Revisiting the nexus between globalization and the shadow economy: Untying the influences of de jure vs. de facto globalization

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Abstract

This paper examines the relationship between globalization and the size of the shadow economy, focusing on the differential effects of de jure and de facto globalization. Using panel data on over 120 countries from 1991 to 2017, the results suggest that globalization reduces the prevalence of the shadow economy. Furthermore, after differentiating between de jure and de facto globalization, we find that both de facto and de jure globalization are effective in curbing the spread of the shadow economy, with de jure globalization showing a larger impact. These results withstand a series of robustness analyses and offer important policy implications.

Keywords: Shadow economy; Globalization; De facto globalization; De jure globalization

JEL classification: O17; E26; F60; F62

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1. Introduction

Countries have continued on the path of becoming more integrated (economically, politically, and socially) across the globe as a result of globalization, which is defined by Keohane and Nye (2000, p. 2) as "a state of the world involving networks of interdependence at multi-continental distances." Of course, the spread of globalization has not been similar for all countries; for example, South Korea has experienced rapid globalization, while the experience in other countries is much less (see Gygli et al. (2019)).

The idea of globalization is multi-faceted, capturing integration across several dimensions, including economic, political, and social (Dreher (2006); Dreher et al. (2008); Potrafke (2010)). The increase in exchange of goods and services across borders, reduction in trade barriers, lower transaction costs, and increase in capital flows are all consistent with countries becoming more globally integrated (World Bank (2002); Dreher (2006) Potrafke (2015)). Consequently, globalization has been shown to benefit economic growth (e.g., Dreher (2006)) and life expectancy (e.g., Bergh and Nilsson (2010a)), and reduce poverty (e.g., Bergh and Nilsson (2014)). Still, the economic consequences of globalization are not well-understood.

While researchers have studied the influences of globalization on the formal sector of the economy (e.g., Dreher (2006); Grossman and Helpman (2015)), there has been relatively little attention paid to the large clandestine, or shadow (also called underground or informal), economy that makes up as much as 30% of the world's economy, and in some countries comprises the majority of the economy (e.g., Bolivia) – see Schneider et al. (2010) and Medina and Schneider (2019). Although the shadow economy is a large and robust economy in most developing countries, it also exists in varying degrees across developed countries (Schneider and Enste (2000); Gërxhani (2004)). The shadow economy includes market-based economic activity that is unreported (Medina and Schneider (2019); Schneider and Enste (2000); Gërxhani (2004)). In other words, goods and services produced shadow economy would be included in the gross domestic product (GDP) had they been reported, thus it excludes the so-called criminal sector.

Understanding the causes and effects of the shadow economy is important as it imposes certain costs on society. In particular, the shadow economy results in a reduction of tax collections by governments thereby leading to lower quantity and quality of public goods and services; it distorts macroeconomic statistics which are relied on by policy makers; and it also contributes to a misallocation of scarce resources (see Schneider and Enste (2000) and Gërxhani (2004) for a discussion). For these reasons, researchers and policy makers strive to better understand the cost-benefit calculus that goes into the decision to consume and produce in the shadow economy (Dreher et al. (2009); Schneider (2011); Buehn and Schneider (2012)).

Broadly speaking, countries that are considered more globalized typically experience less trade restrictions (e.g., tariffs and quotes) and have institutions that support a free and open exchange of goods, services, and people, which then gives rise to improved quality of institutions and lower taxes and regulations due to inter-country competition. As a result, the net benefits of moving underground are reduced, or the opportunity cost of participating in the shadow sector increases, and this has been shown empirically by Berdiev and Saunoris (2018). Nevertheless, enhanced competition brought about by globalization may encourage firms to move (at least

partially) underground or sub-contract to underground suppliers as a means of cutting costs and staying competitive (Goel et al. (2019)).

Whereas previous literature has treated globalization as one dimensional, recently Gygli et al. (2019) differentiate between de jure globalization (i.e., institutions and policies put in place to promote the exchange of people, goods and, ideas across borders) and de facto globalization (i.e., actual movement of people, goods, and ideas across borders). While the de jure and de facto measures of globalization in some nations are similar in recent years (e.g., South Africa, China, Belgium), the experience of other nations shows clear distinctions between the two aspects of globalization (e.g., Albania, Nicaragua, United States of America). This distinction is important for understanding which of the two aspects of globalization is the important driver of economic activity. For instance, Gygli et al. (2019) find that de facto and de jure globalization have differing effects on economic growth. Moreover, scholars have shown that de facto and de jure measures of judicial independence (e.g., Feld and Voigt (2003)) and financial openness (e.g., Quinn et al. (2011)) have varying influences on economic growth.

Related to the shadow economy, research shows that globalization reduces the size of the underground sector (e.g., Berdiev and Saunoris (2018)), and an important subgroup of the shadow economy, namely, informal entrepreneurship (e.g., Berdiev and Saunoris (2019a)); however, the potential differing effects of de facto and de jure globalization is an open question and one that is addressed in this paper. For instance, is it the policies and institutions that promote the exchange of goods, people and ideas (i.e., de jure globalization) that matter for curbing the spread of the shadow economy or is it the actual transmission of ideas, goods, and people across national borders (i.e., de facto globalization) that truly matters for lowering the prevalence of underground economic activity? The influences of de jure and de facto globalization have not been considered in the extant literature, and, therefore, becomes the focus of the current research.

More specifically, the main questions we attempt to address in the current paper are:

- Does globalization significantly influence the development of the shadow economy?
- Are the influences of de jure and de facto globalization on the shadow economy similar?

Thus, besides revisiting the impact of globalization on the shadow economy using the most recent measure of the shadow economy covering more than 120 countries from 1991 to 2017, we also empirically untie the influences of de jure and de facto globalization. In particular, we analyze the impact of de jure and de facto globalization on the prevalence of the shadow economy. The results show that globalization reduces the size of the shadow economy. Moreover, after distinguishing between the two aspects of globalization, we find that both de facto and de jure globalization are effective in curbing underground economic activity, with de jure globalization exhibiting a larger influence. Our findings withstand a series of robustness analyses.

The remainder of this paper is structured as follows: Section 2 discusses the theory and the literature; Section 3 documents the data and empirical methodology; Section 4 reports the results; and the final section concludes.

2. Theoretical discussion and literature review

Research argues that the process of global integration – economic, social, and political – might affect the development of the shadow economy. For instance, greater economic integration through such things as lessening/eliminating trade restrictions (e.g., quotas and tariffs) constrains opportunities for shadow operators to satisfy the demand for potentially regulated items, thereby curbing the spread of underground economic activity (Buehn and Farzanegan (2012); Mishkin (2009); Saunoris and Sajny (2017); Schneider and Enste (2000)).

The literature documents various other channels of influence from globalization to the shadow economy. Globalization, for instance, improves the quality of institutions (Dong et al. (2012); Potrafke (2012); Bonaglia et al. (2001)) and stimulates the growth of formal output (Dreher (2006); Chang et al. (2013); Gygli et al. (2019)), which, in turn, pushes shadow participants to transition to legitimacy by increasing the benefits (opportunity costs) of participating in the formal (informal) sector of the economy (see Berdiev and Saunoris (2018; 2019a) and Berdiev et al. (2018) for a discussion).

Yet, there can be instances when globalization might promote the prevalence of the informal sector. Broadly speaking, globalization through higher trade openness improves competition; thus, entrepreneurs, in an attempt to stay competitive, are more likely to migrate to the informal sector where the costs of operations are lower relative to the formal sector of the economy (Goel et al. (2019)). This dimension of interplay might therefore increase the size of the shadow economy.

Globalization might also increase informal sector participation indirectly through its impact on income inequality. For instance, the extant literature has illustrated that globalization fosters income inequality (Dreher and Gaston (2008); Bergh and Nilsson (2010b); Asteriou et al. (2014)), which might then encourage individuals to transition to informality due to limited resources available to those at the lower end of the income distribution. The positive nexus between income inequality and the shadow sector is supported by prior research (see, e.g., Chong and Gradstein (2007); Rosser et al. (2000); Berdiev and Saunoris (2019b)).

Empirically, various scholars have documented the relationship between globalization and the shadow economy (see, e.g., Fugazza and Fiess (2010); Pham (2017); Berdiev and Saunoris (2018; 2019a); Blanton et al. (2018); Bayar and Öztürk (2019); Fazanegan et al. (2020); Goel et al. (2020); Mara (2021)). For instance, Berdiev and Saunoris (2018), Bayar and Öztürk (2019) and, more recently, Mara (2021), find that globalization reduces the size of the informal economy. In contrast, Goel et al. (2020) show that globalization promotes underground economic activity.

A closely related dimension, analyzed by Blanton et al. (2018) and Fazanegan et al. (2020), involves the influence of economic globalization on the prevalence of the underground economy. An interesting study by Pham (2017) shows that various globalization measures influence the development of the shadow economy using Bayesian Model Averaging analysis. Another angle

is examined by Berdiev and Saunoris (2019a) who, using data for a vital subgroup of the underground sector, find that globalization lowers informal entrepreneurship.

In general, most studies reveal that globalization (and its various subcomponents) lowers the shadow economy. While prior studies have considered many dimensions of globalization, the distinction between de facto globalization and de jure globalization is less forthcoming, which forms the focus of the current paper. Still, before we attempt to untie the influences of de facto and de jure globalization on the size of the shadow economy, it is important to describe the differences between the two aspects of globalization.

In particular, we follow Gygli et al. (2019: 549) and note that "[w]hile de facto globalization measures actual flows and activities, de jure globalization measures policies, resources, conditions and institutions that, in principle, enable or facilitate actual flows and activities." For instance, the de jure economic globalization includes provisions such as tariffs and trade agreements, whereas the de facto economic globalization depicts cross-country movements such as trade in goods/services and foreign direct investment (see Gygli et al. (2019) for further details).

Overall, one would expect that both the de facto and de jure globalization affect the size of the underground sector. For instance, the presence of trade restrictions (de jure globalization) induces entrepreneurs to move underground to skirt high costs of participating in the formal economy (Schneider and Enste (2000); Berdiev and Saunoris (2018); Saunoris and Sajny (2017)). Berdiev et al. (2018) provide evidence that institutions that support freedom to trade internationally enjoy a smaller shadow economy.

Similarly, Berdiev and Saunoris (2018) and Blanton et al. (2018) provide evidence that relaxing restrictions on international trade have negative spillovers to the underground. Early and Peksen (2019) show that nations that face sanctions experience a larger shadow economy. Regarding the de facto globalization, various scholars have shown that cross-border trade and foreign direct investment curb participation in the informal sector (see, e.g., Goel et al. (2019); Blanton et al. (2018); Huynh et al. (2020); Esaku (2021); Canh et al. (2021)).

Additional aspects of de jure globalization consist of such things as civil liberties, access to the internet, education, and freedom of the press (see Gygli et al. (2019)). These measures of de jure globalization, through transfer of ideas and information (Keohane and Nye (2000)), might promote the spread of sound institutions thereby restraining production in the informal sector of the economy (Berdiev and Saunoris (2018)). For instance, Elgin (2013) shows a negative relationship between internet usage and the informal sector.

Research has also argued that countries that support policies to promote political freedom through greater political rights and civil liberties check participation in the underground (see Teobaldelli and Schneider (2013); Goel and Nelson (2016); Berdiev et al. (2020)). Moreover, nations that advocate for education through higher investment in human capital increase the return (opportunity cost) in the formal (informal) economy (Loayza et al. (2009); Buehn and Farzanegan (2013); Gërxhani and van de Werfhorst (2013); Berdiev et al. (2015)). Given all that, these facets of de jure globalization might check the spread of informality.

Other features of de facto globalization, which consists of such things as cross-national migration, tourism and patents (see Gygli et al. (2019)), have also been shown to influence the development of the shadow economy. For instance, Salinas et al. (2021) find that international tourism lowers the underground sector. However, Goel et al. (2015) find no evidence that innovation measured as patent grants/applications affects the shadow economy. Recent evidence also suggests that the size of the shadow economy increases with immigration (Goel et al. (2020)), including refugee inflows (Berdiev (2021)).

Lastly, globalization also represents "the diffusion of government policies, or of international regimes (Keohane & Nye (2000: 5))." Within this domain, the de jure globalization consists of such things as international treaties and memberships in international organizations, while the de facto globalization consists of embassies and international nongovernmental organizations (see Gygli et al. (2019)). Berdiev and Saunoris (2018) argue that political integration, through diffusion of sound government policies, provides an environment where governments can learn from each other on ways to enhance the quality of their institutions that, in due course, would hamper underground operations.

Given the distinction between the two aspects of globalization, would one then expect the impacts of the de facto and de jure globalization on the prevalence of the shadow economy be different? Recently, Gygli et al. (2019) investigate the influence of de facto and de jure globalization on economic growth and argue that the underlying theoretical predictions tying de facto and de jure globalization to economic growth are complicated by the fact that de jure globalization is likely a prerequisite to de facto globalization. For example, according to Gygli et al. (2019: 564), "tariffs need to be reduced or abolished to promote international trade. Infrastructure such as internet access needs to be available to exchange information and ideas. International agreements need to be signed and embassies built to enable political collaboration." Consequently, we rely on the following empirical analysis to shed light on the impact of these two types of globalization on the shadow economy.

3. Data and empirical model

3.1. Data

The data used in the analysis is a panel data set of 124 countries observed annually from 1991 to 2017 – see Table A1 for variable definition and sources, Table A2 for summary statistics, and Table A3 for the countries used in the analysis. The dependent variable is the size of the shadow economy measured as a percent of GDP from Medina and Schneider (2019). Because the shadow economy consists of economic activity that is deliberately unrecorded, researchers have attempted to employ various statistical techniques to estimate the extent of economic activity that takes place underground (Schneider et al. (2010); Schneider and Buehn (2013); Medina and Schneider (2019)).[1] Aside from surveys, which are extremely costly to carry out over time and across different countries, alternative indirect methods have been used by researchers to estimate

[1] For a useful survey of the various techniques used to estimate the size of the shadow economy see Schneider and Buehn (2013).

the size of the shadow economy. Indirect methods rely on single indicators of shadow activity such as currency demand and energy consumption given their prominence in the underground economy.

Alternatively, another approach known as the Multiple Indicators, Multiple Causes (MIMIC) method has become popular given its use of covariance information from several indicators and causes that are used to estimate the shadow economy (see Frey and Weck-Hannemann (1984) and Schneider et al. (2010) for details). The MIMIC method uses simultaneous equations comprised of a structural model that links the latent shadow economy variable with its observable indicator variables and a measurement equation that links the observable causal variables to the latent shadow economy variable. Using the MIMIC method, Medina and Schneider (2019) construct a panel data set of the estimate the size of the shadow economy for 157 countries from 1991 to 2017. Based on their estimate of the shadow economy, the average size of the shadow economy in our sample is about 28% of GDP, ranging from a high of 70.1% (Bolivia) and a low of 5.1% (Switzerland).

The main independent variables of interest include three indices of globalization. According to Gygli et al. (2019: 546) "[g]lobalization describes the process of creating networks of connections among actors at intra- or multi-continental distances, mediated through a variety of flows including people, information and ideas, capital, and goods. Globalization is a process that erodes national boundaries, integrates national economies, cultures, technologies and governances, and produces complex relations of mutual interdependence."

Consequently, Gygli et al. (2019) revise the earlier KOF index of globalization from Dreher (2006) and Dreher et al. (2008). This revised index of globalization includes more variables (43 instead of 23) and time-varying weights of the variables. The globalization index is a composite index used to measure the degree of globalization across three dimensions including economic, social, and political. As part of their revision of the earlier globalization index, Gygli et al. (2019) also distinguishes between de jure and de facto globalization. According to Gygli et al. (2019: 544) "de facto globalization measures actual international flows and activities, de jure globalization measures policies and conditions that, in principle, enable, facilitate, and foster flows and activities." All three indices of globalization are measured on a scale from 0 to 100 with higher numbers denoting a greater degree of globalization.

The average measure of de jure (de facto) globalization is 66.8 (61.0) with Luxembourg (Switzerland) having the highest degree of de jure (de facto) globalization and Mozambique (Mongolia) the lowest degree of de jure (de facto) globalization. In terms of correlation, the shadow economy is negative correlated (< -0.64) with all three measures of globalization. Furthermore, a cursory look at the relationship between the size of the shadow economy and each measure of globalization is given in Figures 1-3 in the Appendix A. The best-fit line in each case reveals a negative relationship between the size of the shadow economy and globalization. Interestingly, the slope of the line appears to be similar across the three measures of globalization. In the next section, we conduct a more comprehensive analysis by accounting for other confounding effects that have been shown to influence shadow operations.

The remaining control variables are used to account for economic, institutional, and demographic influences and include *Economic Growth*, *Democracy*, *Bureaucratic Quality*, *Government Size*, and *Education* – see Tables 1 and 2 for variable details. These variables are based on the extant literature (Gërxhani (2004); Goel and Nelson (2016); Berdiev et al. (2018); Schneider and Enste (2000)) and extracted from reputable international sources. A growing formal economy, measured by the annual growth rate of GDP per capita, signifies a healthy economy with ample opportunities to earn a living, while democratic states, as opposed to authoritative states, give individuals voice in the political arena to inform policy decisions and throw corrupt government officials out of office. A growing democratic formal economy reduces the incentive to move their productive efforts underground. We also account for the size (*Government Size*) and quality of government (*Bureaucratic Quality*). A large government is consistent with burdensome taxes and regulations, while poor government quality is associated with corruption and cronyism, all of which encourage individuals to migrate underground. Finally, human capital investment (*Education*) increases the opportunities available in the formal sector and thus prevents underground participation.

3.2. Empirical model

To test the impact of globalization, including de jure and de facto globalization, on the size of the shadow economy, we estimate the following linear model:

$$Shadow_{it} = \beta_0 + \beta_1 Globalization_{it}^{k} + \gamma' X_{it} + \tau_t + \mu_i + \varepsilon_{it} \quad (1)$$

where *i* and *t* denote country and time, respectively; *Shadow* is the measure of the size of the shadow economy as percent of GDP; *Globalization* is the index of globalization where *k* denotes the overall, de jure, or de facto globalization; *X* is a vector of control variables described above and includes *Economic Growth*, *Democracy*, *Government Size*, *Bureaucratic Quality*, and *Education*; τ_t accounts for time effects; μ_i accounts for country-specific fixed effects; and ε_{it} is the random error term with the usual properties.

On the bottom of Table 4, we report several diagnostic tests. To determine if equation (1) should be estimated using the random effects model or the fixed effects model we conducted a Hausman test. Under the null hypothesis the errors are uncorrelated with the regressors, therefore the random effects model is consistent and more efficient than the fixed effects model. Under the alternative hypothesis, the random effects model is inconsistent, whereas the fixed effects model is consistent. Additionally, we conducted an F-test for the joint significance of the time dummies in equation (1) under the null that they are jointly equal to zero and thus can be dropped from the equation. According to the results reported at the bottom of Table 4, the null hypothesis is rejected for the Hausman test and the joint F-test, therefore equation (1) is estimated using the two-way country and time fixed effects model.

As additional diagnostic tests, we conducted tests of the residuals for heteroskedasticity and serial correlation with the results reported at the bottom of Table 3. First, we report the Breusch-Pagan test for heteroskedasticity, under the null hypothesis that the residuals are homoskedastic. Next, we report the Breusch-Godfrey test for serial correlation under the null hypothesis that

there is no serial correlation in the residuals. Results, again reported at the bottom of Table 3, show that the null is safely rejected in all cases for the Breusch-Pagan test for heteroskedasticity and the Breusch-Godfrey test for serial correlation, which indicates that the residuals are heteroskedastic and serially correlated. Accordingly, to ensure correct inference in the case of heteroskedastic and serially correlated residuals, we report clustered-robust standard errors.

4. Results

4.1. Baseline models

The regression estimates for equation (1) are reported in Table 1. The results show that the coefficient on overall globalization is negative and statistically significant at the 1% level (Model 2.1). As expected, this finding suggests that globalization restrains underground economic activity and is consistent with the extant literature (e.g., Berdiev and Saunoris (2018); Bayar and Öztürk (2019); Mara (2021)). Quantitatively speaking, a ten percent increase in the overall globalization decreases the size of the shadow economy by 3.3 percent.

The novelty in the current research is that we distinguish between de jure globalization (i.e., institutions and policies put in place to promote the exchange of people, goods and, ideas across borders) and de facto globalization (i.e., actual movement of people, goods, and ideas across borders) in our empirical model (see Gygli et al. (2019)). Consequently, turning to the distinction between de facto and de jure globalization in Models 1.2 and 1.3, the results show that both aspects of globalization negatively affect the prevalence of the shadow economy and the coefficients are statistically significant at the 1% level. In terms of magnitude, a ten percent increase in de facto (de jure) globalization decreases the size of the shadow economy by 1.7 (2.8%) percent. Model 1.4 includes both de facto and de jure globalization as regressors and the results are consistent, albeit slightly smaller in absolute value.

These findings suggest that both de facto and de jure globalization matter in checking underground operations, with de jure globalization being more effective at reducing the shadow economy relative to the de facto globalization. In other words, the size of the shadow economy is less affected by actual international flows and activities and more affected by policies and conditions that facilitate the international flows and activities. For example, reducing tariffs would be more effective at reducing the size of the shadow economy than the actual increases in exchange of goods and services across borders. Moreover, the beneficial policies and institutions put in place to encourage globalization are the same policies and institutions that reduce transactions costs and enable a more free and open economy.

The control variables are mostly consistent with expectations in terms of sign and statistical significance, with the exception that *Democracy* is statistically insignificant. Greater economic growth and human capital investment (*Education*) reduce the shadow economy. In terms of government size and quality, we find that a larger government (*Government Size*) increases the shadow economy, while greater government quality (*Bureaucratic Quality*) reduces the shadow economy.

4.2. Robustness check 1: Correcting for the potential influence of outliers

Because outlying observations may distort the estimated relation between globalization and the shadow economy, we mitigate the effects of outliers by winsorizing the dependent variable, shadow economy, and each globalization variable. That is, by country, the observations are ordered in ascending order and the top 95^{th} percentile and bottom 5^{th} percentile are replaced by the next observation counting inward (see Barnett and Lewis (1994) for details). Using these transformed variables, we re-run the baseline models and report the results in Models 2.1-2.4 of Table 2.

The results continue to show that the coefficients on each of the globalization measures are negative and statistically significant in Models 2.1-2.3. Based on these results, the coefficient estimates are therefore relatively insensitive to outlying observations. However, in Model 2.4 when controlling for de jure globalization, the impact of de facto globalization is statistically insignificant at conventional levels. The results for the remaining control variables are consistent with the baseline findings.

4.3. Robustness check 2: Considering an alternate measure of the shadow economy

As discussed above, estimating the shadow economy is akin to measuring the unmeasurable, and because there is no methodology that is without its disadvantages a useful robustness check is to check the baseline results against an alternate measure of the shadow economy based on a separate methodology. To this end, we consider an estimate of the shadow economy based on the dynamic general equilibrium approach from Elgin and Öztunali (2012). This methodology uses a two-sector economy (formal and shadow sector), where households decide the amount of labor they allocate to the taxed formal sector or the untaxed shadow sector. Based on this micro-founded macroeconomic model, Elgin and Öztunali (2012) backout an estimate for the size of the shadow economy for unbalanced panel of 161 countries from 1950 to 2009.

Using this alternate measure of the shadow economy, we re-estimate the baseline models and report the results in Models 3.1-3.4 of Table 3. The results show that the coefficients on all three measures of globalization support the shadow reducing effects of globalization, however, only the coefficients on the overall globalization and de jure globalization are statistically significant. Surprisingly, the coefficients on the control variables reveal some interesting differences. For instance, formal economic growth increases the size of the shadow economy, while larger governments decrease the size of the shadow economy (albeit statistically insignificantly). Further, the effects of education are negative and statistically significant, whereas bureaucratic quality is negative and statistically significant only in Model 3.3. Overall, these results mostly support the baseline models using an alternate measure of the shadow economy.

4.4. Robustness check 3: Controlling for the potential endogeneity of globalization

Because policy makers may turn to enacting policies that embrace globalization as means to reduce the spread of the shadow economy/tax evasion, we account for this endogeneity by re-estimating the baseline models using two-stage least squares and report the results in Models 4.1-4.4 of Table 4. To instrument each globalization variable, we rely on readily available internal instruments using their second and third lags. Lagged values of the endogenous variables are usually highly correlated with the contemporaneous endogenous variables and typically only impact the dependent variable through their effects on the contemporaneous endogenous variable. To verify that these instruments are both relevant (i.e., highly correlated with the endogenous variables) and valid (i.e., orthogonal to the error), we report two diagnostic tests at the bottom of Table 4. The statistical significance of the weak instrument F test shows that the instruments are highly correlated with the endogenous variable, and the statistical insignificance of the Sargan-Hansen test for overidentifying restrictions verifies that the instruments are valid.

The results in Table 4 confirm the baseline results that increased globalization is associated with smaller shadow economies, and this finding is overall consistent for each of the measures of globalization. However, in Model 4.4, the coefficient on de facto globalization is no longer statistically significance after controlling for de jure globalization. It is also important to note that the coefficients on each of the globalization measures are greater (in absolute value) relative to the baseline models thereby suggesting an even larger influence. The control variables are also mostly consistent with the baseline findings except that education is statistically significant only in Model 4.3.

4.5. Robustness check 4: Accounting for a non-linear influence of globalization

The baseline models assume that globalization has a linear and constant impact on the shadow economy; however, it is conceivable that globalization has a diminishing effect on the shadow economy. To check this, we augment the baseline models to include a quadratic term for each of the globalization variables and report the results in Models 5.1-5.4 of Table 5.

The negative and statistically significant coefficient on the level term for each globalization variable confirms the baseline findings; however, the positive and significant coefficient on the quadratic variables (except for de jure globalization) reveals that globalization has a diminishing effect on the shadow economy. Based on the results in Model 5.1, the marginal effect of globalization on the shadow economy peaks at 77.5, which is a relatively large degree of globalization, consistent with the degree of globalization experienced in such places as Korea and New Zealand. Also, the control variables are very similar across all models. In sum, while the baseline findings are confirmed, these results also reveal a diminishing impact of globalization.

4.6. Robustness check 5: Distinguishing between OECD and Non-OECD countries

As a final robustness check, we relax the assumption that the shadow economy has a homogeneous response to globalization by examining the potential heterogeneous response in OECD and non-OECD countries. A look at Table A2 summary statistics reveals that the shadow

economy is almost double the size in non-OECD relative to OECD countries. Further, OECD countries tend to be more globalized relative to non-OECD countries. Therefore, to examine the potential heterogenous relationship between the shadow economy and globalization, we split the sample into OECD and non-OECD countries and re-estimate the baseline models. These results are reported in Table 6.

With the exception of economic growth and the size of government, the results are quite different across the two samples. Interestingly, globalization has a negative and statistically significant effect on the shadow economy in OECD countries, but not in non-OECD countries. These results suggest that globalization's shadow reducing effects is dependent on the level of development. Similarly, democracy is negative and statistically significant in OECD countries, but positive and marginally statistically significant in non-OECD countries. Furthermore, education is negative and statistically significant in OECD countries, but positive and statistically insignificant in non-OECD countries. Lastly, bureaucratic quality is negative and statistically significant in non-OECD countries, while statistically insignificant in OECD countries. Consequently, globalization is effective at combating shadow activity in OECD countries, whereas improvement in government quality would be more effective at reducing the shadow economy in non-OECD countries.

5. Conclusions

This paper adds to the vast literature on the drivers of the shadow economy by examining the impact of globalization on the development of the shadow economy with a focus on the disparate effects of de jure globalization and de facto globalization. While previous research has shown the shadow reducing effects of globalization, we employ the recent measures of de jure and de facto globalization from Gygli et al. (2019) to examine their potential disproportionate effects on the shadow economy.

Using panel data on 124 countries from 1991 to 2017, the results are consistent with the literature in that overall globalization reduces the size of the shadow economy. After disaggregating globalization into de facto and de jure globalization, we find that both aspects of globalization matter in curbing the spread of the shadow economy; however, the effects of de jure globalization are significantly greater than the effects of de facto globalization. Consequently, the policies and institutions that are put in place to encourage inter-country exchange are more important for limiting participating in the underground sector rather than the actual flow of economic activity across national borders. Globalization-friendly institutions and policies appear to be effective at reducing the net-return of underground production, which discourages formal production from moving underground and encourages underground production to return to legitimacy.

The results presented here are not meant to be the last word on the impact of globalization on the shadow economy, but instead shed light on the importance of globalization in lowering informal economic activity. Globalization is multi-faceted, thus more research on the different aspects and dimensions of globalization and their effects on the shadow economy is left for future research. One area that seems fruitful in terms of future research is an examination, theoretically and

empirically, of the interaction between globalization and the formal and informal economy. Overall, these results suggest that endorsing institutions and policies that promote globalization will pay dividends in reducing the size of the shadow economy.

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Table 1: Globalization and the shadow economy: Baseline model
Dependent Variable: *Shadow*

	(1.1)	(1.2)	(1.3)	(1.4)
Globalization, Overall	-0.138***			
	(0.035)			
Globalization, De Jure		-0.112***		-0.099***
		(0.027)		(0.022)
Globalization, De Facto			-0.074***	-0.037*
			(0.027)	(0.020)
Economic Growth	-0.074***	-0.074***	-0.078***	-0.074***
	(0.015)	(0.015)	(0.015)	(0.018)
Democracy	0.440	0.470	0.398	0.460**
	(0.375)	(0.391)	(0.392)	(0.234)
Bureaucratic Quality	-0.566***	-0.537***	-0.642***	-0.541***
	(0.179)	(0.181)	(0.191)	(0.096)
Government Size	0.201***	0.194***	0.210***	0.196***
	(0.036)	(0.037)	(0.037)	(0.021)
Education	-0.026**	-0.023*	-0.032***	-0.024***
	(0.012)	(0.012)	(0.012)	(0.005)
Hausman Test for FE vs RE	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Test for Time Effects	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Breusch-Pagan Test for Heteroskedasticity	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Breusch-Godfrey Test for Serial Correlation	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Pesaran's Cross-Sectional Dependence Test	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Country Effects	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.715	0.715	0.707	0.717
Observations	2,331	2,331	2,331	2,331
Number of countries	124	124	124	124

Notes: See Tables A1 and A2 for variable details. Constants, time effects and country fixed effects are accounted for but not reported. Cluster-robust standard errors are in parentheses and probability values are in brackets. Asterisks denote the following significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 2: Globalization and the shadow economy
Robustness check 1: Correcting for the potential influence of outliers
Dependent Variable: *Shadow*

	(2.1)	(2.2)	(2.3)	(2.4)
Globalization, Overall	-0.139***			
	(0.035)			
Globalization, De Jure		-0.111***		-0.097***
		(0.027)		(0.027)
Globalization, De Facto			-0.077***	-0.041
			(0.027)	(0.027)
Economic Growth	-0.068***	-0.068***	-0.071***	-0.067***
	(0.015)	(0.015)	(0.015)	(0.015)
Democracy	0.437	0.468	0.403	0.456
	(0.365)	(0.382)	(0.385)	(0.370)
Bureaucratic Quality	-0.542***	-0.515***	-0.608***	-0.520***
	(0.173)	(0.174)	(0.184)	(0.171)
Government Size	0.186***	0.179***	0.196***	0.182***
	(0.036)	(0.036)	(0.037)	(0.037)
Education	-0.025**	-0.023*	-0.031***	-0.023*
	(0.012)	(0.012)	(0.012)	(0.012)
Country Effects	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.718	0.717	0.709	0.719
Observations	2,331	2,331	2,331	2,331
Number of countries	124	124	124	124

Notes: See Tables A1 and A2 for variable details. Constants, time effects and country fixed effects are accounted for but not reported. Cluster-robust standard errors are in parentheses. The variables shadow economy and each of the globalization variables have been winsorized. Asterisks denote the following significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 3: Globalization and the shadow economy
Robustness check 2: Considering a different measure of the shadow economy
Dependent Variable: *Shadow* (*Alt*)

	(3.1)	(3.2)	(3.3)	(3.4)
Globalization, Overall	-0.075**			
	(0.038)			
Globalization, De Jure		-0.075***		-0.076***
		(0.026)		(0.025)
Globalization, De Facto			-0.022	0.002
			(0.030)	(0.029)
Economic Growth	0.076***	0.075***	0.071***	0.075***
	(0.019)	(0.019)	(0.018)	(0.018)
Democracy	0.405	0.413	0.367	0.413
	(0.513)	(0.515)	(0.519)	(0.516)
Bureaucratic Quality	-0.528	-0.499	-0.563*	-0.499
	(0.327)	(0.327)	(0.327)	(0.327)
Government Size	-0.044	-0.046	-0.040	-0.046
	(0.046)	(0.045)	(0.046)	(0.045)
Education	-0.037***	-0.033**	-0.040***	-0.033**
	(0.014)	(0.014)	(0.014)	(0.014)
Country Effects	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.376	0.383	0.365	0.383
Observations	1,552	1,552	1,552	1,552
Number of countries	121	121	121	121

Notes: See Tables A1 and A2 for variable details. Constants, time effects and country fixed effects are accounted for but not reported. Cluster-robust standard errors are in parentheses. Asterisks denote the following significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 4: Globalization and the shadow economy
Robustness check 3: Controlling for the potential endogeneity of globalization
Dependent Variable: *Shadow*

	(4.1)	(4.2)	(4.3)	(4.4)
Globalization, Overall	-0.200***			
	(0.045)			
Globalization, De Jure		-0.152***		-0.120***
		(0.036)		(0.042)
Globalization, De Facto			-0.136***	-0.076
			(0.043)	(0.047)
Economic Growth	-0.090***	-0.087***	-0.094***	-0.089***
	(0.017)	(0.017)	(0.017)	(0.017)
Democracy	0.543	0.579	0.501	0.554
	(0.412)	(0.447)	(0.414)	(0.421)
Bureaucratic Quality	-0.666***	-0.626***	-0.728***	-0.652***
	(0.217)	(0.217)	(0.234)	(0.219)
Government Size	0.201***	0.190***	0.216***	0.197***
	(0.034)	(0.035)	(0.036)	(0.037)
Education	-0.018	-0.017	-0.027**	-0.017
	(0.013)	(0.013)	(0.012)	(0.013)
Weak Instrument F-Test	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Sargan-Hansen Test	[0.4008]	[0.3960]	[0.9660]	[0.5820]
Country Effects	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.701	0.701	0.688	0.703
Observations	2,104	2,104	2,104	2,104
Number of countries	111	111	111	111

Notes: See Tables A1 and A2 for variable details. Constants, time effects and country fixed effects are accounted for but not reported. Models 4.1-4.4 are estimated using two-stage least squares with each globalization variable instrumented using its second and third lag. Cluster-robust standard errors are in parentheses and probability values are in brackets. Asterisks denote the following significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 5: Globalization and the shadow economy
Robustness check 4: Accounting for a non-linear influence of globalization
Dependent Variable: *Shadow*

	(5.1)	(5.2)	(5.3)	(5.4)
Globalization, Overall	-0.310***			
	(0.085)			
Globalization, Overall²	0.002**			
	(0.001)			
Globalization, De Jure		-0.198***		-0.007
		(0.071)		(0.095)
Globalization, De Jure²		0.001		-0.001
		(0.001)		(0.001)
Globalization, De Facto			-0.314***	-0.290***
			(0.089)	(0.112)
Globalization, De Facto²			0.002***	0.002**
			(0.001)	(0.001)
Economic Growth	-0.066***	-0.072***	-0.064***	-0.062***
	(0.014)	(0.014)	(0.013)	(0.013)
Democracy	0.525	0.494	0.548	0.579
	(0.384)	(0.401)	(0.381)	(0.367)
Bureaucratic Quality	-0.584***	-0.572***	-0.614***	-0.509***
	(0.168)	(0.177)	(0.175)	(0.170)
Government Size	0.202***	0.194***	0.209***	0.198***
	(0.036)	(0.036)	(0.038)	(0.039)
Education	-0.020*	-0.022*	-0.020*	-0.015
	(0.012)	(0.012)	(0.012)	(0.012)
Country Effects	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.720	0.717	0.718	0.724
Observations	2,331	2,331	2,331	2,331
Number of countries	124	124	124	124

Notes: See Tables A1 and A2 for variable details. Constants, time effects and country fixed effects are accounted for but not reported. Cluster-robust standard errors are in parentheses. Asterisks denote the following significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 6: Globalization and the shadow economy
Robustness check 5: Distinguishing between OECD and Non-OECD countries
Dependent Variable: *Shadow*

	OECD Countries				Non-OECD Countries			
	(6.1)	(6.2)	(6.3)	(6.4)	(6.5)	(6.6)	(6.7)	(6.8)
Globalization, Overall	-0.194***				-0.033			
	(0.045)				(0.041)			
Globalization, De Jure		-0.135***		-0.114***		-0.004		0.013
		(0.038)		(0.037)		(0.041)		(0.043)
Globalization, De Facto			-0.122***	-0.073**			-0.036	-0.040
			(0.039)	(0.034)			(0.028)	(0.029)
Economic Growth	-0.050**	-0.050**	-0.042	-0.050**	-0.067***	-0.068***	-0.067***	-0.067***
	(0.024)	(0.024)	(0.025)	(0.024)	(0.018)	(0.018)	(0.018)	(0.018)
Democracy	-1.159***	-0.773**	-1.750***	-1.024***	0.846*	0.853*	0.857*	0.865*
	(0.323)	(0.393)	(0.440)	(0.393)	(0.465)	(0.478)	(0.456)	(0.463)
Bureaucratic Quality	0.209	0.287	0.037	0.242	-0.600***	-0.612***	-0.604***	-0.611***
	(0.306)	(0.303)	(0.312)	(0.303)	(0.200)	(0.209)	(0.196)	(0.204)
Government Size	0.265***	0.282***	0.316***	0.264***	0.163***	0.161***	0.165***	0.165***
	(0.076)	(0.083)	(0.073)	(0.077)	(0.037)	(0.036)	(0.037)	(0.037)
Education	-0.023*	-0.022*	-0.031**	-0.022*	0.0004	0.0004	0.0004	0.0004
	(0.013)	(0.012)	(0.014)	(0.013)	(0.019)	(0.019)	(0.018)	(0.018)
Country Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.828	0.823	0.806	0.828	0.731	0.730	0.731	0.731
Observations	861	861	861	861	1,470	1,470	1,470	1,470
Number of countries	36	36	36	36	88	88	88	88

Notes: See Tables A1 and A2 for variable details. Constants, time effects and country fixed effects are accounted for but not reported. Cluster-robust standard errors are in parentheses. Asterisks denote the following significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Appendix A

Figure 1: Overall globalization and the shadow economy

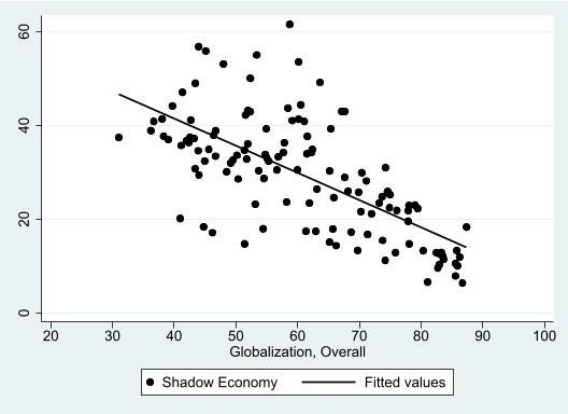

Figure 2: De facto globalization and the shadow economy

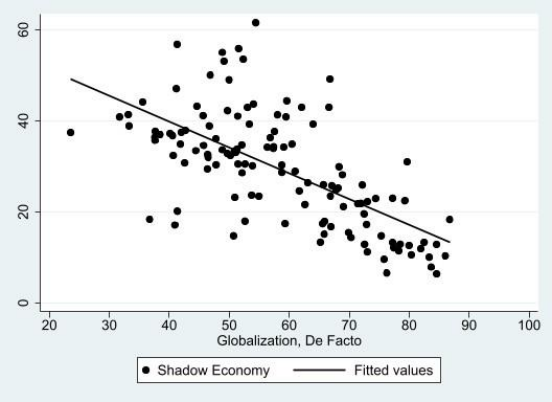

Figure 3: De jure globalization and the shadow economy

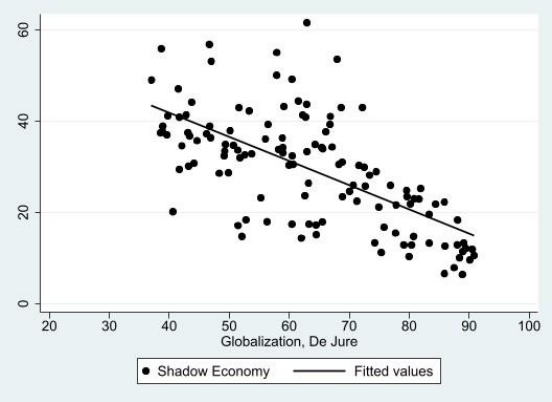

Table A1: Variable definitions and data sources

Variable	Description	Source
Shadow Economy	The size of the shadow economy measured as a percent of GDP using the MIMIC method.	Medina and Schneider (2019)
Shadow Economy (Alt)	The size of the shadow economy measured as a percent of GDP using the DGE method.	Elgin and Öztunali (2012)
Globalization, Overall	Overall Globalization index comprised of economic, social, and political aspects of globalization. The index is on a scale from 0 to 100 with higher values denoting a higher degree of overall globalization.	Gygli et al. (2019)
Globalization, De Jure	De jure globalization index comprised of economic, social, and political aspects of globalization. The index is on a scale from 0 to 100 with higher values denoting a higher degree of de jure globalization.	Gygli et al. (2019)
Globalization, De Facto	De facto globalization index comprised of economic, social, and political aspects of globalization. The index is on a scale from 0 to 100 with higher values denoting a higher degree of de facto globalization.	Gygli et al. (2019)
Economic Growth	Economic growth measures as the log difference in real GDP per capita (constant 2020 US dollars).	The World Bank (2020)
Democracy	Democracy measured as a dummy variable equal to one for democracy and zero for authoritarian.	Bjørnskov and Rode (2020)
Bureaucratic Quality	Bureaucratic quality measures as an index from 0 to 4 with high values denoting greater strength and quality of bureaucracy.	International Country Risk Guide
Government Size	Government size measured as the government consumption expenditures as a percent of total consumption expenditures.	The World Bank (2020)
Education	Education measured as secondary school enrollment as a percent of gross enrollment.	The World Bank (2020)

Table A2: Summary statistics

	Full (n=124)			Non-OECD (n=88)			OECD (n=36)		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Shadow Economy	2,331	27.80	12.55	1,470	33.92	10.82	861	17.34	7.256
Shadow Economy (Alt)	1,529	29.62	12.15	953	35.03	11.29	576	20.65	7.22
Globalization, Overall	2,331	63.86	15.05	1,470	55.83	11.61	861	77.56	9.239
Globalization, De Facto	2,331	60.95	14.92	1,470	53.67	12.14	861	73.39	10.27
Globalization, De Jure	2,331	66.75	16.07	1,470	57.98	12.38	861	81.74	9.037
Economic Growth	2,331	2.081	3.834	1,470	2.100	4.178	861	2.049	3.164
Democracy	2,331	0.721	0.449	1,470	0.565	0.496	861	0.987	0.112
Bureaucratic Quality	2,331	2.459	1.071	1,470	1.891	0.839	861	3.428	0.645
Government Size	2,331	21.48	8.109	1,470	19.12	8.432	861	25.50	5.568
Education	2,331	81.13	30.46	1,470	67.36	28.05	861	104.7	17.09

Notes: Summary statistics are based on all available data for 124 countries from 1991 to 2017.

Table A3: Countries used in the analysis

Albania	Dominican Republic	Korea, Rep.*	Poland*
Algeria	Ecuador	Kuwait	Portugal*
Angola	Egypt, Arab Rep.	Latvia*	Qatar
Argentina	El Salvador	Liberia	Romania
Armenia	Estonia*	Libya	Russian Federation
Australia*	Ethiopia	Lithuania*	Saudi Arabia
Austria*	Finland*	Luxembourg*	Senegal
Bahamas, The	France*	Madagascar	Sierra Leone
Bahrain	Gabon	Malawi	Singapore
Bangladesh	Gambia, The	Malaysia	Slovak Republic*
Belarus	Germany*	Mali	Slovenia*
Belgium*	Ghana	Malta	South Africa
Bolivia	Greece*	Mexico*	Spain*
Botswana	Guatemala	Moldova	Sri Lanka
Brazil	Guinea	Mongolia	Suriname
Brunei Darussalam	Guinea-Bissau	Morocco	Sweden*
Bulgaria	Guyana	Mozambique	Switzerland*
Burkina Faso	Honduras	Myanmar	Tanzania
Cameroon	Hong Kong SAR, China	Namibia	Thailand
Canada*	Hungary*	Netherlands*	Togo
Chile*	Iceland*	New Zealand*	Tunisia
China	India	Nicaragua	Turkey*
Colombia*	Indonesia	Niger	Uganda
Congo, Dem. Rep.	Iran, Islamic Rep.	Nigeria	Ukraine
Congo, Rep.	Ireland*	Norway*	United Arab Emirates
Costa Rica	Israel*	Oman	United Kingdom*
Cote d'Ivoire	Italy*	Pakistan	United States*
Croatia	Jamaica	Papua New Guinea	Uruguay
Cyprus	Jordan	Paraguay	Venezuela, RB
Czech Republic*	Kazakhstan	Peru	Vietnam
Denmark*	Kenya	Philippines	Zimbabwe

Notes: N = 124. * denotes OECD countries.