

Cerdeira, Jorge; Lourenço, Diogo

Article

Does corruption impact firm innovation? Evidence from Portugal

Economies

Provided in Cooperation with:

MDPI – Multidisciplinary Digital Publishing Institute, Basel

Suggested Citation: Cerdeira, Jorge; Lourenço, Diogo (2022) : Does corruption impact firm innovation? Evidence from Portugal, *Economies*, ISSN 2227-7099, MDPI, Basel, Vol. 10, Iss. 7, pp. 1-10,
<https://doi.org/10.3390/economies10070173>

This Version is available at:

<https://hdl.handle.net/10419/328473>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>

Article

Does Corruption Impact Firm Innovation? Evidence from Portugal

Jorge Cerdeira ^{1,2,3,*}  and Diogo Lourenço ^{1,4}

¹ Centro de Economia e Finanças (CEF.UP), Faculdade de Economia da Universidade do Porto, Rua Dr. Roberto Frias, 4200-464 Porto, Portugal; dlourenco@fep.up.pt

² Instituto de Sociologia, Faculdade de Letras, Universidade do Porto, Via Panorâmica, 4150-564 Porto, Portugal

³ Centro de Inovação e Investigação em Ciências Empresariais e Sistemas de Informação (CIICESI), Escola Superior de Tecnologia e Gestão, Instituto Politécnico do Porto, Rua do Curral, Casa do Curral, Margaride, 4610-156 Felgueiras, Portugal

⁴ Departamento de Economia e Gestão, Universidade Portucalense, Rua Dr. António Bernardino de Almeida 541, 4200-072 Porto, Portugal

* Correspondence: jcerdeira@letras.up.pt

Abstract: This paper aims to analyze the impact of corruption on firm innovation in Portugal, using data from the World Bank Enterprise Surveys on 1062 firms for 2019. We employ regression analysis and instrumental variables techniques to account for endogeneity in the corruption variable. Our results show that corruption fosters innovation in Portugal, regardless of the dependent variable we use to measure innovation. We have also analyzed the effect of corruption on innovation in foreign and domestic firms. While corruption boosts innovation for domestic firms, we found that the effect is not statistically significant for foreign firms. Our conclusions are of interest to policymakers, as any measure intended to fight corruption should consider its impact on firm performance. As this article shows, such an impact need not be negative. Nevertheless, if mitigating the impact of corruption is still intended, our results indicate that measures promoting foreign direct investment could help achieve this.

Keywords: corruption; innovation; firm performance; IV estimation; foreign firms



Citation: Cerdeira, Jorge, and Diogo Lourenço. 2022. Does Corruption Impact Firm Innovation? Evidence from Portugal. *Economies* 10: 173. <https://doi.org/10.3390/economies10070173>

Academic Editor: Ralf Fendel

Received: 2 May 2022

Accepted: 13 July 2022

Published: 19 July 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Corruption may be defined as “an illegal activity (bribery, fraud, financial crime, abuse, falsification, favoritism, nepotism, manipulation, etc.) conducted through misuse of authority or power by public (government) or private (firms), officeholders for private gain and benefit, financial or otherwise” (Bahoo et al. 2020, p. 2). Corruption stands in the way of social development and economic growth (Wei 1999). It lessens trust in institutions, increases inequality and fosters undemocratic, populist perspectives (Bjørnskov 2011). The challenges raised by corruption are not limited to less developed countries with weak institutional settings. They are also of concern in several relatively developed countries (De Rosa et al. 2015).

Of the impacts of corruption on social life, one domain that has been extensively researched is that on the performance of firms. Succinctly, research has found that firms in high-corruption environments tend to perform worse, all things considered. In other words, that corruption sands the wheels of business (Ashyrov and Masso 2020; Wu 2019). Yet, in certain institutional setups, usually those in which corruption is most prevalent, corrupt activities have been found to offer a helpful grease for firms to overcome artificial hurdles and ‘get things done’ (Martins et al. 2020). Previous research has therefore not supported any simple, black-and-white relation between corruption and firm performance (Nur-tegin and Jakee 2020).

In this article, we seek to throw light on the impact of corruption on the innovativeness of a representative sample of Portuguese firms. The case of Portugal is interesting as, according to the European Innovation Scoreboard (European Commission 2020), the country was ranked in 2006 as the 22nd most innovative country in the European Union and in 2020 the country reached position number 12, being considered a strong innovator. This means that, in a 15 year period, Portugal was able to converge with the average of the European Union, being above that average in indicators such as scientific publications co-authored with authors outside the European Union; the penetration of broadband in firms; the number of international doctoral students; the percentage of companies trained in information and communications technologies (ICT); the percentage of small and medium enterprises (SMEs) with product/process innovation; the percentage of innovative SMEs collaborating with other SMEs; or employment in high-growth companies in innovative sectors (European Commission 2020). Nevertheless, the country still shows important frailties, being below the European average in indicators such as access and availability of capital or investment in research and development (R&D) activities by firms (European Commission 2020).

According to the World Bank's Worldwide Governance Indicators for Portugal (World Bank n.d.), in 2019 this country's score for 'control of corruption' ranked it in percentile 77.4, whereas the scores for Regulatory Quality and Rule of Law ranked it at the 77.9 and 84.6 percentiles, respectively. In other words, Portugal scores relatively well in indicators of institutional quality, including one directly linked to corruption. On the other hand, in 2021, according to Transparency International's Global Corruption Barometer, 3% of users of Portuguese public services paid a bribe. Also, in that same year, Portugal scored only 62 points out of 100 in that body's Corruption's Perception Index. This means that perceptions of corruption are better in Portugal than in Spain or Italy, but worse than in Botswana, or the United Arab Emirates. In other words, if corruption does not seem rampant in Portugal, there is noteworthy room for improvement.

In this study, we use 2019 data from the World Bank Enterprise Surveys (WBES) on 1062 Portuguese firms. We find evidence that Portuguese firms that report corruption as a major constraint to their activities are more innovative than those that do not. This indicates that corruption is positively associated with innovation, a result often found in countries with weak institutional settings. It also suggests that innovative firms may have an incentive to engage in corruption. Our results therefore point towards the need for measures of policy that address corruption and bolster institutional quality.

To the best of our knowledge, this is the first study to measure the impact of corruption on firm innovation in Portugal. While previous studies mostly assess the impact of corruption on a sample of countries and at the macro-level, our study leverages a novel dataset to focus on one country, Portugal, and runs at the micro, i.e., firm, level.

In the next section, we summarize the relevant literature and formulate our main hypotheses. In Section 3 we describe the data and methods used. In Section 4, the main results are fleshed out. Section 5 concludes.

2. Literature Review and Main Hypotheses

A well-performing firm is capable of making use of its resources to turn out products of interest to its customers at a competitive cost (Siepel and Dejardin 2020). Performance depends on the ability of the firm to sell its products, and on its ability to use its resources, such as labor, in a productive way. But it also depends on the firm's capacity to transform its processes and products to meet the evolving demands of customers, as well as the evolving behavior of competitors (Siepel and Dejardin 2020). Innovativeness, both in process and product, is therefore a dimension of firm performance.

To understand the impact that corruption may have on firm performance, innovativeness included, it is crucial to notice that corruption is a broad notion, encompassing several phenomena with varying degrees of severity (Teixeira 2015). Even focusing on the types of corrupt activity of greatest concern to individual firms, the literature has distinguished

several relevant types. Corruption may be grand, involving high-level government officials, or petty, if it occurs at the administrative level (Teixeira 2015). It may happen once or recurrently (Seck 2020). It may be something that certain firms actively seek, or rents that firms need to pay to avoid undue penalties by overstepping officials (Zhou and Peng 2012).

Given the multidimensional nature of both firm performance and corruption, it would be surprising to find an unambiguous relation between corruption and firm performance. Each type of corruption potentially impacts the several dimensions of performance in different ways (Nur-tegin and Jakee 2020). Further, neither phenomenon exists in a vacuum. Any impact is therefore bound to depend on the institutional context in which the firm develops its activities (Krammer 2019). Finally, corruption may lower the performance of the average firm, whilst relatively boosting the performance of firms that engage in corrupt activities (Krammer 2019; Seck 2020).

There are theoretical reasons to support the claim that corruption often hinders firm performance. Central to this is the observation that several types of corruption warp incentives and draw resources to non-productive activities (Baumol 1990). First, corruption often involves a transfer of resources from one party, the firm, to another. In other words, it is costly to the firm (Kaufmann and Wei 2000). Second, entrepreneurs are incentivized to divert their time and talents away from management and innovation and into corruption-related endeavors (Murphy et al. 1993). These can be in view of adopting processes and techniques that protect the firm from corrupt officials (Svensson 2005), but, less benignly, they may also be in view of using corruption to promote artificial barriers to entry and stave off potential competition (De Rosa et al. 2015).

This said, as mentioned, there are also reasons to believe that corruption may foster the performance of certain firms, especially in low-quality institutional settings. In such circumstances, corruption may simply be an expedient for firms to ‘get things done’ in the morass of bureaucratic and regulatory obstacles (Krammer 2019). A one-off payment to fast-track the concession of a water or electricity license is a case-in-point (Seck 2020). In other words, corruption may facilitate the normal flow of business and actually reduce costs (Méon and Weill 2010). Moreover, corruption may offer the firm a good standing with the bureaucracy or access to higher-level decision-making. These, in turn, may result in protection against political risks (Krammer 2019), such as a government takeover of business activities, or even offer a leg-up accessing lucrative procurement opportunities (Hanousek et al. 2019).

True to these two lines of reasoning, the empirical evidence points in both directions. Several studies find that firms working in high-corruption environments perform worse, all things considered, than those in more transparent environments. This result is robust to the measures of performance used. For instance, Nur-tegin and Jakee (2020), using a sample of 136 countries, find that corruption harms firms’ sales and employment growth. Thakur et al. (2020), in turn, find that it harms productivity growth in firms from 16 emerging market economies. Another example is Wu (2019), who finds that corruption harms innovativeness among firms from four Latin American countries. Importantly, studies have consistently found that the impact of corruption on firm performance is modulated by firm characteristics, even if the literature is not consistent in terms of direction. Sahakyan and Stiegert (2012) or Paunov (2016), for instance, find that smaller firms are more negatively impacted by corruption than larger firms, but Athanasouli et al. (2012), on the other hand, find the opposite. Domestic and foreign firms also seem to be differently impacted (Paunov 2016). The external environment of the firm, such as the competitiveness of its market, has also been found to matter (Martins et al. 2020).

This said, there is also evidence to support the above claim that in high-corruption environments, firms that engage in corruption perform better than those that do not. This is what Williams et al. (2016) found when studying over 100,000 firms from 132 countries. These authors estimate that bribes positively impact employment, productivity and sales growth. Williams and Kedir (2016), focusing instead on almost 6000 firms from 40 African countries, also found that bribes promote firm innovation.

Indeed, focusing on the narrower case of product innovation, [Krammer \(2019\)](#) shows that engaging in corruption may help firms innovate by lowering transaction costs, hedging against political risks, and fostering access to relevant decision-making bodies. [Krammer \(2019\)](#) also shows that such is true in low-quality institutional environments. In high-quality environments, on the other hand, the potential net benefits to the innovating firms of engaging in corruption are lower, not only because the obstacles to the firm's activity are lower, but also because the potential costs of illicit activities are higher, be it due to higher odds of detection, or concerns with reputational effects.

Consequently, in line with the literature, we hypothesize that corruption might offer some grease to innovative activities at the firm level, even if such effect is unlikely to be inordinately large in countries with relatively robust institutions, such as Portugal. In other words:

Hypothesis 1 (H1). *Corruption has a positive impact on firm-level innovation in Portugal.*

Further, [Paunov \(2016\)](#), focusing on emerging economies, finds that the tendency to innovate of smaller, privately owned, and domestic firms is more significantly impacted by bribes than that of larger, publicly owned, or foreign firms. In other words, the impact of corruption on innovation depends on firm characteristics, with domestic firms more significantly impacted. We thus hypothesize that:

Hypothesis 2 (H2). *Corruption has a greater impact on the innovativeness of Portuguese domestic firms.*

3. Methodology and Empirical Strategy

In order to test our hypotheses, we used data from the World Bank Enterprise Surveys (WBES). The WBES is a database managed by the World Bank with information at the firm level that results from surveys administered to representative samples of private firms. The WBES has been used in many studies to analyze the impact of corruption in several countries and regions ([Martins et al. 2020](#)). As for Portugal, the database includes information on 1062 firms for 2019, each of which from one of the following sectors: fabricated metal products; food; garments; machinery and equipment; retail; other manufacturing and services.

Regarding the dependent variables, the WBES collects information on innovation behavior by firms, recording whether a firm has introduced a new product or process in the last fiscal year (variable Innovation). For robustness, we also consider the variable Product Innovation, which indicates whether a firm has introduced a new product, but not a new process, in the last fiscal year.

The database collects information on several firm characteristics, which we use as independent and control variables. As a measure of corruption, we use a binary variable that takes the value 1 if the firm identifies corruption as 'a major or very severe obstacle to the current operations' of the firm, and 0 otherwise. Such an answer could either mean that the firm finds itself compelled to engage in corrupt activities, or that not doing so leaves it at a competitive disadvantage. This measure has been previously used in the literature (e.g., [Martins et al. 2020](#)). As controls, we include in the analysis the size of the firm, the share of foreign ownership in the firm's capital, whether the firm is an exporter, the age of the firm and manager experience. Finally, we consider two obstacles to the firm's activity: access to financing and tax rates.

Table 1 lists the variables used in this study and presents descriptive statistics. 28.2% of firms introduced a new product or a new process in the last fiscal year, while the corresponding number for product innovation alone is 24.1%. As for corruption, 12.4% of firms report that it is a major constraint to the firm's activities.

Table 1. Variables and descriptive statistics.

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
Innovation	Binary variable equal to one if the firm introduced a new product or a process in the last fiscal year; zero otherwise	1062	0.282	0.450	0	1
Product innovation	Binary variable equal to one if the firm introduced a new product in the last fiscal year; zero otherwise	1059	0.241	0.428	0	1
Corruption	Binary variable equal to one if the firm identifies corruption as a major constraint to firm's activities; zero otherwise	965	0.124	0.3301	0	1
Size of the firm	Number of employees	1062	76.058	167.569	5	2000
Foreign ownership	Share of private foreign ownership in the firm (%)	1059	6.019	23.163	0	100
Exporter	Binary variable equal to one if firm exports; zero otherwise	1062	0.407	0.491	0	1
Age	Age of the firm	1052	27.806	19.972	2	147
Manager experience	Number of years the top manager has been working in the firm's sector	1030	29.833	12.110	1	60
Access to financing	Binary variable equal to one if access to financing is perceived as the biggest obstacle to firm's activities; zero otherwise	1046	0.014	0.119	0	1
Tax rates	Binary variable equal to one if tax rates are perceived as the biggest obstacle to firm's activities; zero otherwise	1046	0.631	0.483	0	1

Firms in our dataset are heterogeneous. On average, each firm employs around 76 people; however, the standard deviation for this variable is more than twice the corresponding mean, which implies significant variability among firms. Similarly, while 6.02% of the value of firms' capital is owned by private foreigners on average, the corresponding standard deviation is again much greater than the mean.

As for controls, 40.7% of firms export and, on average, firms have significant experience on the market, as the average age of the firm is 27.81 years. The same pattern is revealed in management, as, on average, managers had been working in the firm's sector for 29.83 years. As for the obstacles to firms' activity, 1.4% of firms in our dataset consider that access to financing is the biggest obstacle faced, while a significant fraction of firms (63.1%) reveals that it is tax rates.

In line with previous literature, we test our hypotheses by estimating the following model for each dependent variable (Innovation and Product Innovation):

$$Y_i = \alpha + \beta C_i + \gamma X_i + u_i \quad (1)$$

In (1), Y_i is the dependent variable, C_i the corruption variable, X_i other independent and control variables and u_i a zero-mean error term.

Ordinary Least Squares (OLS) are the most common method to estimate the coefficients of models such as (1). However, in this case, OLS is not an appropriate method due to endogeneity issues. Endogeneity occurs when a regressor is correlated with the error term. OLS is inconsistent in the presence of endogeneity (Wooldridge 2010; Cameron and Trivedi 2005). We expect endogeneity to arise in our case as it is known that firms may not report illegal (corruption) activities; in addition, there may be variables that impact both corrupt activities and innovation decisions (see, e.g., Martins et al. 2020; Seck 2020). True to this,

the Durbin-Wu-Hausmann test for endogeneity, performed on the full sample, rejected the hypothesis that the corruption variable is exogenous, with a p -value of 3.36%.

To solve the issue of endogeneity, we resort to instrumental variables estimation (Wooldridge 2010; Cameron and Trivedi 2005). This is a two-step estimation method that makes use of instruments, i.e., variables that are correlated with the endogenous variable (Corruption), but not the error term. We employ industry-location averages of corruption as instruments in our estimation method. This instrument has been widely used in the literature (e.g., Fisman and Svensson 2007; Ha et al. 2021; Martins et al. 2020). Underlying this use is the observation that corruption typically depends on factors idiosyncratic to the firm but also on factors specific to its industry. These, however, such as industry-specific technologies or the rents that could be extracted by corrupt officials, are exogenous to the firm (Fisman and Svensson 2007). We have employed the Montiel-Pflueger robust weak instrument test (Montiel and Pflueger 2013), rejecting the null hypothesis of having weak instruments—the effective F statistic is equal to 32.446, greater than the critical value 23.109, with a significance level of 5% and a threshold of 10%.

We estimate Equation (1) for the entire dataset, as well as for foreign firms and domestic firms separately. Foreign firms are firms for which the share of private foreign ownership is greater than or equal to 10%; otherwise, the firm is domestic. We estimate the model separately for these two groups to consistently evaluate the moderating role of foreign ownership in the impact of corruption on innovation. In all regressions, we estimate clustered-robust standard errors at the industry-location level to ensure the validity of statistical inference.

4. Results and Discussion

The main results of our empirical strategy are presented in Table 2. As mentioned, for robustness, we consider two dependent variables (*Innovation* and *Product Innovation*). For each, we estimate the model for the entire dataset (All firms), as well as segregated by foreign firms (Foreign) and domestic firms (Domestic). All regressions are globally significant at 1%.

The results for the entire dataset reveal that corruption has a positive and statistically significant impact on innovation, regardless of the dependent variable used. In other words, we do not reject H1. This result contradicts some literature, viz. that which concludes that corruption is detrimental to innovation, as well as firm performance in general (e.g., Hanousek et al. 2019; Paunov 2016; Martins et al. 2020). It is, however, in line with the literature that shows that in some institutional settings corruption may have a positive impact on firm performance (Krammer 2019; Mendoza et al. 2015), as, *inter alia*, it could help the firm overcome bureaucratic and regulatory obstacles to ‘getting things done’, thus lowering the costs of innovating activities (Krammer 2019). These results might be partially driven by differences across sectors, but this is unlikely in this case, as a one-way Anova testing the null hypothesis that average corruption does not differ across sectors has p -value of 0.422. In other words, we do not find evidence of significant differences in corrupt activities across sectors.

Regarding the control variables, larger firms are more innovative, as the coefficient for the size of the firm is positive and statistically significant, a result aligned with the previous literature (e.g., Gorodnichenko et al. 2010). We further find that difficulties with financing hinder innovation, a result that is not surprising (Ayyagari et al. 2011) and that the experience of the top manager positively impacts product innovation. Finally, there is also evidence that firms with higher levels of foreign ownership are more innovative, also a result previously found in the literature (Mateut 2018). This said, the order of magnitude of these effects is much lower than that of the effect of corruption¹.

In addition to the entire dataset, Table 2 also displays the results of estimating our model only for foreign firms and only for domestic firms. The effects for foreign and domestic firms are distinct: while corruption has no significant impact on innovation in foreign firms, it has a positive and significant impact on innovation in domestic firms.

Insofar as this suggests that the impact of corruption on firm innovation depends on the share of foreign capital the firm has, then foreign direct investment may reduce that impact. If the positive impact of corruption on firms' innovation activities is linked to a desire to overcome bureaucratic and regulatory constraints to 'getting things done', it is not surprising that such constraints be more challenging for domestic firms than for foreign firms. In fact, domestic firms may have more incentives to corrupt than foreign firms, as foreign firms could belong to international conglomerates and already have privileged relations with institutions and officials (Paunov 2016). On the other hand, a firm that does not engage in corrupt activities, but considers itself at a competitive disadvantage due to the corruption it observes, might seek to overcome this disadvantage by further innovating. This incentive is unlikely to be as significant for a foreign firm, insofar as its innovation decisions tend to be less linked to the specificities of domestic institutions. Our results thus seem to support H2.

Table 2. Regression results: instrumental variables estimation.

Variables	Innovation			Product Innovation		
	All Firms	Foreign	Domestic	All Firms	Foreign	Domestic
Corruption	1.4258 *** (0.5452)	−1.2203 (1.3960)	2.0152 *** (0.6293)	1.5644 *** (0.5074)	−0.7980 (1.1340)	2.1317 *** (0.6386)
Size of the firm	0.0004 *** (0.0001)	0.0002 (0.0002)	0.0004 *** (0.0001)	0.0003 *** (0.0001)	0.0003 (0.0002)	0.0004 ** (0.0002)
Foreign ownership	0.0023 ** (0.0012)			0.0025 ** (0.0010)		
Exporter	0.0627 (0.0499)	0.1181 (0.2001)	0.0625 (0.0625)	0.0507 (0.0396)	0.1291 (0.1489)	0.0496 (0.0529)
Age	0.0022 (0.0014)	−0.0058 (0.0039)	0.0029 (0.0018)	0.0023 (0.0016)	−0.0044 (0.0031)	0.0028 (0.0021)
Manager experience	0.0012 (0.0013)	−0.0041 (0.0040)	0.0019 (0.0018)	0.0024 ** (0.0012)	−0.0038 (0.0027)	0.0031 * (0.0017)
Access to financing	−0.3394 *** (0.0896)	0.2701 (0.8268)	−0.2777 *** (0.0844)	−0.3982 *** (0.1023)	0.0937 (0.6566)	−0.3441 ** (0.1397)
Tax rates	0.0343 (0.0671)	−0.1563 (0.1105)	0.1126 (0.0755)	0.0606 (0.0552)	−0.1575 * (0.0919)	0.1370 ** (0.0610)
Constant	−0.0927 (0.1677)	0.7321 *** (0.2017)	−0.2643 (0.2034)	−0.1915 (0.1443)	0.5907 *** (0.1448)	−0.3565 * (0.1963)
Wald χ^2 -test	39.07 ***	16585.86 ***	41.92 ***	36.95 ***	27335.56 ***	28.56 ***
Observations	923	60	864	922	60	863

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Turning to the results for the other variables, again, the size of the firm has a positive effect on innovation in domestic firms, whereas access to financing constitutes a relevant obstacle for these firms. We can also see that the experience of top management boosts product innovation in domestic firms. As for tax rates, there are differences for foreign and domestic firms: tax rates have a negative effect on product innovation for foreign firms, but the opposite happens for domestic firms. This latter result is puzzling, but we speculate that domestic firms may be willing to report higher costs to artificially decrease taxable profits. One way to increase costs is through investments in research and development activities.

For robustness, we have also estimated our model for the entire dataset including an additional variable: the interaction between *Corruption* and *Foreigner*, the latter being a binary variable that is equal to one if the firm is foreign and equal to zero if it is domestic. By including this interaction, we can evaluate the impact of corruption on innovation for these two groups of firms. Again, we estimate the model resorting to instrumental variables estimation and report the results in Table 3.

Table 3. Robustness analysis: instrumental variables estimation.

Variables	Innovation	Product Innovation
Corruption	1.8291 *** (0.6969)	1.9141 *** (0.6686)
Corruption * Foreigner	−2.0021 *** (0.3308)	−1.7342 *** (0.2893)
Size of the firm	0.0004 *** (0.0001)	0.0004 *** (0.0001)
Foreign ownership	0.0037 *** (0.0012)	0.0037 *** (0.0010)
Exporter	0.0626 (0.0549)	0.0506 (0.0440)
Age	0.0023 (0.0017)	0.0023 (0.0018)
Manager experience	0.0016 (0.0016)	0.0028 * (0.0015)
Access to financing	−0.2386 * (0.1245)	−0.3109 ** (0.1486)
Tax rates	0.0752 (0.0752)	0.0960 (0.0625)
Constant	−0.1879 (0.2063)	−0.2741 (0.1878)
Wald χ^2 -test	1884.18 ***	4753.31 ***
Observations	923	922

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3 presents the outcomes for both *Innovation* and *Product Innovation*. Both regressions are globally significant at 1%. As for corruption, the coefficient of the variable *Corruption* in Table 3 refers to its impact on innovation for domestic firms (i.e., *Foreigner* = 0), while the coefficient of *Corruption * Foreigner* considers the additional impact of corruption on innovation for foreign firms (i.e., *Foreigner* = 1). For both dependent variables (*Innovation* and *Product Innovation*), the results are in line with those presented in Table 2: corruption enhances innovation in domestic firms, while in foreign firms the impact is statistically lower. As for the control variables, the results are qualitatively equal to those reported in Table 2 for the entire dataset.

5. Conclusions

This paper analyzes the impact of corruption on innovation in Portugal. We use data from the World Bank Enterprise Surveys on 1062 firms for 2019 and employ instrumental variable techniques to take into account endogeneity in corruption. For robustness, we consider two alternative dependent variables: product innovation and innovation (the latter considers both product and process innovation). We include in our model several firm characteristics, as well as obstacles to firm activities, as controls variables. Our results show that corruption fosters innovation in Portugal, regardless of the dependent variable we use to measure innovation. This result is in line with previous literature that considers that corruption may have a positive impact on firm performance in less robust institutional environments (Krammer 2019; Mendoza et al. 2015).

In addition to estimating our model for the entire dataset (all firms), we have also evaluated the impact of corruption on innovation in (only) foreign and (only) domestic firms. Our results suggest that the effect of corruption on innovation is significantly different for foreign and domestic firms. While corruption boosts innovation for domestic firms, we found that it does not have any statistically significant effect when we consider foreign firms. This result holds when we perform additional regressions for robustness, including an interaction term between corruption and the type of firm (foreign versus domestic).

To the best of our knowledge, this is the first study to evaluate the effect of corruption on innovation in Portugal using a novel dataset from the World Bank with information at the firm level. We find that firms that are either compelled to corrupt or, if they are not, see corruption as a major obstacle, are more innovative. This indicates that corruption offers the former a leg-up in overcoming bureaucratic or regulatory obstacles, and that the latter might find in innovation a strategy for overcoming the disadvantages brought about by corrupt activities.

Our conclusions are of interest to policymakers. Currently, in Portugal, there are considerable legislative and governmental efforts dedicated to fighting corruption ([Governo de Portugal 2021](#)). Any measure to this end should, however, consider the impact of corruption on firm performance. As this article shows, such an impact need not be negative.

This said, firm performance is but one dimension of the overall societal impact of corruption. If neutralizing its effects is a policy goal, for instance with a view to eliminating the benefits thereof, this article offers hints at possible measures. Given that corruption has different impacts on the performance of foreign and domestic firms, foreign direct investment (FDI) may be a way to reduce the impact of corruption. As such, policies that boost FDI—e.g., easing access to credit, promoting economic stability or strengthening the quality of institutions—may contribute to mitigate the impact of corruption.

For future research, it would be interesting to replicate this analysis considering data for different periods, i.e., panel data. That would allow uncovering effects over time that we cannot identify in this paper, given that we only have cross-sectional data. Additionally, because of constraints in data availability, we have only used one corruption measure in this study. Thus, future research that investigates whether these results hold when different corruption measures are considered would be welcome.

Author Contributions: J.C. and D.L. contributed equally to this article. All authors have read and agreed to the published version of the manuscript.

Funding: This research has been financed by Portuguese public funds through FCT—Fundação para a Ciência e a Tecnologia, I.P., in the framework of the project with reference UIDB/04105/2020, the project with reference UIDB/04728/2020 and the project with reference UIDB/00727/2020

Data Availability Statement: The data that support the findings of this study are openly available in Enterprise Surveys, The World Bank, <http://www.enterprisesurveys.org> (accessed on 26 April 2022).

Acknowledgments: We thank the Enterprise Analysis Unit of the Development Economics Global Indicators Department of the World Bank Group for making the data available.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Note

- ¹ We have calculated the standardized (beta-)coefficients for this regression and the modulus of this coefficient for corruption is over 1, whereas for the other variables they are all below 0.15.

References

- Ashyrov, Gaygysyz, and Jaan Masso. 2020. Does corruption affect local and foreign-owned companies differently? Evidence from the BEEPS survey. *Post-Communist Economies* 32: 306–29. [\[CrossRef\]](#)
- Athanasouli, Daphne, Antoine Goujard, and Pantelis Sklias. 2012. Corruption and firm performance: Evidence from Greek firms. *International Journal of Economic Sciences and Applied Research* 5: 43–67.
- Ayyagari, Meghana, Asli Demirgüç-Kunt, and Vojislav Maksimovic. 2011. Firm Innovation in Emerging Markets: The Role of Finance, Governance, and Competition. *Journal of Financial and Quantitative Analysis* 46: 1545–80. [\[CrossRef\]](#)
- Bahoo, Salman, Ilan Alon, and Andrea Paltrinieri. 2020. Corruption in international business: A review and research agenda. *International Business Review* 29: 101660. [\[CrossRef\]](#)
- Baumol, William J. 1990. Entrepreneurship: Productive, unproductive, and destructive. *Journal of Political Economy* 98: 893–921. [\[CrossRef\]](#)

- Bjørnskov, Christian. 2011. Combating corruption: On the interplay between institutional quality and social trust. *The Journal of Law & Economics* 54: 135–59. [\[CrossRef\]](#)
- Cameron, A. Colin, and Pravin K. Trivedi. 2005. *Microeconometrics: Methods and Applications*. Cambridge: Cambridge University Press.
- De Rosa, Donato, Nishaal Gooroochurn, and Holger Görg. 2015. Corruption and productivity: Firm-level evidence. *Journal of Economics and Statistics (Jahrbuecher Fuer Nationaloekonomie Und Statistik)* 235: 115–38. [\[CrossRef\]](#)
- European Commission. 2020. *European Innovation Scoreboard 2020*. Luxembourg: Publications Office, Available online: <https://data.europa.eu/doi/10.2873/6063> (accessed on 23 June 2022).
- Fisman, Raymond, and Jakob Svensson. 2007. Are corruption and taxation really harmful to growth? Firm level evidence. *Journal of Development Economics* 83: 63–75. [\[CrossRef\]](#)
- Gorodnichenko, Yuriy, Jan Svejnar, and Katherine Terrell. 2010. Globalization and Innovation in Emerging Markets. *American Economic Journal: Macroeconomics* 2: 194–226. [\[CrossRef\]](#)
- Governo de Portugal. 2021. PRR—Recuperar Portugal Construindo o Futuro; Lisboa: Ministério do Planeamento. Available online: <https://recuperarportugal.gov.pt/wp-content/uploads/2021/11/Plano-de-Prevencao-Riscos-de-Corrupcao-e-Infracoes-Conexas.pdf> (accessed on 23 June 2022).
- Ha, Leavitt, To Trung Thanh, Doan Thang, and P Anh. 2021. Bribery, export decisions, and institutional constraints: Evidence from cross-country firm-level data. *Economic Analysis and Policy* 69: 585–612. [\[CrossRef\]](#)
- Hanousek, Jan, Anastasiya Shamshur, and Jiri Tressl. 2019. Firm efficiency, foreign ownership and CEO gender in corrupt environments. *Journal of Corporate Finance* 59: 344–60. [\[CrossRef\]](#)
- Kaufmann, Daniel, and Shang-Jin Wei. 2000. Does ‘Grease Money’ Speed up the Wheels of Commerce? IMF Working Paper No. WP/00/64. Washington, DC: IMF, Available online: https://www.imf.org/~{}media/Websites/IMF/imported-full-text-pdf/external/pubs/ft/wp/2000/_wp0064.ashx (accessed on 26 April 2022).
- Krammer, Sorin M. S. 2019. Greasing the wheels of change: Bribery, institutions, and new product introductions in emerging markets. *Journal of Management* 45: 1889–926. [\[CrossRef\]](#)
- Martins, Lurdes, Jorge Cerdeira, and Aurora A. C. Teixeira. 2020. Does corruption boost or harm firms’ performance in developing and emerging economies? A firm-level study. *The World Economy* 43: 2119–52. [\[CrossRef\]](#)
- Mateut, Simona. 2018. Subsidies, financial constraints and firm innovative activities in emerging economies. *Small Business Economics* 50: 131–62. [\[CrossRef\]](#)
- Mendoza, Ronald, Ricardo Lim, and Anne Lopez. 2015. Grease or sand in the wheels of commerce? Firm level evidence on corruption and SMEs. *Journal of International Development* 27: 415–39. [\[CrossRef\]](#)
- Méon, Pierre-Guillaume, and Laurent Weill. 2010. Is corruption an efficient grease? *World Development* 38: 244–59. [\[CrossRef\]](#)
- Montiel, Olea, and Carolin Pflueger. 2013. A robust test for weak instruments. *Journal of Business and Economic Statistics* 31: 358–69. [\[CrossRef\]](#)
- Murphy, Kevin M., Andrei Shleifer, and Robert W. Vishny. 1993. Why is rent-seeking so costly to growth? *The American Economic Review* 83: 409–14.
- Nur-tegin, Kanybek, and Keith Jakee. 2020. Does corruption grease or sand the wheels of development? New results based on disaggregated data. *The Quarterly Review of Economics and Finance* 75: 19–30. [\[CrossRef\]](#)
- Paunov, Caroline. 2016. Corruption’s asymmetric impacts on firm innovation. *Journal of Development Economics* 118: 216–31. [\[CrossRef\]](#)
- Sahakyan, Narek, and Kyle W. Stiegert. 2012. Corruption and firm performance. *Eastern European Economics* 50: 5–27. [\[CrossRef\]](#)
- Seck, Abdoulaye. 2020. Heterogeneous bribe payments and firms’ performance in developing countries. *Journal of African Business* 21: 42–61. [\[CrossRef\]](#)
- Siepel, Josh, and Marcus Dejardin. 2020. How do we measure firm performance? A review of issues facing entrepreneurship researchers. In *Handbook of Quantitative Research Methods in Entrepreneurship*. Cheltenham: Edward Elgar Publishing, pp. 4–20. [\[CrossRef\]](#)
- Svensson, Jakob. 2005. Eight questions about corruption. *Journal of Economic Perspectives* 19: 19–42. [\[CrossRef\]](#)
- Teixeira, Aurora. 2015. Introduction. In *Corruption, Economic Growth and Globalization*. Edited by Aurora Teixeira, Carlos Pimenta, António Maia and José António Moreira. London and New York: Routledge, pp. 1–10.
- Thakur, Bhanu Pratap Singh, M. Kannadhasan, Parikshit Charan, and C. P. Gupta. 2020. Corruption and firm value: Evidence from Emerging Market Economies. *Emerging Markets Finance and Trade* 57: 1182–97. [\[CrossRef\]](#)
- Wei, Shang-Jin. 1999. Corruption in Economic Development: Beneficial Grease, Minor Annoyance, or Major Obstacle? Available online: <https://ssrn.com/abstract=604923> (accessed on 26 April 2022).
- Williams, Colin C., Alvaro Martinez-Perez, and Abbi Kadir. 2016. Does bribery have a negative impact on firm performance? A firm-level analysis across 132 developing countries. *International Journal of Entrepreneurial Behaviour and Research* 22: 398–415. [\[CrossRef\]](#)
- Williams, Colin C., and Abbi M. Kadir. 2016. The impacts of corruption on firm performance: Some lessons from 40 African countries. *Journal of Developmental Entrepreneurship* 21: 1650022. [\[CrossRef\]](#)
- Wooldridge, Jeffrey M. 2010. *Econometric Analysis of Cross Section and Panel Data*, 2nd ed. Cambridge: The MIT Press.
- World Bank. n.d. Worldwide Governance Indicators. Available online: <https://databank.worldbank.org/source/worldwide-governance-indicators/> (accessed on 26 April 2022).
- Wu, Ruohan. 2019. Firm development and bribery: An empirical study from Latin America. *Atlantic Economic Journal* 47: 53–64. [\[CrossRef\]](#)
- Zhou, Jessie Qi, and Mike W. Peng. 2012. Does bribery help or hurt firm growth around the world? *Asia Pacific Journal of Management* 29: 907–21. [\[CrossRef\]](#)