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Does corruption promote emigration? An empirical examination

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Abstract This paper investigates the effects of corruption on the emigration rate of low-, medium- and high-skilled individuals at the country level. Fixed-effects, system generalized method of moments (GMM) and instrumental variable estimations are used to establish a causal relationship between emigration and corruption. The empirical results indicate that as corruption increases, the emigration rate of high-skilled migrants also increases. The emigration rate of individuals with low and medium levels of educational attainment, however, increases at low levels of corruption and then decreases beyond a threshold of 3.4–4.0, where corruption is measured on a scale of 0 (not corrupt) to 10 (totally corrupt). Splitting the sample by income inequality suggests that increased inequality reduces the ability for medium- and low-skilled migrants to emigrate. Therefore, government action should focus on controlling corruption in order to prevent a brain drain.

Keywords Corruption · Emigration · Educational attainment

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1 Introduction

A number of push and pull forces brought about by demographic change, globalization, political conflict, institutions and climate change have increased migration pressures both within and across borders (de Haas 2007) .[1] Pull factors at both the country and individual levels include the attraction of higher wages (Jenkins 1977; Hare 1999; Grogger and Hanson 2011; Mayda 2010), better living conditions (Chowdhury et al. 2012; Curran and Rivero-Fuentes 2003; Roberts and Morris 2003), diasporas (Beine et al. 2011), distance (Mayda 2010) and networks (Massey and Basem 1992). Among the push factors for labour migration at the country level are poverty, unemployment, inequality (Cooray 2014), weak institutions (Ariu et al. 2014) and corruption (Dimant et al. 2013a; Ariu and Squicciarini 2013).[2] Push factors at the individual level include relative poverty (Stark et al. 2009), wealth and contentment with local amenities (Dustmann and Okatenko 2014) and life dissatisfaction (Ivlevs 2014; Nikolova and Graham 2015).[3]

In the present study, we focus on corruption at the country level, as a push factor for labour emigration. Corruption can directly increase emigration as countries that have higher levels of corruption find it difficult to retain and encourage skilled workers. The prevalence of corruption is likely to worsen individual working and living conditions for the majority of citizens.[4] We suggest that corruption can directly influence emigration. Societies with high levels of corruption are marked by poor working environments which negatively affect citizens. Corruption may particularly affect the emigration rate of qualified and highly skilled workers who are in a position to move due to being in demand in other countries. Corruption also has indirect effects on emigration operating through a number of channels. Corruption lowers the returns to education, slowing down the process of growth, acting as a push factor for out-migration (Dimant et al. 2013a). If the inequality generated by corruption leads to an increase in progressive tax rates, it will act as a disincentive to the high-skilled group (Dimant et al. 2013a). Jobs granted on the basis of political connections rather than merit, in the presence of corruption, will generate higher levels of unemployment and/or underemployment, lowering the returns to the stock of human capital. Corruption has also been found to change the size and composition of public expenditure away from vital sectors such as health and education (Mauro 1998; Wei 2001), toward sectors such as defence which involve greater secrecy and less transparency. Corruption will also affect the provision of health and education services, by increasing the cost and lowering the quality of these services (Gupta et al. 2002, 2000). Similarly, Kaufmann et al. (1999) show that corruption reduces life expectancy and literacy and increases infant mortality rates. Dincer and Gunlap (2012) argue that individuals belonging to low-income groups (low levels of educational attainment) could pay a higher proportion of their income in the form of bribe payments. Corruption can therefore lower the stock of human capital and reduce the returns to education by slowing down growth, generating unemployment

[1] See de Haas (2007) for a survey of the literature.
[2] Lederman et al. (2005), Mendez and Sepulveda (2006), Aidt (2003), Dreher et al. (2008) and Meon and Weill (2010) investigate the relationship between institutions and corruption.
[3] See Massey et al. (1993) for a survey of the theories on labour migration.
[4] A similar argument can be found in Dimant et al. (2013a).

and/or underemployment, increasing inequality and reducing welfare (Gould and Amaro-Reyes 1983; Dimant et al. 2013a), acting as a push factor for labour migration.

These push forces can operate to increase emigration flows in the absence of constraints placed by self-selection and out-selection processes (Beine et al. 2011). Host countries' migration policies can restrict both emigration rates and migration intentions (Mayda 2010), especially for the low-skilled. Dreher et al. (2011), Bertoli and Bruker (2011), Beine et al. (2011) and Dimant et al. (2013b) demonstrate that potential host countries increasingly resort to quality-selective immigration policies, which encourage high-skilled migrants over medium- and low-skilled migrants. Additionally, Beine et al. (2011) show that migration involves a cost—of moving, transport, visas, and finding jobs—which low-skilled migrants may find more difficult to bear.[5] High costs, therefore, can constrain the movement of people. The inequality generated by corruption can also increase liquidity constraints, particularly among persons with medium and low levels of educational attainment, reducing their ability to emigrate[6] (Dreher et al. 2011; Bertoli and Bruker 2011). Corruption can additionally, by weakening the tax system, increase tax evasion and reduce the resources available for social welfare spending (Gupta et al. 2002), which could make it more difficult for low-skilled migrants to emigrate. Therefore, as corruption continues to increase, the emigration rate of individuals with low and medium levels of educational attainment may decline.

Examining whether the effects of corruption on emigration are linear or non-linear has important policy implications. In addition to reducing government failure and inefficiencies and improving the quality of the social fabric, policies seeking to control corruption can also be instrumental for reducing the emigration rate of highly skilled individuals. If the non-linear effects were due to the fall in welfare and increased inequality or liquidity constraints generated by corruption, policies for the control of corruption should be implemented together with redistribution policies to reduce the increase in inequality. Similarly, if host country policies were the reason for these non-linear effects, government policy should focus on channelling more funds into education to improve skill levels of the population.

Our contribution to the literature is threefold: (1) Employing the panel dataset of Brücker et al. (2013) for emigration, we establish that corruption increases the emigration rate of persons with high, medium and low levels of educational attainment; (2) we investigate, for the first time, potential non-linearities in the relationship between corruption and emigration. This question has not been addressed before in the literature[7]; (3) we also, for the first time, split the sample into two groups using values from the Gini index—countries with low levels of income inequality (below the mean

[5] Note: This is if low-skilled migrants are also low-wage migrants.

[6] See Mckenzie and Rapoport (2007) for non-linear effects between wealth and emigration.

[7] The studies of Aidt (2003) and Mendez and Sepulveda (2006), find a non-linear relationship between corruption and growth. Mendez and Sepulveda (2006) find evidence in favour of a non-linear relationship between corruption and growth in countries that are politically free as opposed to those which are not. A growth maximizing level of corruption is observed for countries that are politically free. Aidt (2003), also investigating for threshold effects between corruption and growth, observes that corruption has a significant negative impact on growth in countries with well-developed institutions and no effect on growth in countries with weak institutions. It is therefore not unreasonable to expect corruption to have non-linear effects on emigration with emigration initially increasing at low levels of corruption and then declining as corruption increases.

Gini index in the sample) and those with high levels of income inequality (above the mean Gini index in the sample)—to investigate whether the effect of corruption on emigration is dependent on the level of income inequality (see Gupta et al. 2002, who show that corruption increases poverty and income inequality).

The results suggest that corruption, beyond a threshold level of 3.4–4.0, reduces the emigration rate of low- and medium-skilled individuals, where corruption is measured on a scale of 0 (not corrupt) to 10 (totally corrupt). Results are tested for robustness in a number of ways: additional control variables to capture a range of possible influences on emigration, interaction terms and different estimation methods including fixed-effects estimation to account for country level time-invariant unobservable influences on emigration, system generalized method of moments (GMM) estimation to correct for simultaneity, and instrumental variable (IV) estimation to correct for omitted variables bias. Given the uncertainty and likely measurement errors in corruption, the robustness of the results is tested using three different datasets on corruption: the Transparency International (TI 2013), Kaufmann et al. (2013) and International Country Risk Guide (ICRG 2014) corruption datasets. An index for the quality of governance is further generated, by aggregating the six governance indicators of Kaufmann et al. (2013) into their first principal component, to correct for potential correlation between the Kaufmann et al. corruption index and other components of governance (see Ariu et al. 2014).

2 Description of the data

Data on emigration rates by educational level are from Brücker et al. (2013).[8] The data cover information for 20 OECD destination countries by country of origin for the years 1980–2010 in 5-year intervals. We use data covering the 1995–2010 period for 115 origin countries, for which other data series are also available. The absence of the Gini index for many countries limits the sample size. The advantage of the Brücker et al. (2013) dataset is that it is a panel dataset which distinguishes between three levels of education: primary (low-skilled: includes lower secondary, primary and no schooling), secondary (medium-skilled: high-school leaving certificate or equivalent) and tertiary education (high-skilled: higher than high-school leaving certificate or equivalent). The dataset gives the proportion of migrants over the pre-migration population (defined as the sum of residents and migrants in each source country).

Although the emigration rates are available for 5-year intervals from 1980 to 2010 onward, corruption data for the TI and Kaufmann et al. indices are available only from 1995 to 1996 onward, respectively. For this reason, our panel dataset starts from 1995. As the emigration rate is a stock variable, we average all other variables over the 5-year interval to maintain consistency.

The main independent variable of interest is corruption. Three measures of corruption are used in the empirical study that follows. One is the corruption measure from Transparency International (TI). Here, the estimate of corruption ranges from 0 (totally

[8] This dataset covers 20 OECD member states on the immigrant population aged 25 years and older by gender, educational level and country of birth from 1980 to 2010 (5-year intervals). Data are available on the stock of immigrants coming from 195 countries. See Brücker et al. (2013) for greater detail.

corrupt) to 10 (not corrupt). The other is the estimate of corruption from Kaufmann et al. (2013) which ranges from approximately −2.5 (totally corrupt) to 2.5 (not corrupt). Due to problems associated with the TI and Kaufmann et al. indices, changing methodology and inter-year variation of the former, changing sources used in the construction of both indices (Treisman 2007) and close correlation of the Kaufmann et al. index with other indicators of government quality, we also use the ICRG corruption index. The ICRG index ranges from 0 (totally corrupt) to 6 (not corrupt). We rescale all three indices so that they go from 0 to 10 and reverse them so that 0 stands for not corrupt and 10 for totally corrupt to maintain consistency. Therefore, higher values on these three indices indicate higher levels of corruption.

We use a number of control variables. GDP per capita is used to control for the level of development of a country. Vogler and Rotte (2000) find an inverted U-shaped relationship between per capita income and migration. They attribute rising migration at low income levels to the removal of financial restrictions, which is outweighed by home preference in the long run. Therefore, we also include a squared term for per capita income as a control variable. Mauro (1998) and Wei (2001) argue that corruption changes the size and composition of public expenditure away from vital sectors such as health and education. This could increase the emigration rate, in particular, that of the low- and medium-skilled. We incorporate government expenditure devoted to education as a percentage of GDP to control for this. Evidence shows that corruption can also increase unemployment and inequality, thus reducing welfare (Gould and Amaro-Reyes 1983; Dimant et al. 2013a, b), acting as a push factor for labour migration. We use the Gini coefficient to control for inequality and the unemployment ratio to control for unemployment (Vogler and Rotte 2000; Hatton and Williamson 2003). These variables are sourced from the World Development Indicators. The literature also shows that institutions affect corruption (Lederman et al. 2005) and the rate of emigration (Borjas 1987). Given that the Kaufmann index may be capturing not only the effect of corruption but also the effect of the other governance indicators[9] (the pairwise correlations between the six governance indicators are in the range of 0.65–0.93), we aggregate all institutions into their first principal component as in Ariu et al. (2014) and use it as a control variable for the quality of institutions.[10] This constructed variable is termed "Institutions" in the empirical analysis. The advantage of the principal component variable "Institutions" is that it not only captures all the common variability but is also orthogonal to the constructing variables. We use the wage data from the Occupational Wages around the World (OWW) Database complied by Freeman and Oostendorp (2000)[11] to control for wages by skill level. We take the wage earnings corresponding to the 10th percentile as the low-skilled wage earnings, the wage earnings corresponding to the 80th percentile as the high-skilled wage earnings (Grogger and Hanson 2011) and the average wage as the medium-skilled wage earnings. We control for migration policies by using the Henley and Partners Visa

[9] The Kaufmann et al. (1999) index updated in 2013 from the "Governance Matters" project incorporates six indicators of governance which include Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption.

[10] The Kaiser (1960) rule was used to determine the number of components. Only one factor was kept as only one had eigenvalues at least equal to one.

[11] Freeman and Oostendorp (2000) use the October Inquiry Survey of wages conducted by the International Labour Organization to construct wage earnings for over 150 countries in 161 occupations.

Restrictions Index (2014).[12] The maximum attainable score on this index is 218 (there are 219 countries in total) excluding the country of origin. If for example a country has a score of 174, then, the citizens of that country can access 174 countries visa free. We also include non-linear terms for corruption (Mendez and Sepulveda 2006; Aidt 2003). We additionally include interaction terms for the Gini index×corruption and the Visa Restrictions Index×corruption. The Gini coefficient×corruption is introduced in order to see whether inequality increases the impact of corruption on emigration. The Visa Restrictions Index×corruption term is incorporated to investigate whether selectivity increases the effect of corruption on emigration (Dreher et al. 2011; Bertoli and Bruker 2011; Beine et al. 2011; Dimant et al. 2013b). Data for latitude, which is used as an instrument for corruption in the instrumental variable estimation (see next section for discussion), are sourced from the GeoDist dataset compiled by CEPII (2014) http://www.cepii.fr/CEPII/en/bdd_modele/bdd.asp).

3 The model and estimation methodology

The fixed-effects estimator is used to control for any unobserved country-specific time-invariant effects. The panel data model can be expressed by Eq. (1) as follows:

$$M_{it} = X_{it}\beta + \varpi_i + \eta_t + \mu_{it} \tag{1}$$

where M_{it} is the rate of emigration from country i, in period t. The estimation is carried out by disaggregating emigration by education level, high, medium and low. X_{it} is a vector which includes all independent variables, including corruption and the control variables. ϖ_i captures country-specific effects and η_t takes into account relevant time effects. u_{it} is a random error term. Interaction terms are added to the above specification to investigate desired differential effects.

It can be argued that all explanatory variables used in our empirical model are not strictly exogenous. The difficulty in establishing causal relations from corruption to emigration is the potential endogeneity of corruption. For example, Mariani (2007) shows that emigration can lead to a fall in rent seeking in the source country. An approach that allows controlling for the joint endogeneity of explanatory variables through the use of internal instruments is the Arellano-Bover (1995)/Blundell-Bond (1998) system GMM estimator. Arellano and Bover suggest using the system GMM estimator, which is an efficient approach for panel data estimation. This approach involves using lagged first differences as instruments for the equation in levels and lagged levels as instruments for the equation in first differences so that it is possible to exploit fully all of the available moment conditions. Therefore, we use the system GMM approach which maximizes both the consistency in addition to the efficiency of the applied estimator. Two diagnostic tests, the Hansen test for over-identifying restrictions under which the null hypothesis is that the instruments are not correlated with the

[12] The Henley and Partners Visa Restrictions Index produced in corporation with the International Air Transport Association (IATA) is a global ranking of countries according to travel freedom that their citizens enjoy. Henley and Partners (2014) investigate visa regulations of all countries and territories across the world and rank countries according to the freedom with which its citizens can travel to other countries without obtaining a visa.

residuals, and the Arellano-Bond test for second-order correlation in the first differenced residuals, are carried out.

It is also possible that emigration and corruption are both related to a third variable which is omitted from the estimation. In this case, the estimates may be biased and inconsistent, and relationship between the variables could be a correlation rather than a causal relation. Therefore, as a further test for establishing causality, the instrumental variable (IV) estimation could be useful in addition to system GMM. In the IV estimation, a good instrument should be correlated to corruption and not influence emigration through other channels. If corruption is also influenced by a third factor that also influences emigration, then, the estimated regression would change when different variables related to corruption but not directly associated with emigration were used as instruments for corruption (see Pritchett and Summers 1996). Among the variables used as instruments for corruption are ethnolinguistic fractionalization (Mauro 1995), the settler mortality data of Acemoglu et al. (2001) (Ahlin and Pang 2008), latitude (Gupta et al. 2002; Delavallade 2006) and the initial level of corruption (Gupta et al. 2002). As the ethnolinguistic fractionalization index could also be correlated with emigration, and the settler mortality rate leads to a significant fall in number of observations, we use latitude and the initial level of corruption as instruments for corruption. Latitude is correlated to institutions (Acemoglu et al. 2005), but should not directly influence emigration. The initial level of corruption is used because it is pre-determined compared to current values of corruption (see Gupta et al. 2002). The first stage regression results are reported in the Appendix. The first stage F statistics in the system all exceed 10 with a p value of 0.00. Therefore, we can conclude that the instruments are relevant. The null hypothesis that the instruments are exogenous is rejected at the 1 % level of significance with a p value of 0.01 for the J test.

4 Empirical results

4.1 Fixed-effects estimation

The results are reported in Table 1. Columns (1)–(3) report results for high, middle and low levels of educational attainment, respectively, using the TI corruption index; columns (4)–(6) for the same, using the Kaufmann et al. corruption index; and columns (7)–(9) using the ICRG corruption index. All variables except for the corruption indices have been converted into logarithmic form for the empirical estimation.

For emigrants with high levels of educational attainment, columns (1), (4) and (7), only the linear coefficient on the TI, Kaufmann et al. and ICRG corruption indices is statistically significant. The quadratic term is not significant. The results suggest that as corruption increases, the emigration rate of high-skilled migrants increases. In column (1) for example, the linear coefficient on the TI corruption index suggests that a one-unit increase in the corruption index increases the emigration rate by 0.32 %. For medium- and low-skilled migrants, however, the linear terms in columns (2) and (3), columns (5) and (6) and columns (8) and (9) are positive and significant, and the quadratic terms are negative and significant, suggesting that the emigration rate of medium- and low-skilled migrants increases

Table 1 Fixed-effects estimation. Dependent variables: emigration rate of high-, medium- and low-skilled migrants

	(1) High	(2) Medium	(3) Low	(4) High	(5) Medium	(6) Low	(7) High	(8) Medium	(9) Low
Corruption TI	0.316 (0.047)**	0.216 (0.062)***	0.127 (0.062)**	–	–	–	–	–	–
Corruption TI^2	−0.056 (0.040)	−0.027 (0.013)**	−0.018 (0.008)**	–	–	–	–	–	–
Corruption K	–	–	–	0.220 (0.045)***	0.304 (0.103)***	0.207 (0.042)***	–	–	–
Corruption K^2	–	–	–	−0.045 (0.106)	−0.039 (0.012)***	−0.039 (0.012)**	–	–	–
Corruption ICRG	–	–	–	–	–	–	0.250 (0.055)***	0.225 (0.102)**	0.110 (0.034)***
Corruption ICRG^2	–	–	–	–	–	–	−0.160 (0.112)	−0.028 (0.011)***	−0.016 (0.009)*
Per capita income	−0.313 (0.132)***	0.201 (0.095)**	0.413 (0.160)***	−0.210 (0.092)**	0.183 (0.065)***	0.512 0.164)***	−0.278 (0.103)***	0.241 (0.061)***	0.167 (0.083)**
Per capita income^2	0.021 (0.022)	−0.045 (0.020)**	0.011 (0.012)	0.031 (0.124)	−0.036 (0.016)**	0.015 (0.018)	0.013 (0.044)	−0.018 (0.009)*	0.016 (0.022)
Government expenditure on education	−0.043 (0.132)	−0.131 (0.081)*	−0.144 (0.045)***	−0.139 (0.110)	−0.056 (0.026)**	−0.254 (0.145)*	−0.132 (0.113)	−0.165 (0.073)***	−0.186 (0.075)***
Institutions	−0.010 (0.005)**	−0.012 (0.006)*	−0.009 (0.008)	−0.011 (0.004)***	−0.009 (0.004)**	−0.008 (0.007)	−0.012 (0.006)*	−0.010 (0.005)**	−0.008 (0.008)
Gini index	−0.072 (0.084)	−0.047 (0.015)***	−0.094 (0.034)***	−0.065 (0.050)	−0.028 (0.014)**	−0.050 (0.022)**	−0.025 (0.024)	−0.042 (0.014)***	−0.015 (0.008)*
Unemployment rate	0.158 (0.031)***	0.411 (0.153)***	0.017 (0.010)*	0.157 (0.047)***	0.423 (0.151)***	0.131 (0.083)*	0.214 (0.101)**	0.257 (0.112)**	0.104 (0.053)*
Wages	−0.313 (0.110)***	−0.402 (0.130)***	−0.415 (0.142)***	−0.389 (0.175)**	−0.363 (0.152)***	−0.410 (0.123)***	−0.376 (0.104)***	−0.310 (0.105)***	−0.215 (0.102)**
Gini index×corruption	0.021 (0.017)	−0.014 (0.007)*	−0.023 (0.009)***	0.014 (0.016)	−0.009 (0.003)***	−0.015 (0.006)**	0.017 (0.020)	−0.016 (0.008)*	−0.020 (0.008)***
Visa Restrictions Index	0.025 (0.013)*	0.021 (0.142)	0.010 (0.013)	0.012 (0.006)*	0.009 (0.014)	0.010 (0.015)	0.013 (0.006)**	0.007 (0.025)	0.013 (0.016)
Visa Restrictions Index×corruption	0.107 (0.024)***	0.211 (0.234)	0.122 (0.154)	0.132 (0.030)***	0.214 (0.220)	0.315 (0.268)	0.113 (0.050)**	0.191 (0.180)	0.110 (0.112)
R^2	0.76	0.72	0.73	0.76	0.75	0.78	0.77	0.79	0.80
Observations	159	159	159	156	156	156	167	167	167

Robust standard errors reported in parentheses

*, **, ***Significant at the 10, 5 and 1 % levels, respectively

at low levels of corruption and then starts to decline beyond a certain point.[13] This is observed for all three, the TI, Kaufmann et al. and ICRG corruption indices. Calculated threshold points suggest that the emigration rate of individuals with medium levels of educational attainment decline after corruption reaches a level of 4.0, 3.9 and 4.0 on the TI, Kaufmann et al. and the ICRG corruption indices, respectively, and the emigration rate of low-skilled migrants begins to decline when corruption reaches a level of 3.5, 3.6 and 3.4 on the TI, Kaufmann et al. and ICRG indices, respectively. The linear coefficient on the TI corruption index in column (2) for individuals with medium levels of educational attainment suggests that a one-unit increase in the corruption index initially increases the emigration rate by 0.22 %. These findings are perhaps explained by the aforementioned self-selection and out-selection processes. Ariu and Squicciarini (2013) argue that the highly skilled have a stronger preference for good institutions. Thus, as corruption increases, it is likely that this group will be more inclined to emigrate. Similarly, the high-skilled group is likely to move in search of higher skill premiums. As observed by Beine et al. (2011), the high-skilled are also in a better position to emigrate as they are able to bear migration costs. Therefore, the finding of a linear relationship between emigration and corruption for this group is reasonable. For medium- and low-skilled migrants on the other hand, the costs of migration could increase with corruption making it more difficult for them to migrate beyond a certain level of corruption. The inequality generated by corruption could further limit their ability to migrate beyond a certain threshold, which is in part tested by interacting the Gini index with the corruption indices. Similarly, migration policies in host countries could impose restrictions on the rate of emigration, particularly on those with low levels of educational attainment from more corrupt countries, which perhaps explains this non-linearity (Mayda 2010; Dreher et al. 2011).[14]

The results also suggest that the level of development of a country as measured by per capita income has a significant effect on the emigration rates of all three groups. A higher per capita income reduces the incentive for individuals with high educational attainment to emigrate, while it increases the ability of those with low and medium levels of educational attainment to emigrate. Vogler and Rotte (2000) show that at higher incomes, there is a home preference by potential migrants which perhaps explains the inverse relationship between per capita income and the potential emigration of high-skilled migrants. The positive coefficient on per capita income for medium- and low-skilled migrants suggests that an increase in income increases the ability of these two groups to emigrate. This would be so, in particular, if they are cost constrained as corruption increases. This argument is supported by Faini and Venturini (1994) who note that as per capita income increases in low-income countries, it reduces constraints to migration. The squared term on per capita income is statistically significant for persons with medium levels of educational attainment, suggesting a home preference in the long run (Vogler and Rotte 2000). The coefficients on government expenditure devoted to education are statistically significant for individuals with medium and low levels of education, indicating that if a government devotes a larger proportion of GDP to education, it would lead to a fall in the emigration rates of those with

[13] The R^2 terms in the quadratic models indicated that the explanatory power of the model is increased when the quadratic term was incorporated into the models. An F test further rejected the hypothesis that the regression was linear at the 1 and 5 % significance levels against the alternative that it was quadratic.

[14] The results indicate that corruption explains between 10 to 12 % of the variance in the dependent variables.

medium and low levels of educational attainment. This perhaps is because these groups stand to gain most from the government provision of services. The coefficients on the "Institutions" variable constructed by the principal component analysis are negative and statistically significant for the high- and medium-skilled groups, suggesting that better institutions will reduce the emigration rate of these two groups.[15] An increase in inequality as indicated by the Gini coefficient leads to a statistically significant fall in the emigration rate of medium- and low-skilled migrants. The results indicate that the higher the unemployment rate, the higher will be the emigration rate of all groups.

The coefficient on wages suggests that higher wages reduce the emigration rates of all groups. The coefficient on the Gini coefficient×corruption suggests that at high levels of inequality, corruption further reduces the emigration rate of the medium- and low-skilled. Similarly, the statistically significant coefficient on the Visa Restrictions Index shows that greater ease of entry into a country increases the emigration rate of the highly skilled group. The interaction term between the Visa Restrictions Index× corruption indicates that greater ease of entry causes corruption to further increase the emigration rate of the high-skilled group.

4.2 Correcting for endogeneity

Next, the estimation is carried out by using the system GMM and IV methods to address potential endogeneity concerns. Table 2 reports results for system GMM estimation.

The GMM estimates indicate once again a linear relationship between corruption and the emigration rate for the group with high levels of educational attainment and a quadratic (inverted U) shaped relationship between corruption and the emigration rate of those with medium and low levels of educational attainment. Per capita income has a positive statistically significant effect on the emigration rates of medium- and low-skilled migrants and a negative impact on high-skilled migrants. Increased government expenditure on education reduces the emigration rate of medium- and low-skilled individuals, and higher inequality reduces the ability of these groups to emigrate. Higher wages reduce the emigration rate of all skill groups. The coefficient on institutions suggests that better institutions in the source country reduce the emigration rate of the high- and medium-skilled groups. Similarly, the increased ability to travel to another country without a visa increases the influence of corruption on emigration for the high-skilled group. The results are in general, broadly consistent with those obtained above. The Hansen test and the serial correlation test in the system GMM estimation confirm that the moment conditions cannot be rejected.

The correlation between corruption and emigration appears to be robust to the inclusion of a number of control variables. We need however to ensure that the direction of causality is from corruption to emigration. For this, using instrumental variable (IV) estimation could be a useful addition to fixed effects and system GMM. Table 3 reports IV results. We use latitude and the initial level of corruption as instruments for corruption in the IV estimation. The results of the IV estimation are consistent with those obtained under the fixed-effects and system GMM estimation methods. Corruption has a linear effect on the emigration rate of those with high levels of educational attainment and a

[15] The conclusions do not change when the Polity Index is used.

Table 2 System GMM estimation

	(1) High	(2) Medium	(3) Low	(4) High	(5) Medium	(6) Low	(7) High	(8) Medium	(9) Low
Corruption TI	0.210 (0.040)***	0.288 (0.049)***	0.120 (0.041)***	–	–	–	–	–	–
Corruption TI^2	−0.016 (0.010)	−0.036 (0.015)***	−0.017 (0.005)***	–	–	–	–	–	–
Corruption K	–			0.216 (0.045)***	0.201 (0.035)***	0.220 (0.042)***	–	–	–
Corruption K^2	–			−0.042 (0.106)	−0.025 (0.012)**	−0.030 (0.012)***	–	–	–
Corruption ICRG	–			–	–	–	0.247 (0.042)***	0.225 (0.102)**	0.220 (0.034)***
Corruption $ICRG^2$	–			–	–	–	−0.170 (0.110)	−0.028 (0.011)***	−0.032 (0.015)*
Per capita income	−0.280 (0.106)***	0.182 (0.042)***	0.418 (0.131)***	−0.224 (0.095)**	0.165 (0.045)***	0.487 (0.144)***	−0.246 (0.102)***	0.254 (0.087)***	0.154 (0.068)**
Per capita $income^2$	0.024 (0.032)	−0.040 (0.020)*	0.019 (0.022)	0.030 (0.144)	−0.019 (0.010)*	0.020 (0.018)	0.058 (0.049)	−0.020 (0.010)*	0.019 (0.020)
Government expenditure on education	−0.120 (0.121)	−0.128 (0.059)**	−0.132 (0.096)*	−0.121 (0.120)	−0.048 (0.022)**	−0.232 (0.128)*	−0.125 (0.114)	−0.174 (0.085)**	−0.175 (0.078)**
Institutions	−0.012 (0.006)*	−0.010 (0.005)**	−0.005 (0.006)	−0.015 (0.007)**	−0.008 (0.004)**	−0.010 (0.009)	−0.010 (0.005)*	−0.010 (0.005)**	−0.010 (0.012)
Gini index	−0.040 (0.037)	−0.043 (0.015)***	−0.069 (0.021)***	−0.036 (0.045)	−0.031 (0.015)**	−0.049 (0.023)**	−0.032 (0.114)	−0.037 (0.016)***	−0.014 (0.007)*
Unemployment rate	0.165 (0.030)***	0.421 (0.146)***	0.018 (0.009)*	0.148 (0.038)***	0.302 (0.140)**	0.128 (0.064)**	0.210 (0.115)*	0.248 (0.110)**	0.109 (0.048)**
Wages	−0.216 (0.114)*	−0.315 (0.132)***	−0.211 (0.101)**	−0.375 (0.164)**	−0.345 (0.148)***	−0.456 (0.129)***	−0.385 (0.106)***	−0.318 (0.107)***	−0.220 (0.108)**
Gini index×corruption	0.020 (0.029)	−0.020 (0.009)***	−0.023 (0.008)***	0.010 (0.012)	−0.008 (0.004)**	−0.016 (0.008)**	0.020 (0.028)	−0.012 (0.006)*	−0.026 (0.010)***
Visa Restrictions Index	0.025 (0.013)*	0.021 (0.142)	0.025 (0.023)	0.012 (0.006)*	0.009 (0.014)	0.010 (0.015)	0.013 (0.006)**	0.007 (0.025)	0.013 (0.016)
Visa Restrictions Index× corruption	0.120 (0.043)***	0.210 (0.220)	0.101 (0.106)	0.132 (0.030)***	0.220 (0.214)	0.320 (0.298)	0.115 (0.046)***	0.120 (0.124)	0.112 (0.110)
Lagged dependent variable	0.665 (0.312)**	0.671 (0.221)***	0.712 (0.245)***	0.721 (0.314)***	0.605 (0.223)***	0.784 (0.214)***	0.689 (0.154)***	0.762 (0.213)***	0.691 (0.135)***
Hansen test for over-identifying restrictions: *p* value	0.20	0.24	0.31	0.28	0.37	0.22	0.41	0.48	0.21
Arellano-Bond test for second-order autocorrelation: *p* value	0.19	0.23	0.30	0.22	0.25	0.35	0.48	0.47	0.32
Observations	120	120	120	129	129	129	129	129	129

Standard errors reported in parentheses

*, **, ***Significant at the 10, 5 and 1 % levels, respectively

Table 3 IV estimation. Dependent variables: emigration rate of high-, medium- and low-skilled migrants

	(1) High	(2) Medium	(3) Low	(4) High	(5) Medium	(6) Low	(7) High	(8) Medium	(9) Low
Corruption TI	0.264 (0.020)***	0.215 (0.048)***	0.108 (0.041)***				–	–	–
Corruption TI^2	−0.014 (0.010)	−0.026 (0.013)**	−0.015 (0.005)***				–	–	–
Corruption K	–	–	–	0.290 (0.040)***	0.210 (0.101)**	0.125 (0.020)***	–	–	–
Corruption K^2	–	–	–	−0.020 (0.018)	−0.026 (0.014)**	−0.018 (0.008)**	–	–	–
Corruption ICRG	–	–	–	–	–	–	0.241 (0.054)***	0.220 (0.102)**	0.112 (0.034)***
Corruption $ICRG^2$	–	–	–	–	–	–	−0.187 (0.115)	−0.028 (0.011)***	−0.016 (0.008)*
Per capita income	−0.308 (0.108)***	0.180 (0.040)***	0.284 (0.101)***	−0.218 (0.080)***	0.169 (0.063)***	0.433 (0.162)***	−0.281 (0.104)***	0.239 (0.059)***	0.158 (0.072)**
Per capita $income^2$	0.047 (0.114)	−0.039 (0.019)**	0.025 (0.024)	0.041 (0.132)	−0.020 (0.010)*	0.027 (0.024)	0.026 (0.039)	−0.010 (0.005)*	0.029 (0.025)
Government expenditure on education	−0.120 (0.122)	−0.126 (0.057)**	−0.130 (0.096)*	−0.130 (0.124)	−0.040 (0.020)**	−0.231 (0.142)**	−0.128 (0.122)	−0.155 (0.062)***	−0.175 (0.065)***
Institutions	−0.018 (0.009)**	−0.012 (0.006)**	−0.005 (0.007)	−0.016 (0.008)**	−0.014 (0.007)**	−0.008 (0.007)	−0.010 (0.005)*	−0.012 (0.005)**	−0.010 (0.012)
Gini index	−0.042 (0.047)	−0.053 (0.019)***	−0.064 (0.020)***	−0.050 (0.041)	−0.030 (0.015)**	−0.041 (0.020)**	−0.028 (0.034)	−0.039 (0.012)***	−0.016 (0.008)*
Unemployment rate	0.145 (0.030)***	0.302 (0.138)**	0.023 (0.010)**	0.157 (0.051)***	0.420 (0.150)***	0.126 (0.063)***	0.202 (0.110)*	0.248 (0.112)**	0.110 (0.044)*
Wages	−0.254 (0.120)**	−0.189 (0.076)***	−0.174 (0.043)***	−0.165 (0.076)**	−0.187 (0.054)***	−0.154 (0.075)**	−0.289 (0.106)***	−0.324 (0.107)***	−0.224 (0.104)**
Gini index × corruption	0.022 (0.019)	−0.022 (0.009)***	−0.028 (0.011)***	0.016 (0.019)	−0.010 (0.004)***	−0.018 (0.009)**	0.020 (0.029)	−0.010 (0.005)*	−0.016 (0.008)*
Visa Restrictions Index	0.024 (0.012)*	0.139 (0.142)	0.055 (0.069)	0.010 (0.005)*	0.020 (0.018)	0.012 (0.020)	0.012 (0.006)*	0.031 (0.045)	0.041 (0.119)
Visa Restrictions Index × corruption	0.110 (0.018)***	0.220 (0.189)	0.110 (0.116)	0.120 (0.025)***	0.221 (0.210)	0.181 (0.190)	0.110 (0.050)*	0.185 (0.192)	0.111 (0.112)
R^2	0.77	0.74	0.70	0.76	0.71	0.74	0.72	0.74	0.80
Observations	159	159	159	156	156	156	167	167	167

Standard errors reported in parentheses

*, **, ***Significant at the 10, 5 and 1 % levels, respectively

non-linear effect on those with medium and low educational attainment. The general conclusions, in particular, remain the same.

4.3 Splitting the sample

Higher corruption can increase inequality (Gupta et al. 2002), increasing the incentive of those with higher educational levels to emigrate. As corruption increases, migration costs could increase making it more difficult for those from countries with greater inequality to emigrate. Given the robust evidence in favour of an inverted U-shaped relationship between corruption and the emigration rate of medium- and low-skilled migrants, we split the sample into two, using values from the Gini index—those falling below the mean Gini index of 43 (low inequality in income distribution) and above the mean Gini index (high inequality in income distribution)—to investigate whether the effect of corruption on the emigration rate of these two groups is conditional on the income distribution. Each of these groups is divided into two groups based upon inequality in income distribution. Columns (1) and (2) of Table 4 report regression results for countries with low levels of income inequality, and columns (3) and (4) report regression results for countries with high levels of income inequality. We only report results for the estimation carried out with the TI index. The estimation using the Kaufmann et al. and ICRG indices yield similar results.[16]

The results in columns (1) and (2) indicate that in countries with low levels of income inequality, the emigration rate of both groups with medium and low levels of education increases and then decreases beyond a certain threshold. Calculated threshold points indicate that for the group with medium levels of educational attainment, emigration rates begin to fall after reaching a threshold point of 4 and for low-skilled migrants at a threshold point of 3.5. Per capita income has a statistically significant positive effect on emigration, and increased government expenditure on education reduces emigration. The ease with which individuals can travel, measured by the Visa Restrictions Index, is not statistically significant.

Columns (3) and (4) report results for countries with high levels of income inequality. Note that here, only the linear term is statistically significant and negative, suggesting that in the presence of high income inequality, corruption reduces the ability of individuals with medium and low levels of educational attainment to emigrate. It is reasonable to expect those from highly corrupt, high income inequality countries to find it more difficult to emigrate to OECD countries due to higher costs and visa restrictions compared to those from less corrupt countries. Moreover, host country constraints would be higher on emigrants with low educational qualifications.

5 Conclusions

This paper examines the relationship between corruption and the emigration rate of individuals with high, medium and low levels of educational attainment. The empirical results indicate that as corruption increases, the emigration rate of high-skilled persons also increases. The emigration rate of medium- and low-skilled migrants, however, increases at initial levels of corruption and then decreases beyond a certain

[16] The results are available upon request.

Table 4 Splitting the sample by income distribution. Dependent variable: emigration rate of medium- and low-skilled migrants

	(1)	(2)	(3)	(4)
	Below mean Gini index (low income inequality)		Above mean Gini index (high income inequality)	
	Medium	Low	Medium	Low
Corruption TI	0.128 (0.043)***	0.112 (0.016)***	−0.140 (0.039)***	−0.120 (0.040)***
Corruption TI^2	−0.016 (0.007)**	−0.016 (0.007)**	−0.010 (0.011)	−0.120 (0.121)
Per capita income	0.128 (0.050)***	0.162 (0.048)***	0.111 (0.005)***	0.130 (0.015)**
Per capita income^2	−0.018 (0.009)**	0.012 (0.014)	0.013 (0.012)	0.032 (0.142)
Government expenditure	−0.019 (0.010)*	−0.020 (0.012)**	−0.015 (0.007)*	−0.018 (0.008)**
Institutions	−0.008 (0.004)**	−0.002 (0.002)	−0.002 (0.001)*	−0.003 (0.003)
Wages	−0.130 (0.080)*	−0.120 (0.125)	−0.115 (0.061)*	−0.110 (0.121)
Unemployment rate	0.122 (0.029)***	0.214 (0.104)**	0.135 (0.033)***	0.101 (0.070)*
Visa Restrictions Index	0.128 (0.123)	0.118 (0.109)	0.137 (0.126)	0.106 (0.113)
Visa Restrictions Index×corruption	0.014 (0.121)	0.018 (0.020)	0.024 (.0142)	0.013 (0.011)
R^2	0.78	0.73	0.76	0.77
Observations	123	123	219	219

Robust standard errors reported in parentheses

***, **, *Significant at the 1, 5 and 10 % levels, respectively

point exhibiting an inverted U-shaped pattern. Calculated threshold points are in the range of 3.9–4.0 for those with medium levels of educational attainment and in the range of 3.4–3.6 for individuals with low levels of educational attainment. When we split emigrants with medium and low levels of educational attainment by income distribution, we find evidence of a fall in the emigration rate of both these groups due to an increase in income inequality. It is possible that increased inequality generated by corruption increases liquidity constraints faced by medium- and low-skilled migrants, thus reducing their ability to emigrate. Another explanation is provided by host country policies which increasingly favour high-skilled migrants over low-skilled migrants. The results provide some support for selectivity of high-skilled migrants by host countries. The control of corruption would prevent a brain drain and lead to the retention of those with high levels of educational attainment. Government policy should focus on channelling more funds into education to improve the skill levels of the medium- and low-skilled together with combating corruption, which would increase the human capital stock of source countries. This will reduce corruption and lead to better labour market outcomes. It should, however, be noted that the dataset covers emigration rates from various countries of origin into 20 OECD economies. The results could differ if immigration to the developing countries was considered.

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Appendix

Countries of origin used in study

Afghanistan, Albania, Algeria, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bhutan, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo Dem Rep, Congo Rep, Costa Rica, Cote d'Ivoire, Cuba, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Fiji, Gabon, Gambia, Georgia, Ghana, Guatemala, Guinea-Bissau, Haiti, Honduras, India, Indonesia, Iran, Iraq, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Russia, Rwanda, Samoa, Senegal, Serbia, Sierra Leone, Solomon Islands, Somalia, South Africa, Sri Lanka, Sudan, Suriname, Swaziland, Syria, Tajikistan, Turkey, Turkmenistan, Tuvalu, Uganda, Ukraine, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe

Table 5 Summary statistics and data sources

Variable	Obs	Mean	Standard deviation	Minimum	Maximum	Source
Emigration rate of low-skilled migrants	460	4.32	9.70	0.02	64.34	Brücker et al. (2013)
Emigration rate of medium-skilled migrants	460	4.52	7.18	0.04	42.01	Brücker et al. (2013)
Emigration rate of high-skilled migrants	460	17.44	17.66	0.14	84.89	Brücker et al. (2013)
GDP per capita (constant 2005 US$)	441	2068.29	1974.06	50.04	8610.02	WDI
Government expenditure on education (% GDP)	419	14.54	6.47	3.86	54.80	WDI
Unemployment rate	448	4.35	4.48	0.40	26.60	WDI
Gini index	352	43.42	9.00	25.62	62.78	WDI
Corruption Kaufmann et al. index	450	6.10	1.22	1.80	10.00	Kaufmann et al. (2013)
Corruption TI index	405	6.90	1.15	2.80	10.00	Transparency (2013)
Corruption ICRG index	460	5.9	1.27	0.00	10.00	ICRG (2014)
Wages (hourly US$)	460	4.87	6.63	0.02	195.37	Freeman and Oostendorp (2000)
Institutions	450	0.006	1.00	−2.05	2.58	Calculated from Kaufmann et al. (2013)
Visa Restriction Index	440	70.08	102.72	28	166	Henley and Partners (2014)

All corruption indices have been rescaled so that 0 stands for not corrupt and 10 for totally corrupt

Table 6 IV estimation first stage regressions. Dependent variable: corruption

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Corruption TI			Corruption K			Corruption ICRG		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
Per capita income	−0.308 (0.108)***	−0.213 (0.051)***	−0.183 (0.076)***	−0.224 (0.056)***	−0.151 (0.072)**	−0.317 (0.156)**	−0.307 (0.112)***	−0.285 (0.064)***	−0.165 (0.045)***
Per capita income^2	0.023 (0.110)	0.021 (0.024)	0.011 (0.020)	0.056 (0.112)	0.008 (0.006)	0.020 (0.054)	0.016 (0.032)	−0.010 (0.008)	0.034 (0.055)
Government expenditure on education	−0.101 (0.112)	−0.120 (0.060)**	−0.147 (0.047)***	−0.138 (0.028)***	−0.038 (0.019)**	−0.220 (0.112)	−0.121 (0.112)	−0.167 (0.082)**	−0.101 (0.055)*
Institutions	−0.023 (0.010)**	−0.010 (0.005)**	−0.006 (0.003)**	−0.010 (0.005)**	−0.008 (0.004)**	−0.007 (0.007)	−0.012 (0.007)	−0.024 (0.012)**	−0.008 (0.004)**
Gini index	0.035 (0.029)	0.045 (0.020)**	0.074 (0.031)*	0.023 (0.056)	0.010 (0.005)**	0.032 (0.016)**	0.021 (0.044)	0.064 (0.019)***	0.014 (0.007)*
Unemployment rate	0.121 (0.024)***	0.243 (0.129)*	0.031 (0.016)*	0.121 (0.021)***	0.471 (0.250)*	0.122 (0.043)***	0.312 (0.137)**	0.296 (0.172)*	0.116 (0.055)**
Wages	−0.215 (0.118)*	−0.143 (0.062)***	−0.164 (0.051)***	−0.132 (0.086)**	−0.179 (0.044)***	−0.175 (0.035)**	−0.106 (0.110)	−0.513 (0.208)***	−0.201 (0.108)*
Gini index× corruption	0.034 (0.017)**	0.020 (0.010)**	0.036 (0.018)**	0.020 (0.022)	0.012 (0.006)***	0.016 (0.008)**	0.031 (0.086)	0.019 (0.008)**	−0.010 (0.005)**
Visa Restrictions Index	0.021 (0.011)*	0.101 (0.113)	0.067 (0.086)	0.010 (0.005)*	0.034 (0.056)	0.0120 (0.120)	0.010 (0.005)*	0.069 (0.098)	0.021 (0.117)
Visa Restrictions Index× corruption	0.110 (0.018)***	0.312 (0.301)	0.121 (0.135)	0.132 (0.066)**	0.263 (0.290)	0.156 (0.186)	0.111 (0.050)**	0.196 (0.176)	0.110 (0.119)
Latitude	0.110 (0.050)**	0.074 (0.034)**	0.064 (0.034)*	0.042 (0.021)**	0.065 (0.035)*	0.076 (0.037)**	0.053 (0.021)*	0.075 (0.032)*	0.101 (0.046)**
Initial corruption	0.132 (0.045)***	0.241 (0.089)***	0.178 (0.067)***	0.312 (0.138)**	0.423 (0.141)***	0.321 (0.109)***	0.421 (0.137)***	0.395 (0.102)***	0.293 (0.075)***
R^2	0.67	0.68	0.72	0.70	0.69	0.72	0.70	0.69	0.71
F test: p value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
J test: p value	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01
Observations	159	159	159	159	159	159	159	159	159

Standard errors reported in parentheses

***, **, *Significant at the 1, 5 and 10 % levels, respectively

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