariant dyadic determinants of migration with time period dummies but they exploit only two time periods while we use yearly data over 30 years.

Because of the high proportion of zeroes in our dependent variables, we follow Silva and Tenreyro (2006) and estimate Equation 2 with a Pseudo-Poisson Maximum Likelihood (PPML) estimator. Estimation of equation 2 provides us with the predicted values of yearly bilateral inflows of migrants (resp. asylum seeker) $\hat{M}_{i,j,t}$

We then aggregate predicted bilateral flows across origin countries and construct the yearly predicted value of total inflows of immigrants (or asylum seekers) $\hat{M}_{j,t} = \sum_{i \neq j} \hat{M}_{i,j,t}$ in each OECD country j included in our sample.

We divide this predicted amount of migrants $\hat{M}_{j,t}$ by destination country population to obtain the predicted share $\hat{m}_{j,t}$ of migrant (respectively asylum seekers) inflows in host country's population. $\hat{m}_{j,t}$ is then used as an instrument for the share of migrant (resp. asylum seekers) inflows $m_{j,t}$ in our main model.

Estimation results of Equation 2 for immigration and asylum seeker flows are reported in Appendix Table 10. Appendix Figure 2 illustrates the strong positive correlation between observed migrant (resp. asylum seeker flows) and their prediction based on the pseudo-gravity model. The Kleibergen-Paap F (KPF) statistic for weak identification that is reported in each second-step result table is well above the critical values provided by Stock and Yogo (2002), suggesting that our instrument is not weak.

The identification of a causal effect of migrant or asylum seeker inflows on the size of the informal economy relies on the assumption that our instrument is orthogonal to $\epsilon_{j,t}$. In other words, relative geography variables that are used to predict migrant and asylum seeker flows should have no direct impact on the size of the informal economy. They may affect the informal economy only through their impact on incoming flows, once including controls for potential confounding factors. One such likely confounding factor is international trade, however we control for trade openness in our main model. Moreover all time-invariant destination specific characteristics that could jointly affect countries' attractiveness to immigrants and the size of their informal sector are controlled for by first-differencing all variables in our main model. Finally the effects of shocks common to all destination countries such as the 2008 Global Financial Crisis are captured by year dummies.

2.3 Fixed-effects model

To assess the robustness of our results to different specifications, we estimate an alternative version of our baseline model, in which we investigate the impact of a change in either migrant or asylum seeker *inflows*, instead of a change in their *stock*, on the size of

the informal sector. We estimate the following panel fixed-effects model:

$$Informal_{j,t} = \gamma m_{j,t} + \sum_k \kappa_k X^k_{j,t-1} + D_j + D_t + \nu_{j,t} \tag{3}$$

The dependent variable is one of the two above described measures of the size of the informal sector as a share of GDP in country j and year t. $m_{j,t}$ are migrant (resp. asylum seekers) inflows in year t as a share of the population in destination country j. $X^k_{j,t-1}$ is the same set of lagged control as in Equation 1, D_j and D_t are destination country and year fixed-effects, and $\nu_{j,t}$ is the error term.

To overcome endogeneity issues, we use the same instrumental variable strategy as described in Section 2.2 above. $m_{j,t}$ is instrumented by its predicted value obtained from the estimation of the pseudo-gravity model (Equation 2).

Country fixed-effects included in Equation 3 allow us to net out the effect of time-invariant destination countries' characteristics, which is achieved through first-differencing in our baseline model. The γ coefficient here captures the impact of a change in migrant (resp. asylum seeker) inflows. Estimation results are reported and discussed in Section 4.3.

2.4 VAR model

We complement our empirical analysis with a study of the dynamic relations between migrants or asylum seeker inflows and the informal economy. We estimate a panel vector autoregression (VAR) model that is specified as follows:

$$\begin{aligned} Y_{jt} &= A(L)Y_{jt} + D_j + D_t + \lambda_j t + \eta_{jt} \\ &= \sum_{s=1}^{p} A_s Y_{jt-s} + D_j + D_t + \lambda_{jt} + \eta_{jt} \end{aligned} \tag{4}$$

where Y_{jt} is a vector of K endogenous variables. More specifically in our setting K is equal to four and Y_{jt} is the following system:

$$Y_{jt} = [log(1 + m_{jt}), log(g_{jt}), log(y_{jt}), log(i_{jt})] \tag{5}$$

where m_{jt} are migrant (resp. asylum seekers) inflows as a share of population in destination country j, g_{jt} is the per capita government expenditures, y_{jt} is the per capita real GDP and i_{it} is the per capita informal economy. All variables are in log. L is the lag operator, and A_s with $1 \leq s \leq p$ are the $(K \times K)$ related matrices of coefficients. D_j are

destination country fixed-effects, D_t are year fixed effects, and $\lambda_j t$ are country-specific time trends. Lastly, $\eta_{jt} = (\eta_{jt}^1, ..., \eta_{jt}^K)$ is the $(K \times 1)$ vector of residuals.

To account for the bias induced by the finite time dimension (Nickell, 1981), we use the bias-corrected fixed effects estimator developed by Hahn and Kuersteiner (2002).[6] In order to be able to estimate a panel VAR model, we restrict our sample to the subset of countries for which data are available over the entire period. We end up with a sample of $N = 22$ countries and $T = 21$ periods when we focus on migration flows and $N = 26$ and $T = 21$ when we analyze asylum seeker flows.We therefore estimate Equation 4 using the implementable version of Kiviet (1995) biais-corrected fixed effects estimator provided by Hahn and Kuersteiner (2002). Based on the Akaike information criterion (AIC) and Bayesian information criterian (BIC), our panel VAR includes only first-order lags. This leads us to re-write the model presented in Equation 4 as follows:

$$Y_{jt} = AY_{jt-1} + D_j + D_t + \lambda_j t + \epsilon_{jt} \tag{6}$$

Our identification strategy is based on the Cholesky decomposition. In other words, we need to impose a recursive ordering in the VAR structure to identify orthogonal shocks. The Cholesky decomposition relies on the assumption that variables ordered first in the VAR affect other variables contemporaneously, whereas variables that follow can affect those ordered before only with a lag. Consistent with the literature that applies VAR models to immigration issues, we order migration variables first in our recursive identification (d'Albis et al., 2019, 2021). This ordering implies that migration may influence contemporaneous economic outcomes in destination countries but only react to them with a one-year delay. Such a choice may be justified by the fact that migration is a lengthy process, as the decision to migrate is commonly driven by the prevailing economic situation in the destination country during the previous years (Mayda, 2010). An additional rationale supporting our identification scheme is linked to the administrative delays imposed to migration plan. Migration to OECD countries most often requires the acquisition of a visa or a residence permit, which usually entails a lengthy process. Although current economic conditions at destination may affect without delay the decision to migrate, migration plans are likely to be achieved with delay due to administrative and logistic constraints (Czaika and de Haas, 2017). Regarding the remaining variables in the recursive scheme, government expenditures come second, followed by GDP per

[6]Other studies that estimate macro panel VAR models rely on the generalized method of moments technique in order to deal with the Nickell bias (see for instance Rousseau and Wachtel (2000) Love and Zicchino (2006), or Acheampong (2018)). However, the GMM estimators were designed for datasets with a large cross-sectional dimension relative to the time dimension. In particular, Hahn and Kuersteiner (2002) conduct Monte Carlo experiments and show that the efficiency of the bias-corrected estimator measured by the root mean squared error (RMSE) often dominates that of the GMM estimator.

capita, and the informal economy per capita. Note that since our migration (respectively asylum seeker) variable is ordered first in the identification scheme, the sequence of the remaining variables does not matter for the analysis of the response of informality to migration shocks.

3 Data

3.1 Migration and asylum seekers

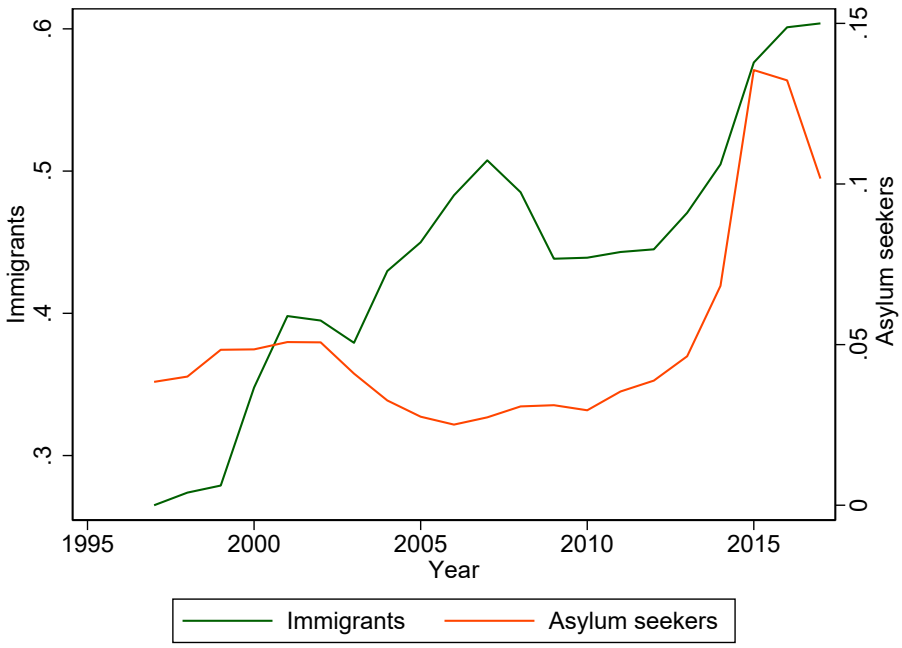
We employ data on international migrants and asylum seekers flows from the OECD International Migration Database (IMD). The IMD has been used extensively in the migration literature (Coniglio and Pesce, 2015; Adsera and Pytlikova, 2015). It contains annual data for international migration and asylum seekers flow to OECD destinations from about 200 origin countries from 1995 onwards. International migrants are defined as foreign-born individuals, and flow data are gathered from national population registers or residence and/or work permits. In addition, the OECD IMD contains information on asylum seekers for each country of origin and destination that are gathered from records provided by the United Nations High Commissioner for Refugees (UNHCR). These are commonly first instance applications made at or within asylum country borders, as notified by governments to the UNHCR. The main advantage of the IMD database is the availability of data on migration flows and asylum seekers on an annual basis that allows us to study the dynamics of the migration process.

Our final sample consists of 34 OECD countries for which data on migrant and asylum seekers flows are available. In particular, our sample includes 9 OECD non-European countries : Australia, Canada, Chile, Israel, Japan, Mexico, New Zealand, Turkey and the United States ; and 25 European countries : Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Italy, Latvia, Luxembourg, Netherlands, Norway, Spain, Slovakia, Slovenia, Sweden, Switzerland, Poland, Portugal and the United Kingdom. Our sample includes major destinations of international migrants. According to the United Nations (2017) estimates for 2015, 45% of all international migrants lived in one of the OECD countries that is included in our sample.

Using population data from the World Development Indicators database, we compute for each destination the share of immigrants/asylum seekers inflows in the total population. Figure 1 depicts the evolution of migrant and asylum seeker inflows to selected OECD countries over the period 1997-2017. What is clearly shown is the fairly large increase in migration flows over the past two decades. This is due to a number of events

such as military conflicts in Afghanistan and Iraq, the Balkans' ethnic conflicts, the Arab spring in Middle Eastern and North African countries as well as political turmoil in sub-Saharan African and central Asian countries. In our sample, the average migration flow as a share of host population is 0.66%, with a lowest value of 0.02% for Mexico and a highest one of about 3% for Luxembourg. For asylum-seekers inflows, the average ratio is 0.09%.

Figure 1: Immigrants and asylum seekers inflows to OECD countries



Data source : OECD-IMD

3.2 Measures of the informal economy

Measuring the informal economy is a complex issue, as it cannot be directly observed. Indeed, the notion of informal or shadow economy covers economic activities that are not officially registered (Elgin and Oztunali, 2012).[7] As recalled by Medina and Schneider (2019), the informal economy should not be confused with illegal activities such as drug trafficking or corruption: the informal economy mainly refers to legal activities that are unrecorded for monetary, regulatory or institutional reasons. We use in this paper the data series provided by Elgin and Oztunali (2012) and Medina and Schneider (2019) that provide yearly estimates of the informal economy for a large set of countries over

[7]More precisely, Elgin and Oztunali (2012) choose to use a definition of the informal economy as "economic activities that take place outside the framework of bureaucratic public and private sector establishments."

the last decades. Although they agree on a similar definition of the informal economy, Elgin and Oztunali (2012) and Medina and Schneider (2019) adopt different approaches to approximate its size. Medina and Schneider (2019) builds on Schneider et al. (2010) and use a structural equation model (MIMIC) to estimate the size of the informal sector. The informal sector is modelled as a latent unobservable variable, correlated with a number of observable indicators and caused by a set of factors that include trade openness, unemployment, government size, fiscal freedom, rule of law, control of corruption, and government stability. The so called indicator variables selected by the authors are the share of currency in broad money, labor force participation, and the size of the economy proxied by nighttime light intensity. Medina and Schneider (2019) provide estimates of the size of the informal economy as a share of GDP for 158 countries, that include all destination countries contained in our sample, from 1991 to 2015. The second dataset that we use comes from Elgin and Oztunali (2012) who estimate a micro-founded two-sector (official and informal) dynamic general equilibrium model. They produce estimates of the size of the informal economy in 161 countries over 1950-2017.[8] Although early contributions in empirical economics related to the informal sector used alternative measures of the informal sector, using in particular electricity consumption (Chong and Gradstein, 2007), recent articles addressing the issue of informality from a macroeconomic perspective use either one or both of the two indicators presented above (Biswas et al., 2012; Gutiérrez-Romero, 2021; Goel and Saunoris, 2014; Elbahnasawy et al., 2016; Berdiev et al., 2020; Elbahnasawy, 2021).

One reassuring point is that in spite of their divergent methodological grounds the two measures of the informal economy that we use are strongly correlated: the raw correlation coefficient is 0.93 in our sample. The average size of the informal economy in our sample is 15.6 percent of GDP, with a large heterogeneity across countries. The estimated size of the informal sector ranges from a minimum of 5.1% in Switzerland up to 30% in Turkey.

3.3 Integration policies and additional data sources

To the extent that inflows of migrants and asylum seekers impact the size of the informal sector, their relation is likely to depend on the type of integration policies in destination countries. In what follows, we describe the two indices that we use to measure integration policies in OECD countries.

Comparing migrant integration policies across time and space is a major empirical challenge (Rayp et al., 2017). In this paper, we rely on data produced by two different projets. We first use the DEMIG POLICY database compiled as part of the Determinants

[8] Elgin and Oztunali (2012) provides data series for 1950-2009 only, but the authors shared with us estimates of the informal economy for 2010-2017.

of International Migration (DEMIG) project (De Haas et al., 2015). It provides the description of the direction and magnitude of 6,500 changes in immigration policies in 45 countries, forming the largest change-tracking database completed to date[9]. The DEMIG data provide information on changes in the restrictiveness of the legal framework regarding migration policies, categorized in different areas and policy tools. DEMIG further categorizes policy changes depending on their magnitude using a four level scale. We construct two different measures of integration policy changes adapted to the two types of flows that we study: migrants, and asylum seekers. As concerns migrants, we focus on policy changes related to employer liabilities and work visa/permit. For asylum seekers, we focus on policy changes that specifically target "*refugees, asylum seekers, and other vulnerable people*". For both migrants and asylum seekers we construct two binary variables that take the value one for more and less restrictive policies respectively, and limit our analysis to major policy changes that refer to the top level of the above mentioned four-level scale.

Second, we use information provided by the Migrant Integration Policy Index (MIPEX).[10] MIPEX data contains an assessment of migrant integration in eight areas [11] for 52 countries, including all OECD countries, over the 2007-2019 period. The index ranges from 0 to 100 with higher values indicating better integration. In our case, the main shortcoming of this index is its limited time span. However, for any given country there is small variation in the MIPEX index over the period. For instance, for France, the index value of 51 is identical for the years 2007 to 2019. In Germany, over the same time period, the index increased from 57 in 2007 to 58 in 2019. We take for each country the average value of the MIPEX over the entire period and create a binary variable equal to one for countries with an average value of the index that is above the sample median.

All the variables used as controls in our regressions come from the World Bank's World Development Indicators (WDI) database.

[9]Nevertheless, the DEMIG database does not contain information for Estonia and Latvia that are included in our initial sample. As a result, in the estimates aiming to investigate the heterogeneous effects of migrant inflows depending on policy changes, both the number of countries and periods are reduced.

[10]See https://www.mipex.eu/

[11]These areas are labor market mobility, family reunion, education, health, permanent residence, political participation, access to nationality and anti-discrimination.

4 Results

4.1 Immigration, asylum seekers, and the informal economy

We present estimation results of equation 1 in Table 1. The dependent variable is alternatively the first-difference of the size of the informal sector as a share of GDP provided by Medina and Schneider (2019) (in columns (1) and (3)), and Elgin and Oztunali (2012) (in columns (2) and (4)). We explore separately the impact of immigration and asylum seekers inflows considered as a proxy for first-differenced stocks of migrants and asylum seekers, respectively. Our equation includes year fixed-effects, and a set of first-differenced country level controls measured as a share of country GDP, namely government expenditures, trade openness, gross capital accumulation, as well as inflation and unemployment rates.

The main explanatory variable is immigration flows as a share of total population at destination in columns (1) and (2) and asylum seekers flows as a share of population in columns (3) and (4). Immigration and asylum seeker flows are instrumented by predicted flows resulting from the estimation of a gravity model, as detailed in Section 2.2.

We find positive and significant coefficients on immigrant and asylum seeker inflows, whatever informality measure we use as dependent variable. These findings suggest that an increase in the stock of either migrants or asylum seekers increases the share of the informal sector in destination country's GDP. Coefficients on asylum seeker flows are about four times larger than those on immigration flows. This result is not surprising given labor market restrictions imposed on asylum seekers in host countries (Fasani et al., 2021, 2022; Brell et al., 2020). However, although the coefficients are all significant, estimated effects are very small: a one percentage point increase in the stock of immigrants as a share of population leads to an increase of the informal sector as a share of GDP of 0.05 to 0.06 percentage points, depending on the index that is used. As a reference point, in 2016 the stock of foreign-borns amounted to 11.9% of the population in France, 12.7% in Spain and 13.7% in the U.K.[12] A one percentage point increase in immigrant flow as a share of the population would represent a 8.4% increase in the stock of foreigners in France, a 7.8% increase in Spain, and a 7.3 increase in the U.K. The informal sector, as estimated by Medina and Schneider (2019) represents 12.5% of GDP for France over 1997-2017, 21.4% for Spain, and 10.1% in the U.K. Therefore in all three cases, a large increase in the stock of migrants would result in an economically negligible expansion of the informal sector.

Larger estimated coefficients on the asylum seeker flow variable suggest that asylum

[12]The same figures for foreigners are 7.0%, 9.5% and 9.0% respectively.

seekers have a greater impact on the informal sector than migrants, but this impact is still very limited. As an example, a one percentage point increase in the stock of asylum seekers as a share of the population would be equivalent to four times the mean yearly value of asylum seeker flows (0.25%) observed for France over 1997-2017.

Table 1: Immigrant/Asylum seekers flows and the informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.064***	0.048***		
	(0.018)	(0.016)		
Asylum seekers flow share $_t$			0.262**	0.242***
			(0.120)	(0.067)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615
F statistic KPW	9,851.95	9,851.95	404.82	404.82

Robust standard errors clustered by country in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

4.2 Channels and interpretations

4.2.1 Integration policies

Table 2 analyzes the role played by immigration-related policies at destination. We interact migrant and asylum seeker flow variables with two binary variables that capture positive and negative changes in the degree of restrictiveness of immigration policies. We construct these two variables using the classification and coding of host countries' policies provided by the DEMIG project (see Section 3.3 above). As regards migrant flows (col. (1) and (2)), we focus on policy changes defined as major in the DEMIG database, in areas that are expected to have a direct impact on migrants' employment and labor market insertion and that correspond to the employer liabilities and work visa/permit categories in the DEMIG classification. For asylum seeker flows, we construct different binary variables based on major policy changes that apply specifically to asylum seekers and refugees. The coefficient on the non interacted immigration or asylum seekers flow share represents the impact of inflows in the absence of change in relevant policies at destination.

Table 2: Immigrants/Asylum seekers flows, immigration policies and the informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_{t-1}$	0.069**	0.063***		
	(0.031)	(0.024)		
Immigration flow share in $_{t-1}$ x more restrictive policy in $_{t-1}$	0.034	0.088***		
	(0.062)	(0.033)		
Immigration flow share in $_{t-1}$ x less restrictive policy in $_{t-1}$	-0.024*	-0.005		
	(0.013)	(0.008)		
Asylum seekers flow share $_{t-1}$			0.149	0.465***
			(0.190)	(0.113)
Asylum seekers flow share $_{t-1}$ x more restrictive policy in $_{t-1}$			0.642*	0.390
			(0.330)	(0.424)
Asylum seekers flow share $_{t-1}$ x less restrictive policy in $_{t-1}$			0.112	-0.187*
			(0.178)	(0.110)
More restrictive policy in $_{t-1}$	-0.041	-0.014	-0.049	-0.030
	(0.043)	(0.027)	(0.051)	(0.070)
Less restrictive policy in $_{t-1}$	0.031	-0.010	-0.008	0.025
	(0.022)	(0.014)	(0.038)	(0.026)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	466	466	497	497

Robust standard errors clustered by country in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Results from Table 2 suggest that policy changes in host countries influence the integration of asylum seekers and migrants and their impact on the informal sector. Although results slightly differ depending on the measure of the informal sector, estimation results consistently suggest that the impact of inflows on the size of the informal sector is either magnified by more restrictive policies (in col. (2) and (3)), or reduced by less restrictive policies (col. (1) and (4)).

We explore further the effect of integration policies in Table 3 by using the migrant integration policy index (MIPEX). We interact our flow variables with a binary indicator equal to one for countries with an average value of the MIPEX over 2007-2017 above the sample median. As discussed above, the MIPEX varies little over time. Index mean values over 2007-2017 may thus be extrapolated over the entire period. For this reason, and in order to avoid halving our sample size, we estimate our baseline model augmented with this interaction term over the whole period (1997-2017). The MIPEX is coded on a 0-100 scale, and the mean value of the index is 45 for countries below the median, and 68 for countries above the median.[13] Results unambiguously show that the positive impact of migrant and asylum seekers inflows on the size of the informal sector is driven by countries that perform poorly in terms of migrant integration. In this group of countries, that include countries as diverse as Greece, Japan, Poland or Denmark, a one percentage point increase in migrant and asylum seeker inflows increases the size of the informal sector as a share of the GDP by 0.13-015 and 0.33-0.41 percentage points respectively. In

[13]MIPEX values for countries in our sample are reported in Table 12.

the group of countries with values of the integration index above the sample median, the impact of migrant inflows is 5 to 6 times smaller (between 0.02 and 0.03 percentage point depending on the index) and less significant, as indicated by the p-value reported at the bottom of the table. For asylum seeker, a one percentage point increase in the stock of asylum seekers, as a share of host population is associated with a 0.33 to 0.41 percentage point increase in the informal sector in countries characterized by an integration index below the median, whereas it has no significant effect on informality in the group of countries with an integration index above the median.

Table 3: Immigrant/Asylum seekers flows, host countries integration index, and the informal sector first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index		
Immigration flow share $_t$	0.145***	0.135***		
	(0.037)	(0.024)		
Immigration flow share $_t$ × Integration above median	-0.117***	-0.116***		
	(0.041)	(0.027)		
Asylum seekers flow share $_t$			0.329**	0.408***
			(0.162)	(0.089)
Asylum seekers flow share $_t$ × Integration above median			-0.155	-0.321***
			(0.213)	(0.115)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615
Sum coeff.	0.028	0.019	0.174	0.087
P-value	0.071	0.042	0.255	0.154
F statistic KPW	3,214.49	3,214.49	41.64	41.64

Robust standard errors clustered by country in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

4.2.2 Quality of institutions

Informality at origin The transfers of norms by immigrants from destination back to their origin country is well documented in the literature (Docquier et al., 2020; Spilimbergo, 2009; Valette, 2018). The reverse may also be true, although studies that investigate the potential import of corruption (Bologna Pavlik et al., 2019) or terrorism (Forrester et al., 2019) by immigrants at destination find no empirical evidence of such transfers. In Table 4 we thus explore another possible channel for the impact of migrant and asylum seekers inflows on informality related to such transfers. Immigrants from countries with a high level of informality would import this informality at destination. To test this channel, we include in our model an additional variable reflecting the change in a composite informality index that reflects informality at origin for each country of origin weighted by the share of migrants from this country. Formally, our index writes:

$$\Delta\text{M\&S informality index at origin}_{j,t} = \sum_i I_{i,t}^{M\&S} \frac{Y_{ij,t}}{Y_{j,t}} - \sum_i I_{i,t-1}^{M\&S} \frac{Y_{ij,t-1}}{Y_{j,t-1}}$$

with $I_{i,t}^{M\&S}$ the index of informality from Medina and Schneider (2019) origin country i for year t, $Y_{ij,t}$ migrant or asylum seeker flows from country i to destination j in t, and $Y_{j,t}$ total migrant or asylum seeker inflows to destination j for year t.

After controlling for the change in the size of the immigrant or asylum seeker stock proxied by new inflows, we find that a change in the potentially imported informality has no impact on informality at destination, the coefficient on the informality index at origin being non significantly different from zero in all four regressions. This finding suggests that institutions or norms at origin are unlikely to explain the impact of migrants and asylum seekers on informality at destination.

Table 4: Asylum seekers flows, informality at origin, and the informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.059***	0.046***		
	(0.017)	(0.015)		
Asylum seekers flow share $_t$			0.254**	0.206***
			(0.111)	(0.064)
Δ M&S informality index at origin	0.030	-0.002	0.031	0.002
	(0.027)	(0.004)	(0.029)	(0.004)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	569	569	548	548
F statistic KPW	9,275.27	9,275.27	378.84	378.84

Robust standard errors clustered by country in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Informality at destination We explore in this section the role played by institutions at destination. The quality of institutions is a major determinant of the size of the informal sector (Friedman et al., 2000; Dreher and Schneider, 2010; Dreher et al., 2009; Teobaldelli, 2011; Goel and Saunoris, 2014). As such, it is likely to affect newcomers' integration at destination and their participation to the informal sector. We test the heterogeneous impact of migrant and asylum seeker inflows on informality depending on the quality of host country's institutions by interacting our flow variables with a binary variable that equals one for countries with an average level of informality over the 1997-2017 period that is above the sample median. Results are reported in Table 5, and suggest that the impact of migrant and asylum seeker flows on informality is driven by destinations where the informal sector is the largest. In the case of migrant flows, results differ depending on the informality indicator that is chosen as a dependent variable: while the coefficient on the interaction term is not significantly different from zero in column (1) for the informality indicator from Medina and Schneider (2019), it is positive and significant in column (2). As for asylum seeker flows, the coefficient on the interaction is positive and very close in size in the two specifications, but it is significant at conventional

levels only in column (4).

Table 5: Immigrant/Asylum seekers flows, informality at destination, and the informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.037***	0.016		
	(0.010)	(0.011)		
Immigr. $_t$ x Inf above median	-0.014	0.070**		
	(0.044)	(0.032)		
Asylum seekers flow share $_t$			-0.023	0.024
			(0.125)	(0.053)
Asyl. $_t$ x Inf above median			0.384	0.369***
			(0.288)	(0.123)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615
Sum coeff.	0.023	0.086	0.361	0.392
P-value	0.583	0.003	0.168	0.000

Robust standard errors clustered by country in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

4.2.3 Characteristics of migrant waves

Table 6 investigates the effects of the characteristics of migrant waves, and in particular their concentration in terms of origins. More concentration, or less diversity, may give rise to ethnic networks (Dagnelie et al., 2019) and enclaves that could contribute to the growth of the informal sector (Awaworyi Churchill and Danquah, 2022; Lassen, 2007). We first test this assumption by exploring the heterogeneity in the impact of migrants and asylum seeker flows on informality in countries depending on the average origin composition of flows that they receive. We compute the Herfindahl fractionalization index of flows in terms of origin for each destination and year, referred to as diversity in Table 6, and define a binary variable equal to one for countries with an average value of the fractionalization index over the observation period that is above the sample median. Results are reported in Table 6: in all columns, the coefficient on the interaction between the flow variable and our dummy for flows above median in terms of fractionalization is negative, significant, and the same size as the coefficient on the flow variable. These results suggest that inflows of immigrants and asylum seekers increase the size of the informal sector only in countries hosting migrants and asylum seekers flows that are less diverse in terms of origins. However this model does not allow us to separate the composition effect (more or less diverse in terms of origin) from the size effect of flows.

To overcome this issue we estimate an alternative model in which we include the first-differenced Herfindahl fractionalization index of flows in terms of origin. Results reported in Table 7 suggest that once controlling for variations in the stock or immigrants or asylum seekers, an increase in the diversity index may be associated with a larger informal sector.

Table 6: Immigrant/Asylum seekers flows, diversity in terms of origin, and the informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.072***	0.055***		
	(0.018)	(0.018)		
Immigr. $_t$ x Diversity above median	-0.058**	-0.049**		
	(0.026)	(0.025)		
Asylum seekers flow share $_t$			0.393**	0.370***
			(0.193)	(0.091)
Asyl. $_t$ x Diversity above median			-0.322	-0.308***
			(0.233)	(0.119)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615

Robust standard errors clustered by country in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

However the coefficient is not significant in specifications that use as a dependent variable the index developed by Elgin and Oztunali (2012).

Table 7: Immigrant/Asylum seekers flows, change in diversity, and the informal sector, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.057***	0.048***		
	(0.016)	(0.015)		
Asylum seekers flow share $_t$			0.242**	0.243***
			(0.118)	(0.067)
Δ Diversity index	1.155**	0.079	1.435***	-0.101
	(0.565)	(0.092)	(0.515)	(0.070)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615

Robust standard errors clustered by country in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

4.3 Alternative model: Fixed-effects estimates

As an alternative approach to our baseline first-difference model, we estimate a fixed-effect model using the share of immigrant (respectively asylum seeker) flow in total host population. Results are reported in Table 8. We find in all specifications a positive and significant coefficient on the immigrant or asylum seeker flow variable, which suggests that an increase in the flow of immigrants or asylum seekers with respect to the population in the country of destination increases the size of the informal sector in the country. Results are consistent whatever the measure of informality that is chosen. Time invariant destination characteristics are accounted for by country fixed-effects. Although estimated coefficients in this fixed effect model cannot be directly compared to those of our main (first-difference) model, the magnitude of the effect of migrant and asylum seeker flows

is very limited. For example, a one percentage point increase in the flow of immigrants as a share of the total population entails a 1.6 percentage point increase of the size of the informal sector as a share of the population. To put this figure into perspective, in France the share of immigrants in the population strongly increased from 2010 to 2015, jumping from 0.22 to 0.36% of the population, which represents a 160% increase. According to our estimates, in order to generate a 1.6 percentage point increase in the size of the informal sector, France should have experienced a 550% increase in immigrant inflows as a share of its population (from 0.22% of the population to 1.22% of the population).

Table 8: Immigration/asylum seekers flows and informal sector, fixed-effect model (IV) (1997-2017)

	(1)	(2)	(3)	(4)
	Medina and Schneider (2019) index		Elgin and Öztunali (2012) index	
Immigration flow share $_t$	1.637***		1.147***	
	(0.503)		(0.281)	
Immigration flow share $_{t-1}$		1.580***		1.102***
		(0.468)		(0.256)
Controls	Yes	Yes	Yes	Yes
Destination country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	610	601	610	601
F statistic KPW	20.28	24.19	20.28	24.19
	(1)	(2)	(3)	(4)
	Medina and Schneider (2019) index		Elgin and Öztunali (2012) index	
Asylum seekers flow share $_t$	1.716***		1.790**	
	(0.659)		(0.709)	
Asylum seekers flow share $_{t-1}$		1.309**		1.159**
		(0.544)		(0.508)
Controls	Yes	Yes	Yes	Yes
Destination country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	644	636	644	636
F statistic KPW	22.84	23.43	22.84	23.43

Robust standard errors clustered by country in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

4.4 Dynamic effects: VAR approach

In this section, we present the estimates obtained from the panel VAR model described in Section 2.4 through a discussion of the impulse response functions. Our objective is to estimate the dynamic effects of a migration shock on the informal economy in OECD destination countries. As explained above, we estimate a panel VAR model using the bias-corrected fixed effects estimator provided by Hahn and Kuersteiner (2002).

The impulse response functions are represented in Appendix Figures 4 to 5. Since the variables are in log, the responses are expressed in percentages. We first observe that immigration or asylum seeker flows (expressed as a share of total population at destination) monotonically respond to their own shock. This is shown in all models

provided in figures 4-5. The increase remains significant for approximately ten years. Regarding the economic consequences, we observe that a migration or asylum seeker inflow shock results in a significant increase in government expenditures that peaks four years after the shock for immigrants and five years for asylum seekers. Similar findings of a positive reaction of government expenditures to a migration shock were obtained by d'Albis et al. (2019). Consistent with previous contributions (Ortega and Peri, 2014), our results also show that following a migration shock, the response of GDP per capita is positive and significant.

Focusing on our own contribution, we find that a positive shock to immigrant inflows leads to a significant increase in the size of the informal sector. The effect is instantaneous, is maximum two to four years after the shock, and remains significantly different from zero for about ten to fifteen years depending on the measure of informality that is used. As for asylum seeker flows, impulse response functions shown in Figures 6 and 5 display a similar pattern but the effect is not significant the very year of the shock. The difference between the response of the informal sector to the arrival of migrants and asylum seekers may be explained by the fact that asylum seeker enter the informal sector later, after a period of adaptation or language acquisition to the country of destination, or after emergency assistance expires.

5 Conclusion

We empirically investigate in this paper the impact of immigrant and asylum seeker flows on the size of the informal sector in destination countries, with a macroeconomic approach. We focus in our main analysis on OECD countries over 1997-2017. We find that an increase in the stock of immigrants or asylum seekers significantly increases the size of the informal sector at destination. However, the magnitude of the effect is small: a one percentage point increase in the flow of immigrants (respectively asylum seekers) as a share of host population leads to an increase of the informal sector as a share of GDP of 0.05-0.06 (respectively 0.24-0.26) percentage points. Note that the median value for the flow of immigrant is 0.66% of the host population in our sample, the median value for the flow of asylum seeker is 0.09% of the population, and the median size of the informal sector is 15.6% of GDP. We then explore the mechanisms that explain this positive impact of incoming flows on the informal sector. We find evidence of an impact of immigration and integration policies in destination countries: The effect tends to be larger when more restrictive policies regarding employer liabilities or work or visa permits are implemented, and is reduced by less restrictive policies. In addition, the effect of immigration is two to three times larger in countries characterized by a low value of the MIPEX migrant

integration index than in countries with an integration index above the median. In the latter group of countries, the impact of asylum seeker flows becomes insignificant. Second, we question the role of norm transfers by immigrants, and investigate the impact of informality in countries of origin of migrants and asylum seekers on informality at destination. We find however no evidence of an impact of the level of informality at origin, suggesting that informality is not imported by immigrants. Conversely, we find that institutions at destination do matter, in that the impact of immigrant and asylum seeker inflows of informality is driven by countries where the size of the informal sector is above the median. We analyse in addition the impact of the diversity of migrant or asylum seeker waves, and find rather ambiguous effects: inflows affect informality only in countries that host the less diverse flows, but controlling for flow size, we find that an increase in the fractionalization index of inflows tends to reduce the impact of inflows on the shadow economy. Finally, we explore the dynamics of the relationship between immigration and asylum seeker inflows on the informal sector with a VAR model. The analysis of the impulse-response functions suggest that a shock in immigrant or asylum seeker inflows generates a positive response of the informal sector that is maximum two to four years after their arrival but remains significant up to 10 years after the initial shock. This last result, together with our finding that immigration policies at destination alter the impact of migrant and asylum seeker inflows in informality, suggests that adequate policies that facilitate the integration of immigrants in host countries and their access to the formal sector should be perceived as high-paying long-term investments.

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Appendix

Table 9: Panel unit-root Im et al. (2003) test

Variables		Without trend	With trend
Informal economy - M&S	*Levels*	0.796	-0.668
	Differences	-15.589***	-12.659***
Informal economy - E&O	*Levels*	-0.717	3.494
	Differences	-3.738***	-3.569***

*** p<0.01

Table 10: Zero-stage regressions (1997-2017)

	(1) Bilateral immigrants flows	(2) Bilateral asylum-seekers flows
Log of distance	-1.016***	-1.106***
	(0.054)	(0.104)
Common language	1.331***	1.035***
	(0.105)	(0.212)
Colonial relationship	0.699***	0.040
	(0.142)	(0.242)
War in origin country	-1.493	5.768***
	(1.215)	(0.908)
Log of distance × War in origin country	0.213	-0.617***
	(0.139)	(0.105)
Common language × War in origin country	-0.392*	-0.463***
	(0.200)	(0.180)
Colonial relationship × War in origin country	0.114	-0.031
	(0.247)	(0.314)
Origin-country fixed effects	Yes	Yes
Destination-country fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	144795	141855

Standard errors reported in parentheses are clustered at the destination-origin country pair level. * p<0.10, ** p<0.05, *** p<0.01.
The table reports results using the PPML estimator. Data sources: OECD, CEPII & Upssala Conflict Data.

Table 11: Immigrant/Asylum seekers flows and informal sector controlling for lagged GDP, first-difference model (IV) (1997-2017)

	(1) Δ M&S index	(2) Δ E&Ö index	(3) Δ M&S index	(4) Δ E&Ö index
Immigration flow share $_t$	0.064***	0.043***		
	(0.016)	(0.012)		
Asylum seekers flow share $_t$			0.251**	0.220***
			(0.123)	(0.054)
Controls	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Observations	582	582	615	615
F statistic KPW	7,800.59	7,800.59	398.72	398.72

Robust standard errors clustered by country in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 12: Migrant integration policy index (MIPEX) values over 2007-2017

Country	**MIPEX mean value**
SWE	86.66
PRT	83.64
FIN	81.57
CAN	80.16
NZL	76.90
USA	73.43
NOR	73.13
BEL	71.04
AUS	65.67
NLD	61.35
GBR	61.02
IRL	59.86
DEU	57.61
ITA	56.83
FRA	56.64
ESP	56.61
MEX	56.36
LUX	55.57
CHL	54.47
ISR	51.22
SVN	50.55
HUN	50.25
ISL	48.64
DNK	46.96
GRC	46.63
CHE	44.97
CZE	44.70
JPN	44.20
EST	43.65
POL	41.75
SVK	40.36
AUT	38.35
LVA	36.42
TUR	27.04

Figure 2: First Stage

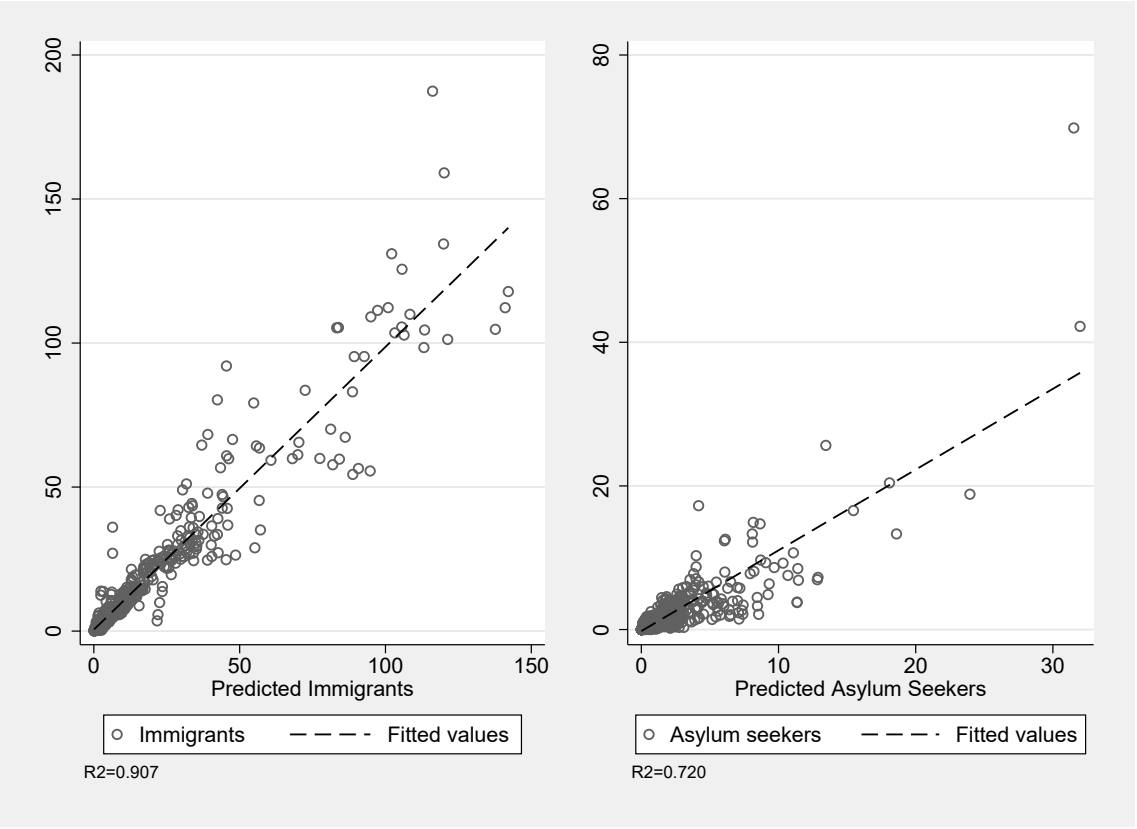
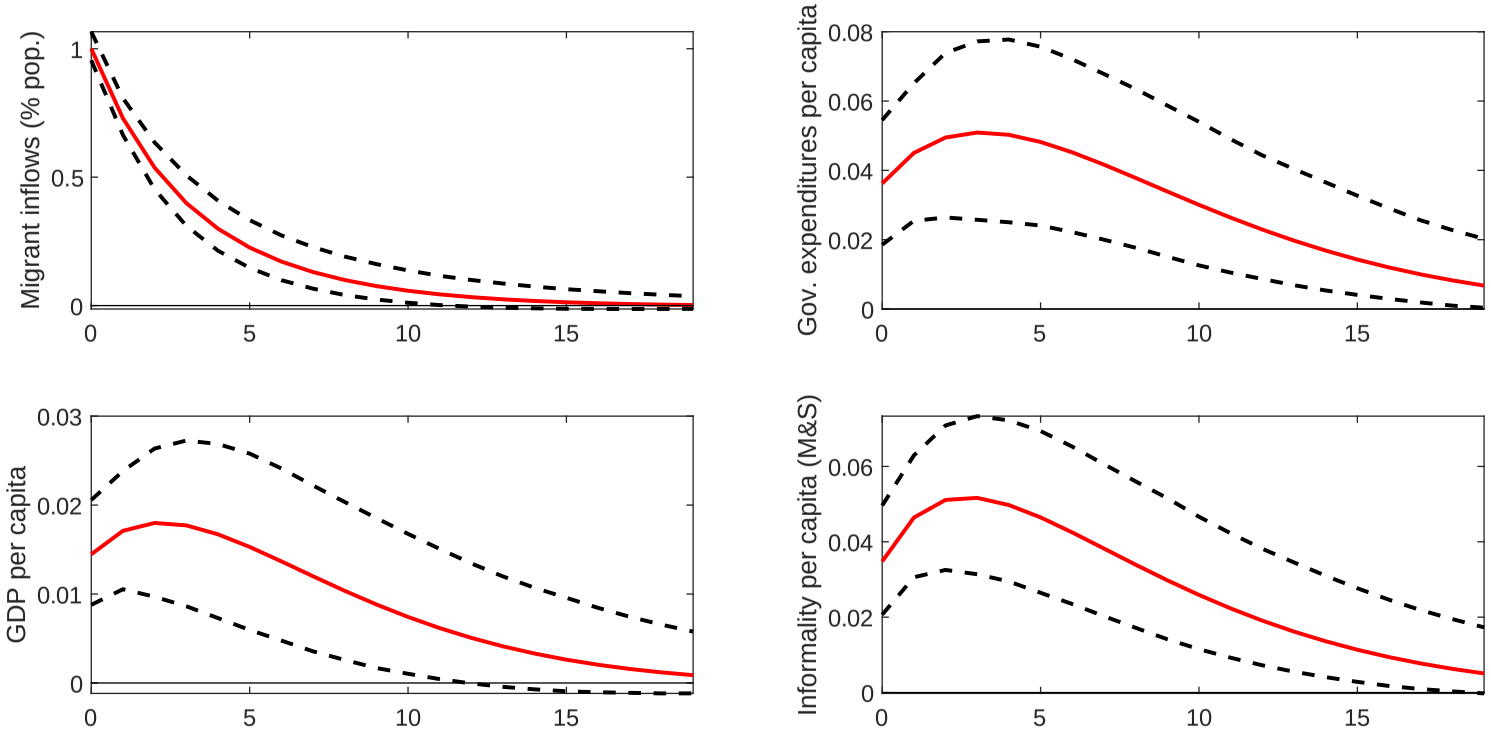
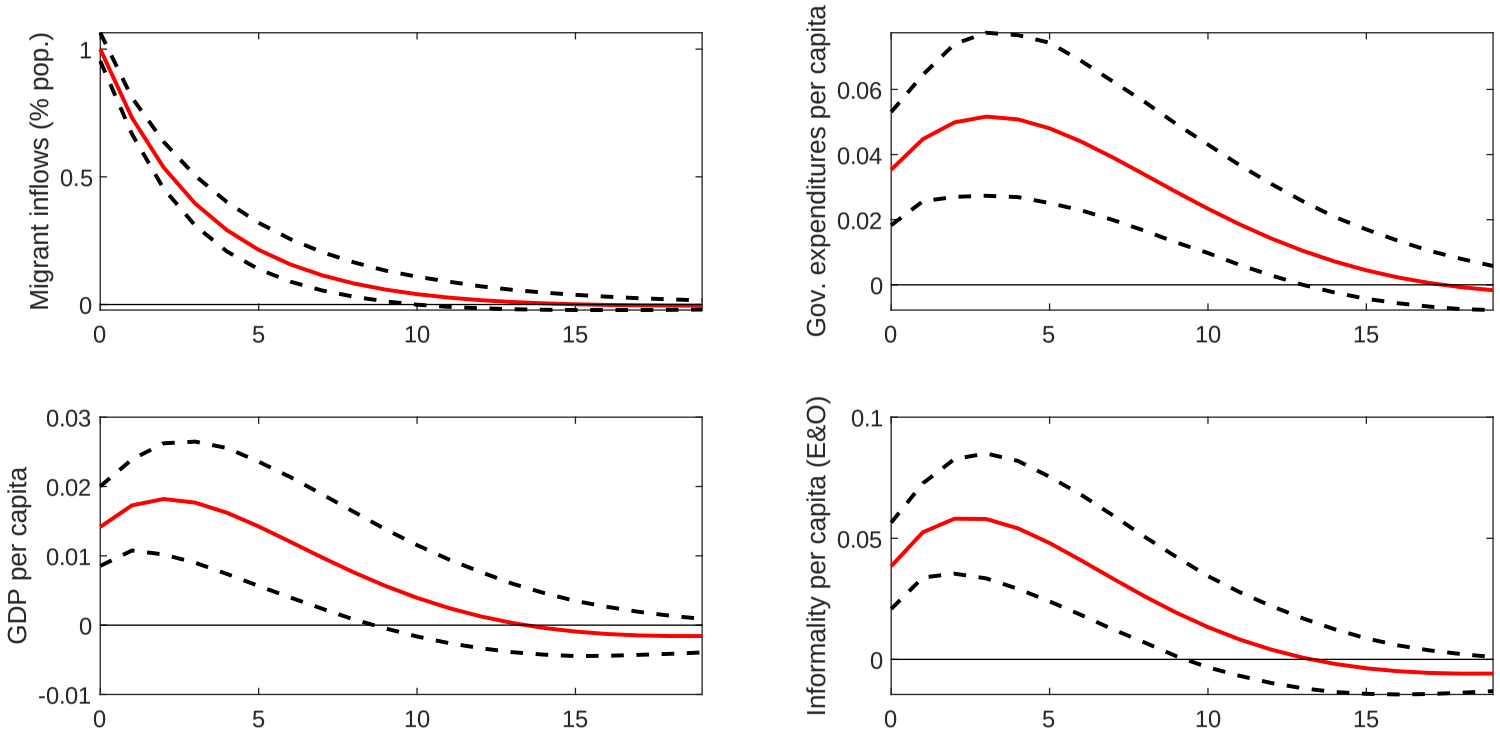


Figure 3: Responses to migration shock



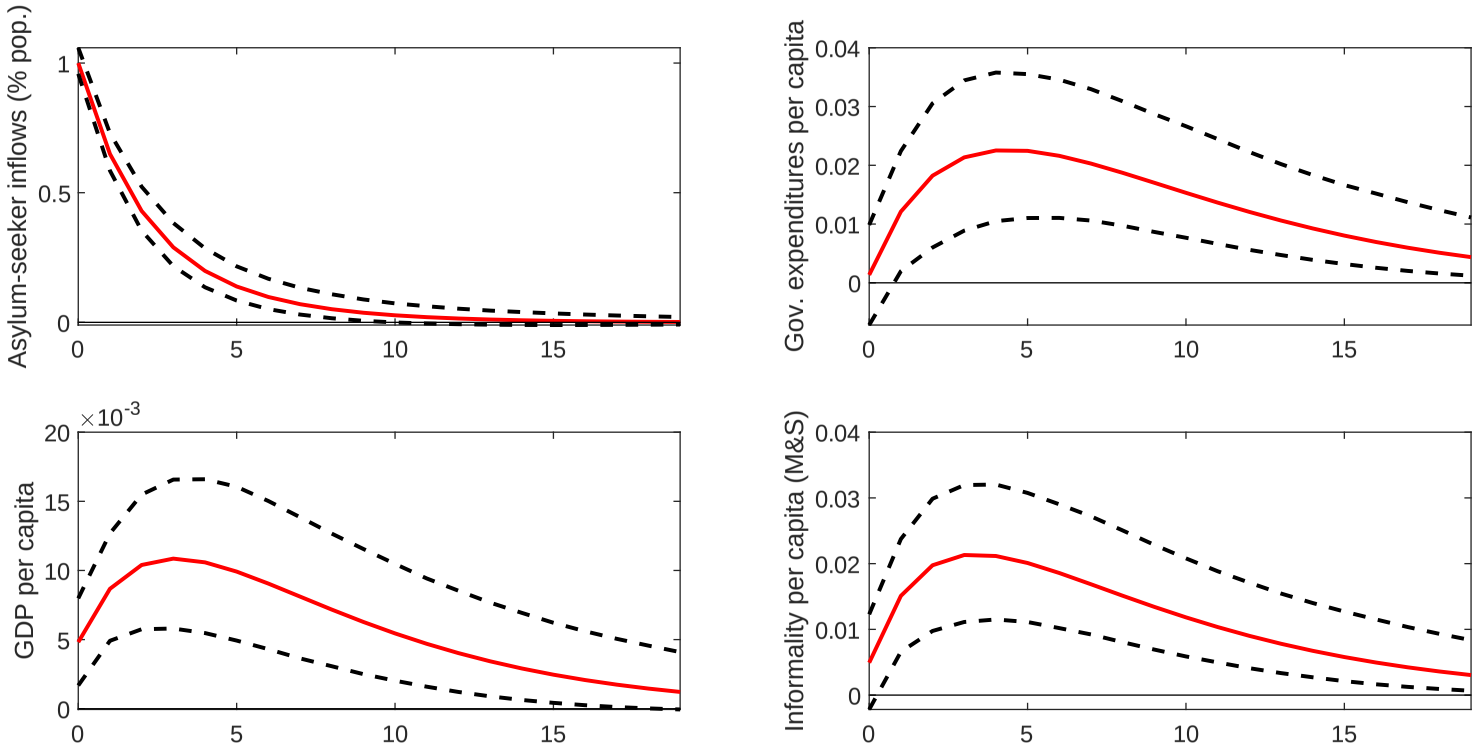
Notes. The solid lines provide the impulse responses to migration shock. Dashed lines provide the 90% confidence intervals generated by Monte Carlo with 5000 replications. Informal economy measure is provided by Elgin and Oztunali (2012).

Figure 4: Responses to migration shock



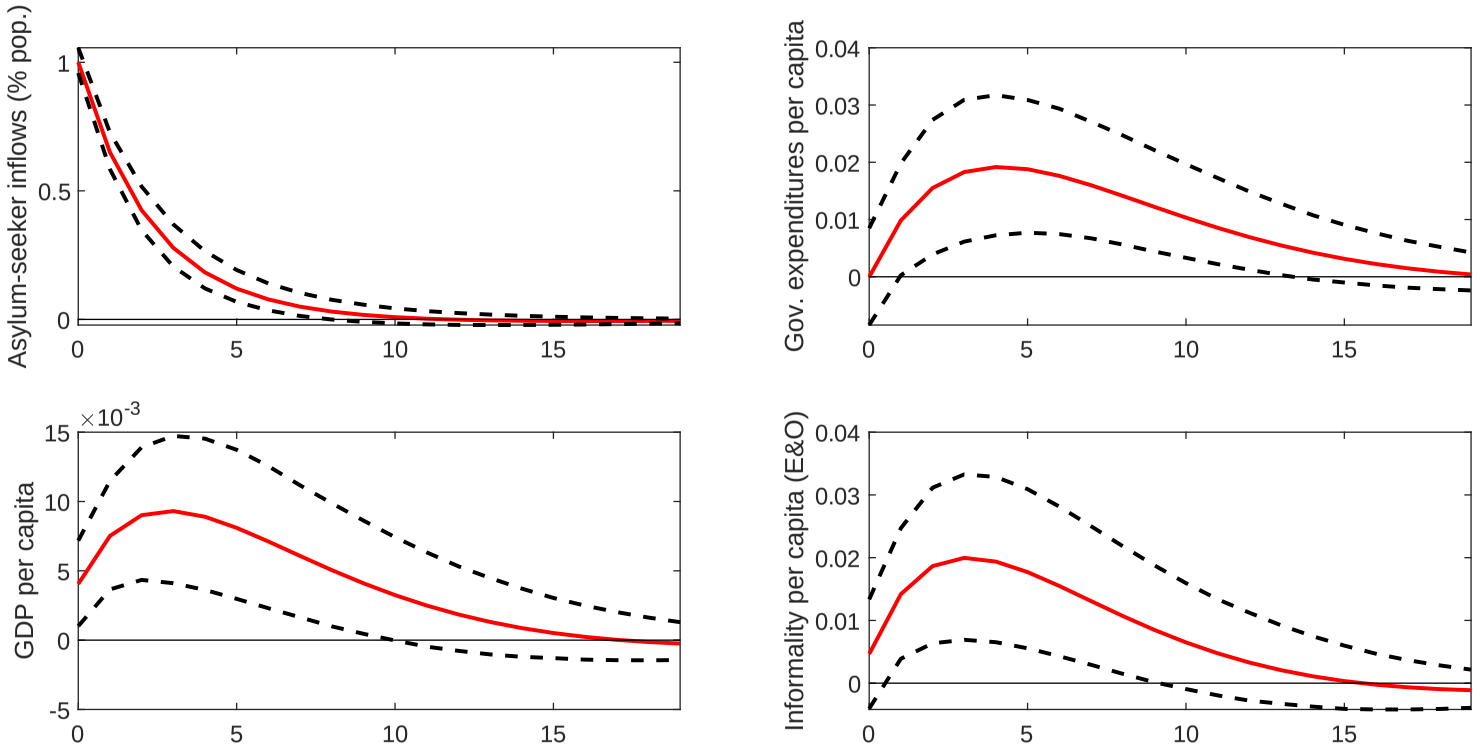
Notes. The solid lines provide the impulse responses to migration shock. Dashed lines provide the 90% confidence intervals generated by Monte Carlo with 5000 replications. Informal economy measure is provided by Medina and Schneider (2019).

Figure 5: Responses to asylum-seeker shock



Notes. The solid lines provide the impulse responses to asylum-seeker shock. Dashed lines provide the 90% confidence intervals generated by Monte Carlo with 5000 replications. Informal economy measure is provided by Elgin and Oztunali (2012).

Figure 6: Responses to asylum-seeker shock



Notes. The solid lines provide the impulse responses to asylum-seeker shock. Dashed lines provide the 90% confidence intervals generated by Monte Carlo with 5000 replications. Informal economy measure is provided by Medina and Schneider (2019).