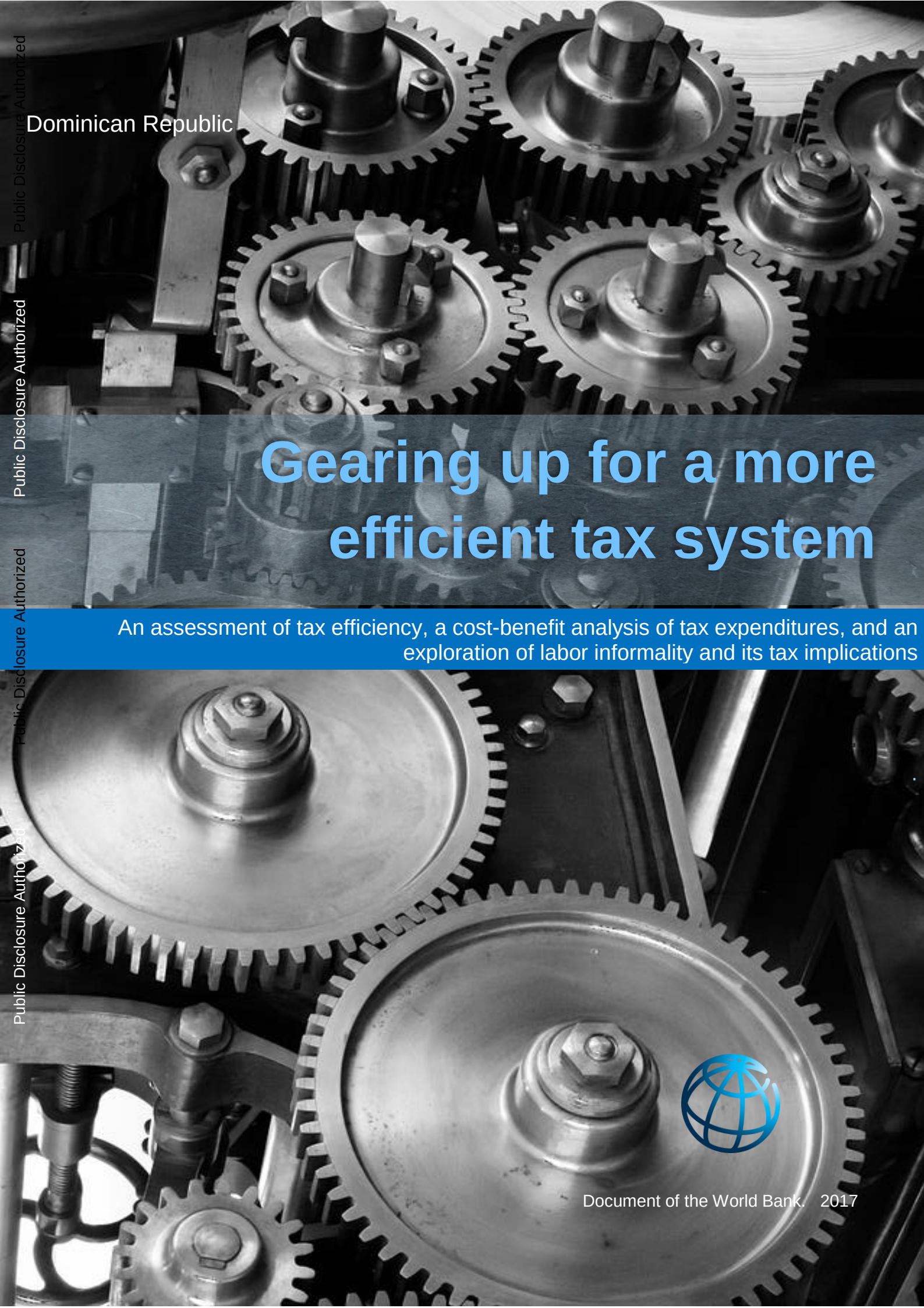
Dominican Republic

Gearing up for a more efficient tax system

An assessment of tax efficiency, a cost-benefit analysis of tax expenditures, and an exploration of labor informality and its tax implications



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Acknowledgments

This study is the latest entry in a multiannual World Bank analytical series on fiscal policy in the Dominican Republic (DR) designed to support the government's efforts to increase revenues and reinforce fiscal stability. The study is grounded in an ongoing dialogue between World Bank staff and the Ministry of Finance's General Directorate of Taxes, initiated during the summer of 2016, as well as regular technical discussions with staff from the Ministry of Economy, Planning and Development's Advisory Unit on Social and Economic Analysis. It builds on the findings of "Fiscal Policy and Redistribution in the Dominican Republic, 2016,[1]" which was published by the World Bank and disseminated in the DR in November 2016. The present study is also intended to strengthen the analytical underpinnings of the "Fiscal Pact" currently being prepared by the new administration.

This study was prepared by an interdisciplinary team led by World Bank staff. Gianluca Mele (Senior Country Economist, MFM) headed the team, which comprised Jaime Aristy-Escuder (University of Santo Domingo), Miguel Almunia (University of Warwick), Anna Llado Segura (Consultant), and Marinella Boccia (Consultant). Miria Pigato (Practice Manager, MFM), Philip Schuler (Senior Country Economist, MFM), Luiz Edgard Oliveira (World Bank Group Analyst, MFM), Daniel Reyes (Senior Economist, T&C), Erik von Uexkull (Senior Economist, T&C), Sebastian James (Senior Economist, GOV), Anne Brockmeyer (Economist, MFM), Guillermo Carlos Arenas (Economist, T&C), Juan Carlos Parra (Economist, POV), and Christian Camilo Gomez Canon (Consultant, POV) provided extensive advice and useful comments to the team, which would also like to acknowledge the valuable overall guidance received from Miria Pigato (Practice Manager, MFM), Tahseen Sayed (Country Director for the Caribbean), Alessandro Legrottaglie (Country Manager for the DR), Sophie Sirtaine (former Country Director for the Caribbean), McDonald Benjamin (former Country Manager for the DR), and Francisco Carneiro (Program Leader). Sincere thanks are also due to the peer reviewers of this study, Vasco Molini (Senior Economist, POV), Sebastian James (Senior Economist, GOV), Rich Stern (Lead Public Sector Management Specialist, GOV) and Blanca Moreno-Dodson (Lead Economist, GOV) for providing invaluable quality control and constructive support. The team would also like to thank Sean Lothrop (Consultant) for his much-valued assistance in revising and editing the study. Patricia Chacon Holt (Language Program Assistant, MFM), Miriam Beatriz Villarroel (Program Assistant, MFM), Maria J. Hermann (Executive Assistant, LCCDO), and Virginia Ricart Giro (Team Assistant, LCCDO) greatly supported this work by tirelessly facilitating all administrative processes.

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[1] The full document is available online at http://documents.worldbank.org/curated/en/827851478242582427/Fiscal-policy-and-redistribution-in-the-Dominican-Republic-an-analysis-based-on-the-commitment-to-equity-methodology-for-2013

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Executive Summary

1. Introduction

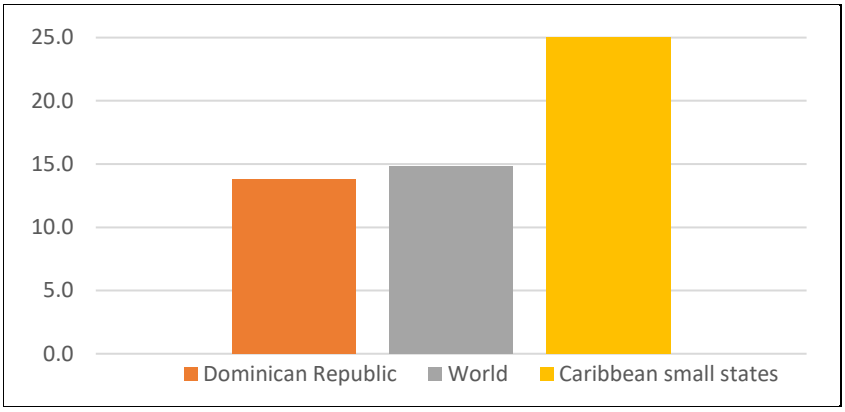
1. The Dominican Republic (DR) is an upper-middle-income country with a rapidly expanding economy. The DR's economy grew at an annual average rate of 5.7 percent from 1991 to 2013, one of the fastest rates in the Latin America and the Caribbean (LAC) region. From 2014 through 2016, a combination of strong domestic demand and favorable external conditions pushed the growth rate to an annual average of 7 percent—the highest rate in LAC. The DR's gross national income (GNI) per capita tripled between 1995 (US$1,910) and 2015 (US$6,130) and now exceeds 90 percent of the LAC average. If the growth rates observed during the past five years are sustained through 2020, the DR's GNI will fully converge with the regional average.

2. Despite many years of robust and broad-based growth, the DR's poverty and inequality indicators remain relatively high by regional standards. A financial crisis in 2003 pushed the monetary poverty rate from 32 percent in 2000 to almost 50 percent in 2004. The poverty rate remained broadly stable for the next eight years, until rising income levels caused it to drop from 42.2 percent in 2012 to 30.5 percent in 2016, which remains however high compared to most countries in the Caribbean and in Latin America. Although the rural poverty rate (38.3 percent) remains higher than the urban rate (28.2 percent), the incidence of poverty in both rural and urban areas fell by roughly 11 percentage points. Income inequality declined slightly during the same period, as the Gini coefficient fell from 0.465 to 0.454, but this trend was not uniform across the country: while the Gini coefficient dropped by 0.015 in urban areas, it rose by 0.007 in rural areas.

3. Fiscal revenues have not kept pace with economic growth, and the DR's revenue effort compares poorly with those of its closest peers. Despite a robust long-term growth trajectory punctuated by repeated economic booms, the DR's consolidated public-sector deficit has remained wide at about 4-5 percent of GDP. Between 2004 and 2014, the tax collection averaged 13.4 percent of GDP, below the LAC average, while total public revenues averaged 14.3 percent. Despite the government's efforts, by 2016 total revenues had reached just 14.6 percent of GDP—well below both the DR's 2007 peak of 16.6 percent and the rates of several regional comparator countries with lower per capita GDP.

4. A series of challenges limit the fiscal space and the country's ability to conduct redistributive policies; among these stands out a highly generous system of tax expenditures that weakens revenue mobilization. The 2003 financial crisis resulted in large fiscal costs associated with the Central Bank's recapitalization, with the government devoting around 1 percent of GDP to this purpose, since 2007. In addition, while remaining manageable debt stocks have continued to increase, and an inefficient electricity sector has been receiving – declining albeit still conspicuous – government transfers, averaging 1.3 percent of GDP over the period 2009-15. Meanwhile, tax expenditures represent a substantial share of total public spending in the DR and amounted to an estimated 6.4 percent of GDP in 2015, with value-added tax (VAT) exemptions alone accounting for 3.4 percent. A 15-year corporate income-tax holiday for firms established in special economic zones (SEZs) has increased total tax expenditures, and the threshold for personal income tax liability remains high. Finally, widespread informality persistently undermines the collection of both personal and corporate income taxes.

Figure A: Tax Revenue as a Percentage of GDP, 2014 or Most Recent Year



Source: World Bank World Development Indicators (WDI)
Note: The most recent data for Caribbean small states are from 2012

2. Objectives of the Study

5. This study is to discuss options to increase the DR's tax revenue and attempts to identify priority areas for efficiency-enhancing reforms. A 2016 World Bank report on Dominican fiscal policy found that the country's tax expenditures were poorly targeted and regressively distributed—benefitting the wealthy more than the poor—and imposed considerable fiscal and economic costs. The report also showed that the tax contribution of the informal sector is extremely low, despite the fact that informal workers account for roughly half of the active labor force. As the new government prepares the "Fiscal Pact" first described in the country's Development Strategy 2030, policymakers will require a more thorough understanding of these issues and their fiscal, economic, and distributional implications.

6. Thus, building on past analytical work, the present study focuses on two priority areas: tax efficiency and labor informality. Chapter One reveals that the DR's strong and sustained economic growth in recent years has had only a modest impact on revenues' efficiency from value-added tax, corporate income tax, personal income tax, and minor taxes. An analysis of tax-collection efficiency reveals several feasible options for boosting tax revenues. Chapter Two explores the characteristics, correlates, and effects of widespread labor informality in the DR. Identifying the correlates of informality yields important implications for promoting formalization and thereby broadening the income-tax base.

3. Assessing Tax Efficiency

Value-Added Tax

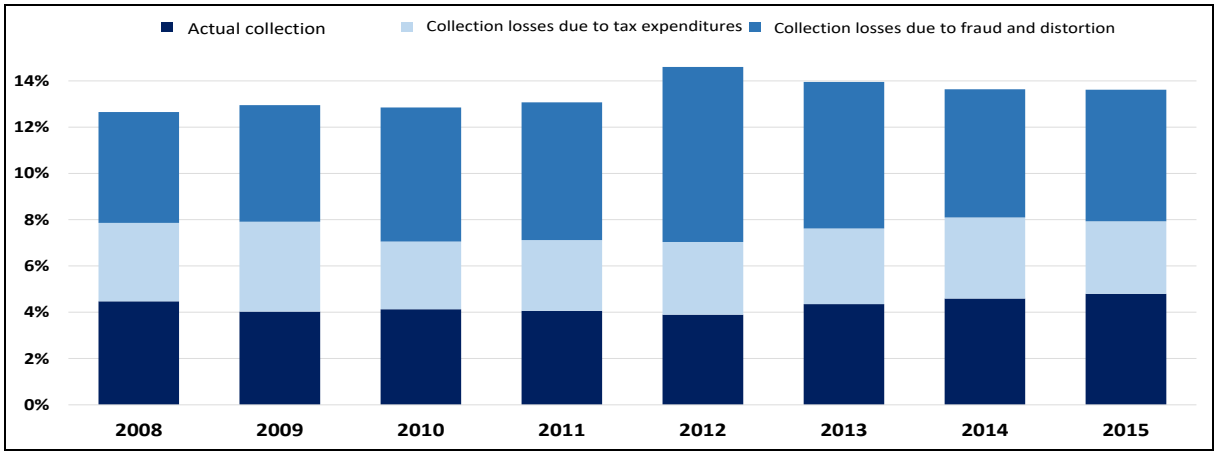
7. VAT is the DR's largest source of tax revenue. Over 2013-15, the DR's VAT, known as the Tax on Transferring Industrial Goods and Services (*Impuesto sobre Transferencias de Bienes Industrializados y. Servicios*, ITBIS), generated revenue equal to an average of 4.6 percent of GDP. The General Directorate of Internal Revenue (*Dirección General de Impuestos Internos*, DGII) collects domestic ITBIS, while the General Directorate of Customs (*Dirección General de Aduanas*, DGA) collects ITBIS on imports. Between 1990 and 2015, domestic ITBIS collected by the DGII represented 56.9 percent of total VAT revenue, while import ITBIS collect by the DGA made up the remaining 43.1 percent. The government tripled the standard ITBIS rate from 6 to 18 percent during this period, with the largest single-year rate increase (4 percent) occurring in 2000 as part of a set of general tax reforms. The 2000 rate increase coincided with an expansion of the tax base, as ITBIS was applied to a wider range of goods and services.

8. At 17.9 percent, the general ITBIS rate is well above the regional average VAT rate of 14.5 percent, but its collection efficiency is very low. The traditional measure of tax effectiveness in collecting revenue is the "efficiency ratio"—the ratio of tax revenue to GDP, divided by the standard tax rate. In the case of the VAT, however, this measure is flawed, as the appropriate benchmark should be total consumption, not GDP. Thus, the analysis considered the so-called "C-efficiency" index—the ratio of VAT revenue to consumption, divided by the standard tax rate. Theory suggests that a VAT that taxed all consumption at a uniform rate— would have C-efficiency of 1. Estimating the C-efficiency index for the ITBIS, shows that the collection efficiency of value added taxation in the DR is very low, 0.35, which is far below the LAC average (0.56) and the levels of various comparable countries.

9. ITBIS revenue efficiency ratio in the DR appears to be influenced by policy and administrative changes. Empirical evidence suggests that both structural and policy factors have an impact on the efficiency of the tax collection in the economy. For example, in countries with a high ratio of trade to GDP, tax collection efficiency tends to be high, as it is relatively easier to collect VAT from imports; by contrast, a high share of agriculture in the economy typically reduces tax efficiency. In the DR, like in other countries, the collection efficiency of the ITBIS is affected by policy and administrative changes. Collection efficiency increases in response to changes in the tax rate or reforms to the institutional framework for tax administration, but this effect diminishes over time until new changes are introduced. Similarly, the appointment of each new GDII leadership is associated with a rapid improvement in collection efficiency followed by a gradual decline.

10. The C-efficiency index also appears to be broadly correlated with the business cycle. An accelerating GDP growth rate is typically accompanied by an increase in ITBIS efficiency, and vice versa. During economic expansions, households tend to spend a smaller share of their income on staple goods, which are often subject to ITBIS reductions or exemptions, and they spend a larger share on non-necessities that are subject to the standard ITBIS rate. The wide variations in tax efficiency observed over time reveal that there is considerable scope to effect permanent structural improvements in collection efficiency.

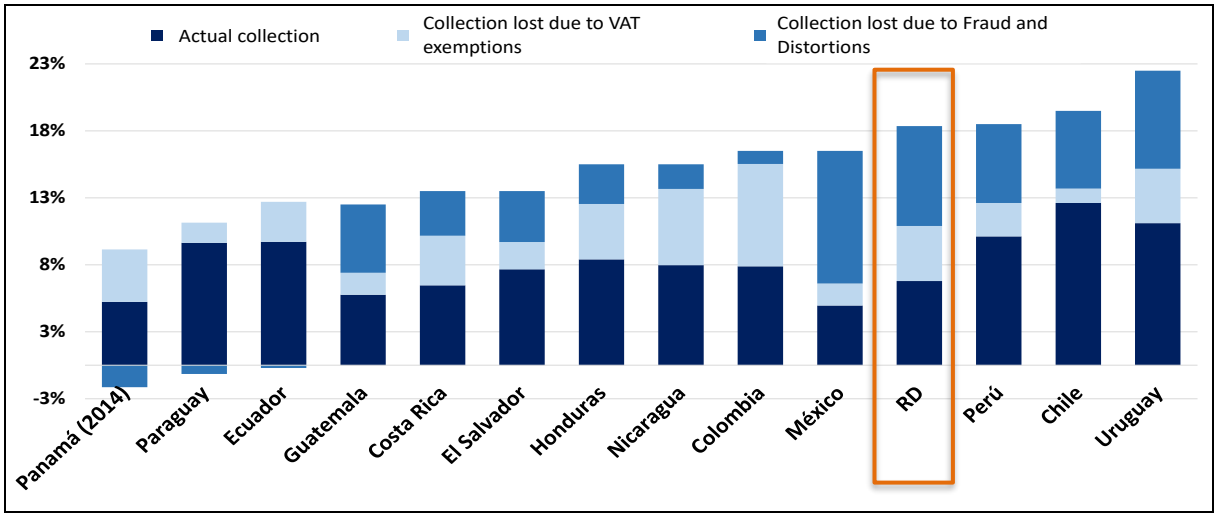
Figure B. Decomposition of Actual and Potential ITBIS Revenue, 2008-2015 (% of GDP)



11. The distance between the current level of efficiency and an ideal status where all consumption is taxed at uniform rate can be explained by two additional indicators: the G-inefficiency ratio and the X-inefficiency ratio. The former measures losses in ITBIS tax efficiency due to tax exemptions (also called "the policy gap") while the latter measures losses due to tax fraud, evasion, and noncompliance with tax administration (also called "the compliance gap"). Foregone revenue from ITBIS exemptions averaged 3.3 percent of GDP during 2008-2015, reaching a peak of 3.9 percent of GDP in 2009 (Figure B). Between 2008 and 2015, the DR's ITBIS

G-inefficiency ratio averaged 0.246, and even at its lowest point it was above the LAC average of 0.21, indicating that the DR's policy gap is significantly wider than those of peer countries. The compliance gap (i.e. losses in tax efficiency due to evasion, fraud, and distortion) widened significantly between 2008 and 2012, as the X-inefficiency ratio rose from 4.8 percent of GDP to a peak of 7.6 percent, and it remains well above its 2008 level. The DR's incidence of VAT evasion, fraud, and mismanagement is among the highest in the region at an average of 0.434 during the 2008-2015 period. The LAC average for the same period was 0.294, and only Mexico and Guatemala lost a larger share of VAT revenue to X-inefficiency. The ITBIS compliance gap is the single largest factor explaining the DR's large potential efficiency gap (Figure C).

Figure C: Decomposition of Actual and Potential VAT Revenue, DR and Regional Comparators 2015 (% of total net consumption)

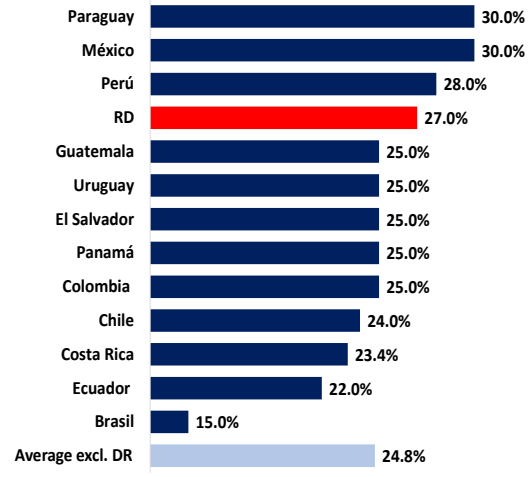


Corporate and Personal Income Tax

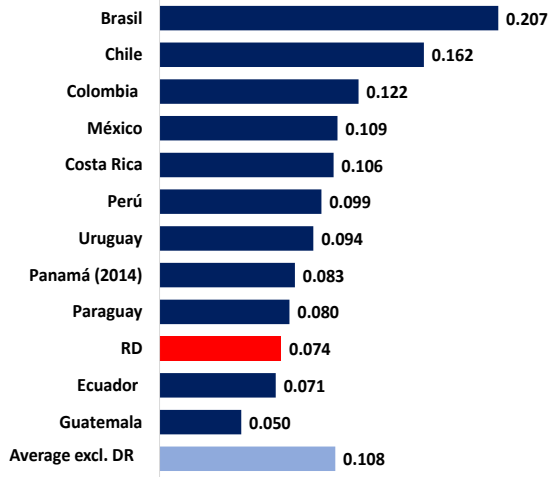
12. Corporate income tax (CIT) is the DR's second-largest source of tax revenue. The CIT accounts for close to one-fifth of the DR's total tax revenue, and was equivalent to 1.6 percent of GDP (average 2002-15), ranging between a low of 1.1 percent of GDP (2010) to a high of 2.6 percent (2014).

13. The DR's CIT rate is among the highest in the region at 27 percent, but its revenue efficiency falls short vis-à-vis most comparator countries. The DR's CIT rate is 2.2 percentage points higher than the average for peer countries, but in 2015 the DR's revenue efficiency was just 0.074. Only Paraguay, Mexico, and Peru have higher CIT rates, and only Ecuador and Guatemala have lower efficiency indicators. Increasing the DR's CIT revenue efficiency from 0.074 to the comparator-group average of 0.108 would boost revenue collection by an estimated 0.9 percent of GDP.

Standard CIT Rates, Dominican Republic and Regional Comparators, 2015

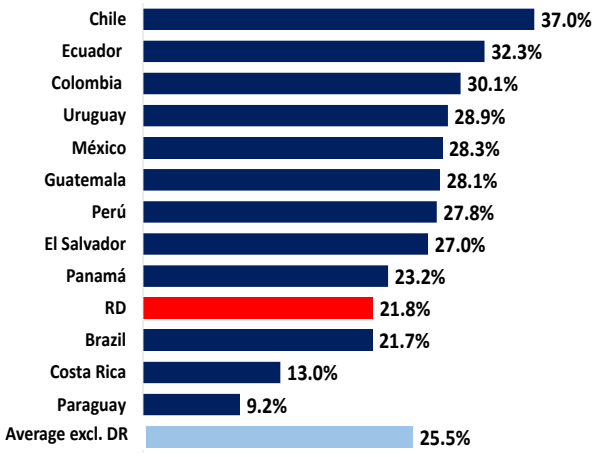


CIT Revenue efficiencies, Dominican Republic and Regional Comparators, 2015

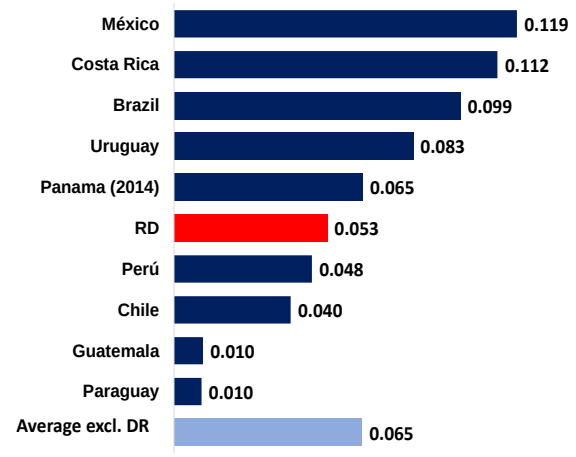


14. The personal income tax (PIT) represents about 10 percent of the DR's total tax revenue. PIT revenue averages about 0.87 percent of GDP, ranging from a low of 0.7 percent in 2005 to a high of 1.16 percent in 2015. The weighted average PIT rate is 21.8 percent, below the LAC average of 25.5 percent, and its revenue efficiency (0.053) is also below the regional average (0.065). Among the DRs regional comparators, only Brazil, Costa Rica, and Paraguay have lower PIT rates, while Chile, Ecuador, and Colombia all impose substantially higher rates. Revenue efficiency is also low by regional standards: the DR's PIT revenue efficiency is just half those of Mexico and Costa Rica and close to those of Peru and Chile. Bringing the DR's PIT revenue efficiency in line with the regional average would increase total tax revenue by 0.26 percent of GDP.

Average PIT Rates, Dominican Republic and Regional Comparators, 2015



PIT Revenue efficiencies, Dominican Republic and Regional Comparators, 2015



4. The Costs and Benefits of Tax Expenditures

15. Tax expenditures represent a substantial share of total tax revenue forgone in the DR, which has exceeded 6 percent of GDP in recent years. Tax expenditures include tax exemptions, deductions, tax holidays, and other policies that reduce the tax liability of specific sectors, firms, and individuals. Although they are features of the tax code, and are not recorded as outlays in the annual budget, tax expenditures have the equivalent fiscal effect of traditional

spending programs, with the aggravation that they make the tax code more cumbersome, create difficulties for the tax administration and often create opportunities for fraud. The use of tax expenditures in many developed and developing countries has been at the same time very popular and very controversial. While such tax loopholes are in some cases provided with the goal to increase investment decisions under some circumstances, there is often no full clarity about whether the overall benefits outweigh the costs. Like many other countries, the DR has introduced various tax expenditures to facilitate the materialization of economic development objectives that are considered particularly important or strategic. The Dominican government has systematically monitored tax expenditures since 2008, and it publishes the results in a dedicated budget annex. The most common technique for estimating them is the foregone-revenue method, a methodology that is also used by DR authorities.

16. The DR's tax expenditures have become increasingly costly over time. Total foregone revenue from tax expenditures rose from a 5.5 percent of GDP in 2010-13 to 6.6 percent in 2014-16. The DR's National Development Strategy 2030 describes the government's plan to consolidate all existing tax expenditure schemes into a single section of the tax code and to establish a coherent and sustainable approach to tax expenditures that reduces their fiscal impact and minimizes their distortive effect on economic incentives. The analysis presented below is designed to contribute to those efforts.

Value-Added Tax Expenditures

17. ITBIS's exemptions represented close to 3 percent of GDP in 2013, according to national official estimates, and recent WB analysis found they are regressively distributed. As previously mentioned, the ITBIS represents the lion's share of indirect taxation. The foregone revenue from its exemptions is also extremely large. ITBIS exemptions comprise for the most part some rate reductions on specific food-items (like milk, unprocessed fruit, or also books and schooling material) and medicines; together these general exemptions represent almost 85 percent of all ITBIS exemptions. A 2016 WB study on Fiscal Policy and Redistribution, found that the ITBIS itself is only barely progressive, and – of particular interest to our analysis – that ITBIS expenditures heavily favor wealthier households. Specifically, 88 percent of ITBIS tax expenditures in 2013 benefited non-poor households. Thus, paring back ITBIS exemptions would allow the DR government to both increase tax revenue and enhance the progressivity of the tax collection.

Corporate Income Tax Expenditures

18. The DR's CIT expenditures equal almost 1 percent of GDP. Both the standard corporate tax regime and the CIT expenditure structure have been repeatedly altered over time, increasing the complexity of corporate taxation. The CIT rate was lowered from 30 percent in 2006 to 25 percent in 2007-2010, then raised to 29 percent in 2011-13, then lowered again to 27 percent in 2014. The CIT is subject to numerous exemptions and tax credits, many of which are quite generous, both in terms of the rate reductions and the time periods during which they can be claimed. Firms located in special economic zones (SEZs) are among the main recipients of corporate tax expenditures. (See Box 3 for more details)

19. Firms located in SEZ zones enjoy comprehensive and widespread tax exemptions. They are generally exempt from CIT, as well as from municipal taxes, tariffs on imports and capital goods, tariffs on exports or re-exports, and various other tax instruments.[2] Due to the generosity of the exemption regime and firms' ability to maximize their tax benefits, SEZ-based firms declare, on average, negative taxable incomes. As a result, both the introduction of

[2] For a full list of exemptions and further details, see: http://www.dgii.gov.do/contribuyentes/regimenesEspeciales/zonasFrancas/Paginas/Exenciones.aspx

new taxes, while increasing marginally the tax collection (in the order or 0.01 percent of total tax revenues, year on year) tends to produce minimal-to-no statistically relevant effects on overall tax revenue. To prove this point, we used a difference-in-difference approach to analyze the impact of (i) the introduction of taxes on the domestic sales of SEZ-based firms in 2011 and (ii) an increase in this rate from 2.5 to 3.5 percent in 2012. The results show that these policy changes do not appear to have negatively affected the sales revenue, assets, or profitability of SEZ-based firms: these firms continued to report taxable profits and liabilities close to zero, despite registering in the same period rapid growth in sales and profits. However, the same is not true for firms located outside of SEZs, which reported an increase in both taxable profits and liability in line with the increase in their sales and fixed assets. Using a different approach, the analysis also shows that firms that receive tax incentives in the DR exhibit better performance indicators than firms that do not, and this performance gap can be attributed exclusively to the existence of tax exemptions.

20. 16. Do tax expenditures promote higher investment and/or job creation? To answer this question we analyzed the response of firms' long-run investment to changes in the user cost of capital (UCC). The UCC can be defined as the minimum rate of return (before taxes) required for an investment to be profitable. The UCC analysis finds that – owing to tax incentives – firms in SEZs create significantly more jobs than outside the SEZs, but also that these employment gains come at a very high fiscal cost. SEZ firms created 14,000 jobs within SEZs, compared to just 4,500 outside them—a 3:1 ratio, in 2015. However, each job created within SEZs costs five times as much in terms of forgone revenue as each job created under the standard tax regime, which casts serious doubt on the cost-effectiveness of SEZ tax expenditures. Moreover, in SEZs the ratio between the fiscal cost of each job created and the average income per worker is 10:1, far higher the 7:1 ratio under the standard tax regime. In other words, while SEZ-based firms generate a substantial number of jobs, each additional job created comes at a massive fiscal cost, that contributes to undermine the capacity of the government to finance much-needed social services and investment.

Table C. The Estimated Marginal Impact of Tax Expenditures on Investment and Job Creation

By Sector	Jobs Created per Million RD$ of Investment	Additional Investment (RD$ millions)	Implied Additional Employment	Forgone Revenue (RD$ millions)	Cost in Forgone Revenue per Job (RD$)	Average. Income per Worker (RD$)	Ratio of Cost to Income per Worker
Agriculture	0,79	3,064	2,425	718	295,948	156,884	1.9
Construction	0,31	22,606	7,087	1,687	238,035	200,706	1.2
Manufacturing	0,19	72,701	13,948	12,065	864,968	201,798	4.2
Mining	0,10	*N/A*	*N/A*	6,327	*HIGH*	275,606	*HIGH*
Real estate	0,00	39,942	*N/A*	2,036	*HIGH*	230,651	*HIGH*
Consumer services	0,06	16,563	1,017	3,167	3,114,165	183,255	17.0
Business services	0,08	31,874	2,562	2,948	1,150,311	267,344	4.3
Tourism	0,18	64,696	11,930	4,231	354,682	188,596	1.9
Trade	0,53	47,843	25,382	8,971	353,443	158,294	2.2
Transportation & communications	0,01	29,433	*N/A*	35,987	*HIGH*	235,571	*HIGH*
SEZ vs. non-SEZ							
SEZ	0.44	31,732	13,962	30,757	2,202,962	212,927	10.3
Non-SEZ (match)	0.19	23,572	4,585	6,587	1,436,687	215,488	6.7

Source: Authors' calculations based on data from the National Labor Force Survey and Tax Data provided by national authorities

5. Labor Informality and Tax Evasion

21. Labor informality is widespread in the Dominican economy, especially in labor-intensive sectors. The informal sector employs roughly half of the country's labor force. Informal employment is particularly common in construction, retail, and transportation, all of which are labor intensive and have relatively high employment-growth elasticities. By contrast, the capital-intensive finance, mining, and electricity sectors have low levels of informality and weak employment-growth elasticities.

22. Informal firms tend to be small, have less access to capital and technology, and be in asymmetric competition with formal enterprises. Informal workers have lower average wages than formal workers, though this disparity vanishes once education level, age, gender, employment sector and other variables have been accounted for, and most lack social security coverage. Non-compliance with taxes and social security regulations both by firms and workers reduces government revenue, thus pressuring the government's fiscal envelope and increasing the tax collection on the formal sector.

23. Labor informality costs the Dominican government roughly one third of a percentage point of the annual GDP in forgone PIT revenue. Data constraints prevent a similar analysis of the impact of informality on CIT. Depending on how the process of formalization would affect the wages of informal workers, complete formalization would boost PIT revenue by between 0.33 and 0.36 percent of the annual GDP. If education improvements are accounted for, this potential increase may go up to roughly 0.6 percent of GDP, as a consequence of the expected increase in income levels.

24. Education, gender, and sector of employment are the factors most closely correlated with informality in the DR. A male worker with eight years of formal education, who lives in an urban center, does not receive remittances, and works in retail has a 71 percent probability of being informal, which rises to 79.2 percent for a female worker. However, keeping all other variables constant, a male worker with a university education has only a 20.1 percent chance of informality, which rises to 28.2 percent for a female worker. Among all workers, having less than 4.3 years of formal education greatly increases the probability of informality. Despite their higher average education level, women in the DR are less likely than men to work in the formal sector, and they work fewer hours on average. Thus, efforts to address informality should be informed by an understanding of its gender dimensions. The close correlation between education and informality implies that policy measures designed to boost educational attainment of the average worker could therefore promote formalization. Intersectoral mobility would likely play an important role in reducing informality, as more-educated workers move from labor-intensive highly informal sectors to capital-intensive highly formal sectors. Also within sectors, greater human capital could enable the development of more sophisticated value chains and encourage the formation of larger, more complex firms, both of which would likely encourage formalization.

25. In addition to being less prone to informality, workers with higher levels of education are also more likely to be enrolled in the national social security and health insurance systems. The average education level of those enrolled with a Pension Fund Administrator (*Administradora de Fondo de Pensión*) and with the National Health Insurance System (*Seguro Nacional de Salud*) is 11.5 years, compared to an average of just 9.3 years among those not enrolled. Even within the informal sector, workers who are enrolled in the pension system have a higher average education level (10.7 years) than the unenrolled (9.3 years). While formal and informal workers who are not covered by social security and public health insurance tend to have a similarly low level of education, both formal and informal workers who are covered have a similarly high level of education. While exploring these issues further would require more in-depth behavioral analysis than the available data allow, these initial findings suggest that workers are more likely to be

informal if their labor productivity is not sufficient to offset the cost of contributing to the social security system.

6. Recommendations

26. This study shows that there is large scope for enhancing the efficiency of the Dominican tax system and boost revenue. A comparison with selected peer countries suggests that well-targeted reforms could greatly increase the revenue collection to GDP of ITBIS, CIT, and personal income taxes. Moreover, the scope for improvements in collection efficiency is so large that the government could substantially raise revenues without altering tax rates. Raising the ITBIS C-efficiency index from its current level (0.35) to the LAC average for VAT (0.56) would generate an estimated 2.8 percent of GDP in additional tax revenue. Raising CIT revenue efficiency from its current level (0.074) to the LAC average (0.108) would boost tax revenue by an estimated 0.9 percent of GDP, and raising PIT revenue efficiency (0.053) to the LAC average (0.065) would increase revenue collection by an estimated 0.26 percent of GDP. Together, these improvements in efficiency could boost overall revenue collection by as much as 4 percent of GDP.

27. The recommendations focus primarily around three areas: 1) enhance the collection efficiency of the tax system; 2) Reduce/modify costly tax expenditures that are inefficient and unequitable; 3) Reduce tax evasion/avoidance by tackling informality. A more detailed set of policy orientations is offered below.

A. Enhancing Tax-Collection Efficiency. The study shows that a significant part of the collection loss is attributable to mismanagement, administrative burdens, tax distortions, fraud, evasion and, to a lesser extent, to a generous system of tax expenditures. Measures to tackle mismanagement and fraud should focus on increasing the quality, the transparency, as well as the integration and the effectiveness of the tax information and administration systems:

- **Strengthening cross-referencing capabilities would greatly facilitate the identification of non-compliant taxpayers.** The authorities could use tax declarations pre-filled by the tax administration to facilitate tax compliance. For example, the government could impose a "minimum tax" on certain classes of taxpayers (typically, for instance, liberal professions) with a reverse onus clause, which would shift the burden of proof (i.e. demonstrating that their turnover is lower than the 'pre-filled' amount) onto the same taxpayer. Increasing the frequency of audits could further improve compliance by heightening the perceived risk of tax evasion. Finally, more effective information exchange between the DGII and the DGA would help the latter detect inconsistencies in the declarations of importers and exporters.

- **Leveraging information technology and risk-based verification programs could strengthen tax administration**. Improving the quality of the information provided by taxpayers by adopting a system of "early detection" to spot inconsistencies would also reduce tax evasion. This could be achieved by developing econometric models based on samples of audited taxpayers: once the model has been estimated, it could be used to determine whether a given taxpayer's current declaration substantially deviates from the value predicted by the model's parameters. This would place the burden of the proof on the taxpayer, who would be responsible for explaining the causes of the gap. In addition, adopting/extending the use of risk-based verification programs would create disadvantages to poor compliance behaviors, by detecting and deterring noncompliance through risk management. Perceiving a stronger

likelihood of detection as well as holding obvious non-compliers publically accountable, could significantly enhance tax compliance. Finally, voluntary compliance could be improved by outreach and communication campaigns using innovative approaches (web-based presentations, TV spots etc.) targeting high-risk sectors/taxpayers.

❖ **Reforming the use of the "ITBIS exemption card" to the purchase of selected goods and services could drastically reduce ITBIS evasion, and should be accompanied by a strengthening of audit and oversight functions on the administrative side.** Currently, the card is used for purchases linked to SEZ's exports. However, a list of goods and services that are exempt under this provision should be clearly defined. Such a list would focus on equipment, goods and services that are directly and provably linked to the production process. The establishment of a pre-tax refund system could reduce inappropriate uses of the exemption card, thus reducing ITBIS evasion. Such reform should be done in parallel to an intensification of the auditing frameworks that govern the tax administration system, as well as a strengthening of the integration and oversight capacity exerted by key divisions – for instance like the large-taxpayers' one – in order to prevent and/or deter potential opportunities for fraud and detect phenomena like transfer pricing.

❖ **Eliminating 'nuisance' taxes that generate low revenue would streamline tax administration and simplify compliance.** The government should thoroughly review all minor taxes and then consolidate or eliminate those that yield minimal revenue or that serve no clear policy purpose. Enhanced tax administration would expand the tax base without the need for legislative changes, allowing policymakers to focus on priority reforms to the tax structure. A cursory assessment within this study suggests that the very modest revenues generated by many of these taxes do not seem to justify either the private cost of compliance or the administrative burden of enforcement**.**

❖ **Other options to improve revenue mobilization and achieve ancillary policy objectives include:** regularly adjusting excise taxes on fuel to better align tax rates with global oil prices introducing taxes on high-calorie foods and beverages could also have positive health effects, and selectively increasing electricity taxes for large-scale consumers could promote cost-recovery in the electricity sector. Considering the adoption of eco-taxes would provide flexible and cost-effective economic disincentives – based on the 'polluter-pays' principle – to environmentally-harmful activities. Finally, establishing a simplified tax system for small taxpayers could incentivize income-tax compliance and reduce evasion.

B. Reducing costly tax expenditures that are inefficient or unequitable. The tax incentives in the DR can be significantly improved both in terms of equity and efficiency. This study shows that the regime of tax exemptions from value added and corporate taxation is very costly – in relation to the benefits it produces. Streamlining ITIBS exemptions – which represented about 3 percent of GDP in 2013 and due to their regressive distribution do little to benefit poor households – could substantially increase government revenues with a negligible impact on poverty. Fixing asymmetries related to tax neutrality across firm types and economic activity by gradually reforming/phasing out SEZs tax exemptions would not only increase tax revenues but could also alleviate performance distortions and promote economy-wide competitiveness, thus contributing to put to an end the country's dual production and export structure:

❖ **Consider streamlining existing ITBIS exemptions**. Reforming tax exemptions provisions on reduced and zero-rate ITBIS, by maintaining the exemptions on goods that are included in the basic consumption basket used in the national poverty-measurement methodology, along with health and education services, while eliminating less progressive

exemptions, could increase revenue by as much as 0.5 percent of GDP and would have a minimal impact on poor households. The few poor households that would be negatively affected by this reform could be compensated through one of the existing – progressive – transfer programs. Reducing ITBIS exemptions would also increase the traceability of documentation of economic transactions, potentially leading to a decline in tax evasion.

❖ **Introduce routine rigorous cost-benefit analyses of all existing corporate incentives and tax expenditures as a first step to reform them, and adopt clear sunset clauses into all legislation that creates or modifies tax incentives.** All existing corporate tax expenditures should be regularly reviewed, and any legislation that creates or modifies tax incentives should cease to have effect after a specific date, unless further legislative action is taken to extend the law. During the last 40 years the SEZs have benefitted from a generous system of tax incentives, and numerous incentives have been provided with very long or even indefinite timeframes. While they have produced significant benefits to the DR economy, the need to increase revenue generation calls for a reform of the current exemption system. Overall, the government should shift corporate tax expenditures from "tax-holiday" model to an "investment-targeting" model. The methodology proposed in this study is one of the ways in which national authorities could monitor the effectiveness of fiscal incentives to the business sector. Unlike many other developing countries, the DR has a functional electronic database of taxpayer information that includes balance sheets and profit-and-loss accounts. This means that there is no additional cost for taxpayers to provide any additional info, and the administrative cost of the analysis would be relatively modest.

❖ **Finally, the authorities should consider adopting a moratorium on new incentives** until a comprehensive tax-reform program—such as the anticipated Fiscal Pact or a comprehensive tax reform package—can establish a clear and consistent policy framework for tax expenditures.

28. It should be stressed that any reform to the existing tax-incentive scheme needs to be based on a system-wide view of the direction of the tax system and should be phased in gradually to avoid abrupt effects upon concerned individuals/firms. In the past there have been many changes to the tax system in response to fiscal pressures or in response to political interests. Reactionary or ad-hoc approaches should be avoided and the Fiscal Pact or also a Tax Reform could provide a good opportunity to consolidating all tax-incentives schemes into a single section of the tax code, which would support a more coherent and sustainable approach to tax expenditures that reduces their fiscal impact and minimizes their distortive effect on economic incentives. Any change in the tax system must take into account the interdependency of the different taxes and their impact on the income of households and firms. Ultimately, the decision to maintain or modify a given tax system is not just economic/technical but inherently socio-political.

C. Broadening the Tax Base by Tackling Informality. The study shows that the large share of the informal economy in the DR results in widespread tax evasion across income groups and sector of activity. The study finds that the potential tax revenue gains deriving from formalization would be contained albeit non-negligible in the case of the Personal Income Tax (i.e. equivalent to roughly 0.3 percent of budget in the scenario of full formalization, which remains clearly unrealistic). Informality remains an extremely complex phenomenon arising from the combination of multifaceted forces and which cannot be adequately explained by a single source. However, the study finds that the education level and gender of workers are

highly correlated with the probability of being informal. Moreover, informality is very pronounced in labor intensive sectors, such as agriculture, construction and retail. Tackling these correlates may help the formalization of the economy. In light of the above, some possible policy actions include:

❖ **Due to the close correlation between educational attainment and labor informality, implementing education programs could help expand the tax base.** Technical training, vocational education, remedial basic education, on-the-job learning, and entrepreneurship support could facilitate formalization by promoting cross-sector mobility and encouraging the development of more sophisticated value chains. Complementing education programs with measures to reduce the administrative cost of firm formalization and improve the overall quality of the business climate would enhance their effectiveness.

❖ **Targeting large non-compliers in the agriculture, construction, and retail sectors – where informality is prevalent – could accelerate formalization.** There sectors include large proportions of informality. Policies should then focus on large non-compliers in these areas and include a mix of (i) *preventive actions* – for example simplifying tax procedures (e.g. flat/simplified regimes) in these sectors would reduce disincentives to declare work; (ii) *sanctions* – which means strengthening oversight and applying appropriate penalties to would discourage tax evasion, and (iii) *adequate public outreach efforts* – highlighting the negative consequences of informality, including its effect on social security, could promote voluntary compliance.

❖ **Authorities should consider strengthening data gathering efforts on dimensions related to informality, which could significantly expand the understanding of the phenomenon and facilitate the identification of better targeted policy actions.** Among the analytical limits identified by this analysis was the unattainability of specific information on informality, and particularly with regard to the availability of granular data on salary structures (formal vs informal, vis-à-vis social security coverages, etc.), detailed behavioral evidence, as well as on the linkages between investment climate, productivity, human capital and informality. A survey or other data gathering efforts could be undertaken, similar to the efforts conducted in 2006 when an ad-hoc module was added to the ENFT to study the characteristics of informality. Stronger data foundations would prove critical to identify and orient policy changes, given the complexity of this topic.

Chapter 1: Tax-Collection Efficiency and Corporate Income Tax Expenditures

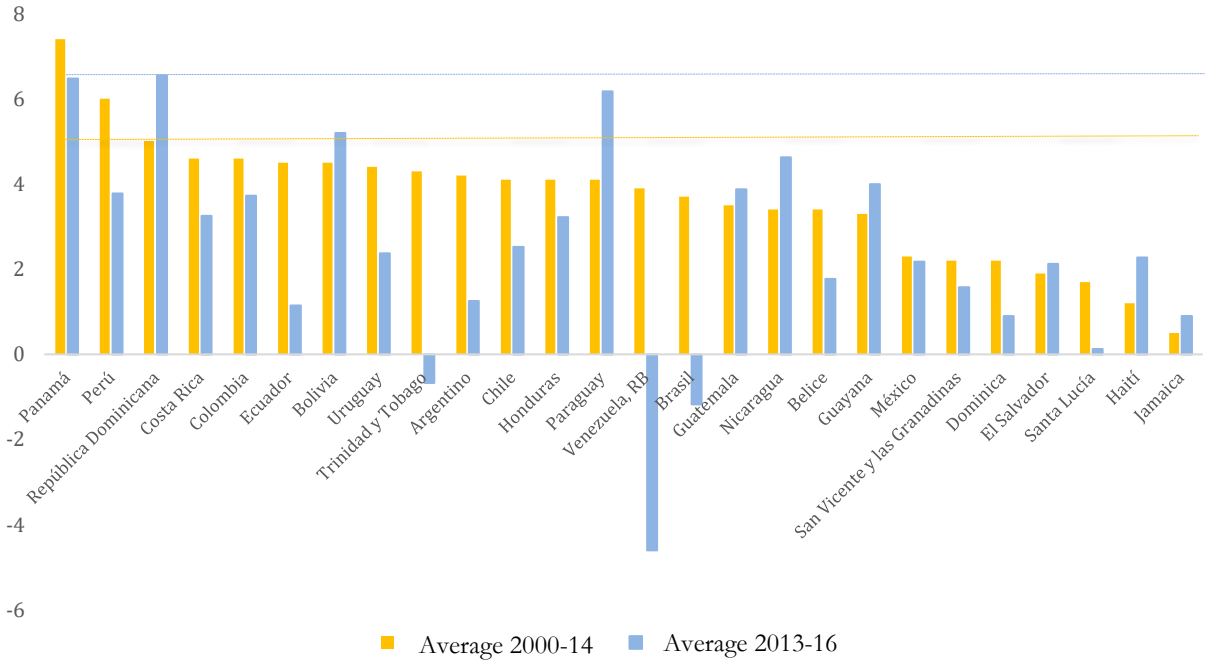
"Every preference in the tax base is a penalty for someone else, because it requires tax rates to be higher than otherwise."

- Joel Slemrod, 1996

Introduction: Macroeconomic and Fiscal Context in the DR

1. The Dominican Republic (DR) is a fast-growing upper-middle-income country. The DR's economy expanded at an annual average rate of 5.7 percent from 1991 to 2013, one of the fastest growth rates in the Latin America and the Caribbean (LAC) region. From 2014 through 2016, a combination of strong domestic demand and favorable external conditions pushed the growth rate to an annual average of 7 percent—the highest rate in LAC (Figure 1). The DR's GNI per capita tripled between 1995 (US$1,910) and 2015 (US$6,130) and now exceeds 90 percent of the LAC average. If the growth rates observed during the past five years are sustained through 2020, the DR's GNI would fully converge with the regional average.

Figure 1: Annual Real GDP Growth, Dominican Republic and Selected LAC Comparators, 2000-2014 and 2013-16 (%)



2. Until recently, the DR's growth had only a modest impact on poverty and inequality. A financial crisis in 2003 pushed the monetary poverty rate from 32 percent in 2000 to almost 50 percent in 2004. The poverty rate remained broadly stable for the next eight years, until rising income levels caused it to drop from 42.2 percent in 2012 to 30.5 percent in 2016.[3] Although the rural poverty rate (38.3 percent) remains higher than the urban rate (28.2 percent), the incidence of poverty in both rural and urban areas fell by roughly 11 percentage points. Income inequality declined slightly during the same period, as the Gini coefficient fell from 0.465 to 0.454, but this trend was not uniform across the country. While the Gini coefficient dropped by 0.015 in urban areas, it rose by 0.007 in rural areas. Despite many years of relatively robust and broad-based growth, the DR's poverty and inequality indicators remain relatively high by regional standards.

3. As a small open economy in the Caribbean, the DR faces structural challenges that limit the government's available fiscal space and affect its debt dynamics. The DR is vulnerable to natural disasters, especially hurricanes and droughts, which can inflict massive economic damage in addition to their terrible human cost. Like many island nations, the DR is reliant on international trade particularly on the import side; and food, fuel and consumer-goods prices are highly sensitive

[3] Government of the Dominican Republic, 2016, *Boletín de Estadísticas Oficiales de Pobreza Monetaria*

to changes in global commodity markets. The US is the country's main export market and its principal source of both foreign direct investment and remittance inflows. Tourism exports, foreign direct investment, and remittances are the DR's major sources of foreign exchange, and its external debt is overwhelmingly denominated in US dollars. Consequently, the DR is subject to both upside and downside risks associated with US growth, as well as changes in US monetary policy. The country's relatively limited land area, coupled with island-specific features contribute to limit the potential of export diversification or import substitution, narrowing further the fiscal revenue base and intensifying external vulnerability.

4. The Dominican authorities have demonstrated a credible commitment to fiscal discipline, but limited domestic revenue mobilization reduces the scope for public investment or redistributive fiscal policies. The consolidated fiscal deficit[4], including one-off tax receipts, capital grants, and tax amnesty collections, has varied between 1.6 and 7.7 percent of GDP over the last few years. The fiscal consolidation that followed the 2012 tax-reform package has helped improve macroeconomic balances by reducing the overall deficit from 7.7 percent of GDP in 2012 to 1.6 percent in 2015 and yielding a primary fiscal surplus of 2.8 percent of GDP on the central government's balance.[5] Improvements in tax administration reduced fraud and evasion; public financial management reforms enhanced the transparency of public accounts; and debt-management policies lengthened debt maturities. Nevertheless, the tax collection remains low at around 14 percent, limiting the government's ability to pursue more active social policies or reduce the consolidated public debt, which is currently estimated at roughly 50 percent of GDP.[6]

The Tax-Revenue Structure

5. Revenue collection capacity in the DR has been narrow. Between 2004 and 2014, the tax collection averaged 13.4 percent of GDP, below the LAC average, while total public revenues averaged 14.3 percent of GDP.[7] Despite the government's efforts, by 2016 total revenues had reached just 14.6 percent of GDP, well below the 2007 peak of 16.6 percent and below the rates of several regional peers with lower per capita GDP (Figure). Widespread informality undermines revenue mobilization, and tax expenditures amounted to an estimated 6.4 percent of GDP in 2015, of which VAT exemptions alone accounted for 3.4 percent. A 15-year CIT holiday for companies established in special economic zones (SEZs) added to total tax expenditures, and the threshold for personal income tax liability remains high. Trade-related tax rates were reduced in 2012, when the Dominican Republic-Central America Free Trade Agreement (CAFTA-DR) took effect.[8] The government responded by increasing the value-added tax (VAT) rate from 16 percent to 18 percent.

6. The DR's revenue effort compares poorly with that of peer countries, and its revenue gap averages around 7 percent of GDP.[9] The revenue gap is measured as the difference between the current level of tax collections and the level that would result from achieving the tax effort prevailing in countries with the same per capita income level. While the DR's revenue effort is slightly above the average for middle-income countries (Figure 2), it is well below the average for Caribbean countries and island nations, which share numerous structural similarities with the DR.

[4] Includes the Central Government deficit, the rest of the Non-Financial Public Sector, and the Central Bank liabilities
[5] This includes a PetroCaribe debt-buyback capital grant equal to 3.1 percent of GDP.
[6] IMF, 2016. See also: Cerovic and Saboin, 2016.
[7] When both tax and nontax revenue are included, the DR has the second-lowest revenue level in LAC. When social security contributions are excluded, the DR's tax revenue is close to the regional average. See: World Bank 2016
[8] The CAFTA-DR was signed by the Dominican government on August 5, 2004 and ratified by the National Congress on September 9, 2005 under Resolution 357-05.
[9] Garza, M., P. Morra, and D. Simard. 2012. "The Fiscal Position: Prospects and Options for Adjustment." In Piñón et al. Central America, Panama, and the Dominican Republic. Challenges Following the 2008-09 Global Crisis. IMF, Washington, DC

Moreover, most of the countries that have both lower GNI per capita and lower rates of tax collection have suffered some form of social or political crisis. Very few countries with a level of GNI per capita comparable to or higher than that of the DR also collect lower tax revenues.

Figure 2: Tax-Revenue-to-GDP ratio and GNI per Capita, Dominican Republic and Comparators, 2013-14

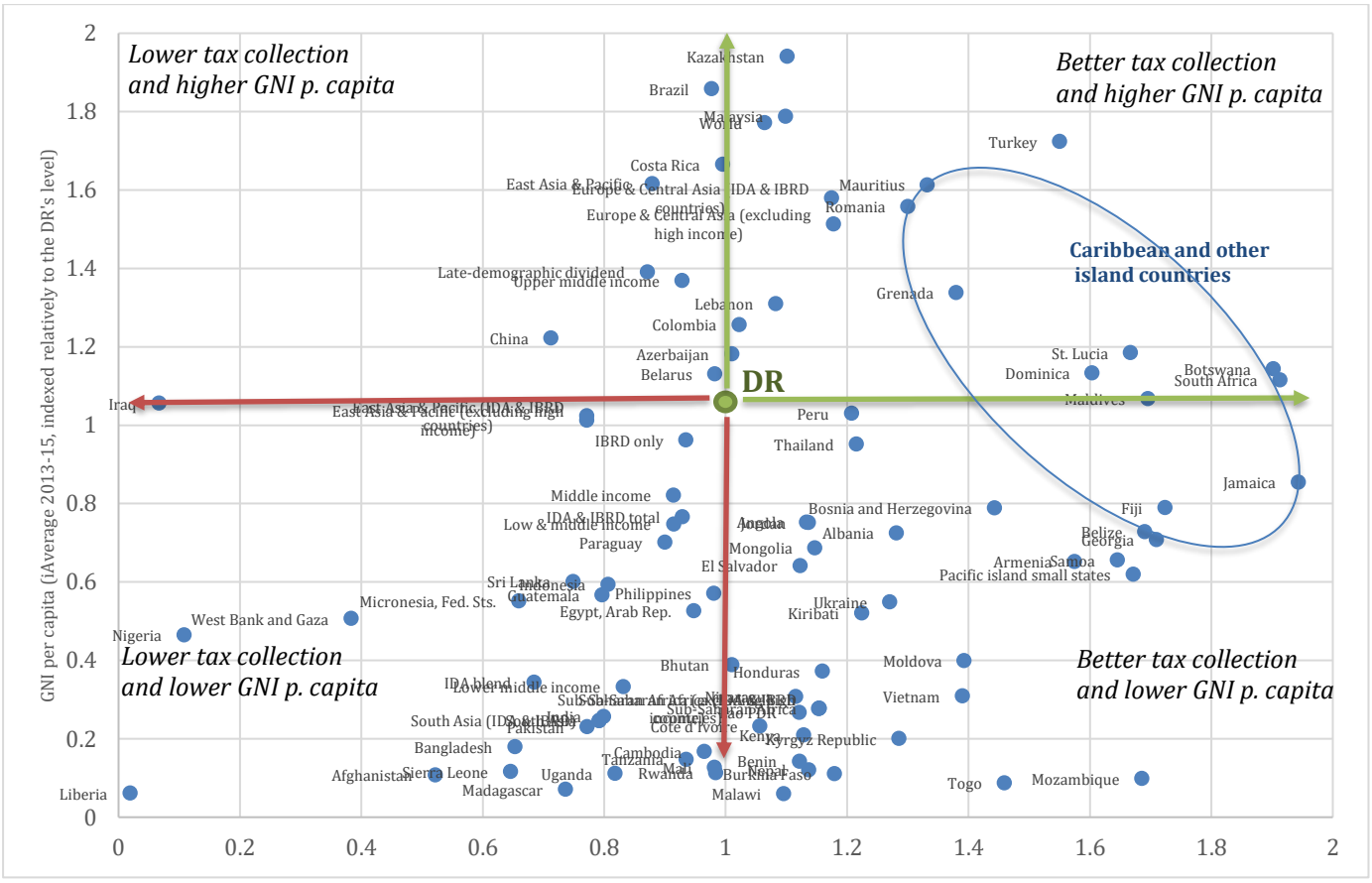
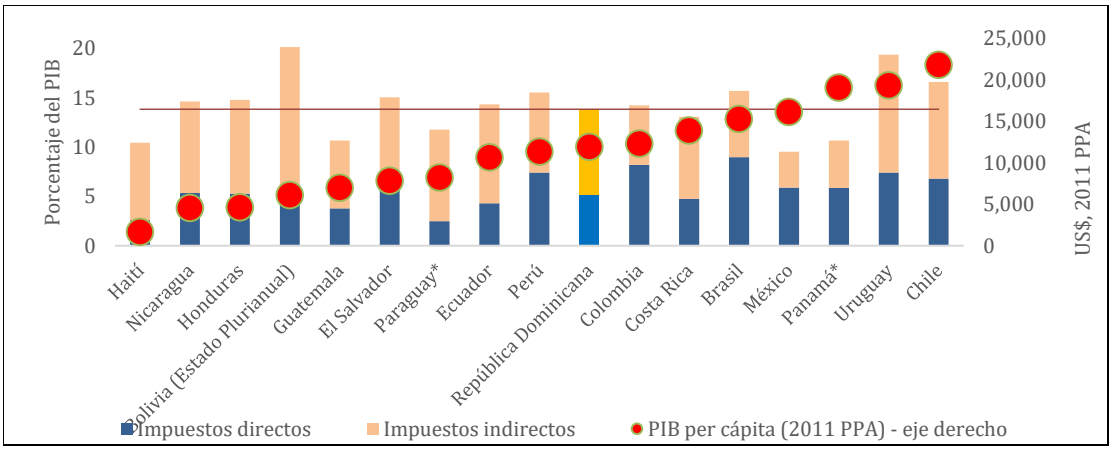


Figure 3: Tax Revenue and GDP per Capita, Dominican Republic and Selected Comparators, 2013



Source: World Bank (2016).

7. The DR relies heavily on indirect taxation. Using 2015 data as a reference, indirect taxes represent roughly 60 percent of total tax revenue. VAT equals 4-5 percent of GDP, a relatively modest level by the standards of lower-middle-income countries.[10] CIT is the largest direct tax,

[10] Garza *et al.*, 2012

accounting for over 15 percent of total revenue and 2 percent of GDP. Taxes on goods and services are the country's main source of tax revenue. In 2015, taxes on goods and services represented 59 percent of total tax revenue. The country's principal VAT is the Tax on Transfers of Industrial Goods and Services (*Impuesto sobre Transferencia de Dienes Industrializados y Servicios*, IBTIS), which represented 36 percent of total revenue collected. PIT and CIT together comprised 29 percent of total tax revenue, while property taxes accounted for less than 5 percent. Free trade agreements such as the CAFTA-DR significantly reduced trade-related taxes, which represented just 7.5 percent of total tax revenue in 2015.

Table 1: Tax Revenue in the Dominican Republic, 2013-15 (average)

	% of total taxes	% of GDP
Total Revenue		**14.3**
Direct Taxes	35.3	4.8
Of which: Wages & income on personal income	7.2	1.0
Corporate Income Tax	15.9	2.2
Other Direct Taxes	10.5	1.4
VAT and Other Indirect Taxes	60.9	8.3
ITBIS (VAT)	33.8	4.6
Excises on Alcoholic Beverages	3.9	0.5
Excises on Tobacco	1.2	0.2
Excises on Oil Derivates	11.4	1.6
Other Indirect Taxes	9.3	1.3
Other Taxes	<0.1	0.0

Source: General Directorate of Internal Revenue

8. The General Directorate of Internal Revenue (*Dirección General de Impuestos Internos*, DGII) is the DR's primary tax-collection agency. The DGII collects 78 percent of all tax revenue. In 2015, the DGII collected 316 billion Dominican pesos (RD$), or 10.3 percent of GDP.[11] The General Directorate of Customs (*Dirección General de Aduanas*, DGA) collects the remaining 22 percent of tax revenue.

9. Ten different taxes account for 77.2 percent of DGII revenue. Four of these taxes—ITBIS, CIT, a fixed tax on the consumption of hydrocarbon fuels, and PIT—generate most tax revenue (Table 2). The domestic ITBIS, which has an effective rate of 18 percent, represents 26.9 percent of all DGII tax revenue. The CIT, which has a rate of 27 percent, brings in 16 percent of DGII tax revenue. The consumption tax on hydrocarbon fuels[12] generates another 10 percent, and the PIT, which applies rates of 15, 20, and 25 percent to different income brackets,[13] contributes 8.1 percent. The law that established the tax on hydrocarbon fuels (Law 112-00) also created a selective ad valorem tax of 16 percent on the domestic consumption of fossil fuels and petroleum byproducts. In 2015, this tax accounted for 4.2 percent of all DGII tax revenue.[14] An excise tax on beer consumption, which includes both a per-liter tax and an ad valorem tax, generates 3.8 percent of the DGII's total tax revenue.[15] Payments made abroad are typically taxed at close to the CIT rate, generating 2.5 percent of DGII tax revenue. The registration of imported motor vehicles (except wheeled farm tractors) is subject an ad valorem tax of 17 percent of the cost, insurance and freight (CIF) value of the vehicle. This tax brings in 2.2 percent of DGII tax revenue. A 10 percent

[11] When all nontax revenues are included, the DGII collected a total of RD$320 billion (10.4 percent of GDP) in 2015.
[12] The Ministry of Industry and Trade adjusts this tax quarterly based on the central bank's consumer price index.
[13] In 2016, the personal income tax threshold was RD$409,281.
[14] The decline between 2014 and 2015 reflects the steep drop in international oil prices during this period.
[15] See paragraph I, Article 375 of Law 11-92. After 2017, the amount of the selective tax will be adjusted quarterly based on the inflation rate calculated by the central bank.

tax on telecommunication services contributes another 2 percent to DGII tax revenue. An ad valorem tax of 0.15 is applied to checks, electronic transfers, and transfers between account holders within the same bank represents 1.9 percent of all DGII tax revenue.

Table 2: Major Sources of DGII Tax Revenue (% of total DGII revenue collected)

Tax instrument	2014	2015
1310010-63-ITBIS (VAT)	25.3%	26.9%
1120010-304-Corporate Income Tax	18.9%	16.0%
1320008-380- Law 112-00	8.4%	9.5%
1110020-310-Income Tax on Salaries, Law 11-92	7.3%	8.1%
1320008-360-Selective tax on domestic consumption of fuels	6.2%	4.2%
1320020-29-Selective tax on beer, Law 11-92	3.5%	3.8%
1130050-317-Tax on international payments	2.6%	2.5%
1220008-362-Tax for vehicle registry	1.9%	2.2%
1330050-353-Selective tax con telecommunications	2.0%	2.0%
1330040-349-Tax on cheques, Law 299-04	1.8%	1.9%
Total	**77.9%**	**77.2%**

10. Meanwhile, a large number of taxes together generated just 0.16 percent of DGII tax revenues in 2015. These include taxes on cellular gaming, matches, land-title registration, and sports betting, as well as excise taxes on cigarettes on alcohol (Table 3). Some of these taxes have extremely limited revenue potential and serve no clear policy purpose, such as the tax on matches, while the low revenue generated from taxes on sports betting, cigarettes, and alcohol appears to indicate serious weaknesses in collection efficiency. The authorities should conduct a thorough review of all minor taxes with a view to consolidating or eliminating unnecessary taxes and strengthening the administration of the remaining taxes (see Annex A).[16]

Table 3: Minor Sources of DGII Tax Revenue (% of total DGII revenue collected)

Tax Instrument	2014	2015
SALES TAX ON BETTING GAMES (LAW 139-11)	0.0746%	0.0667%
TAX ON CASINOS/GAMBLING	0.0570%	0.0583%
TAX ON MOBILE PHONE GAMING (Law 139-11)	0.0209%	0.0175%
TAX ON PHOSPHORUS MATCHSTICKS (84-71)	0.0024%	0.0107%
TAX ON SPORTS GAMBLING SALES (LAW 139-11)	0.0091%	0.0082%
TAX ON IMPORTED ALCOHOLIC BEVERAGES (LAW 259-66)	0.0053%	0.0009%
ADDITIONAL TAX ON CIGARETTES (LAW 137-87)	0.0010%	0.0006%
ADDITIONAL TAX ON RON, GIN AND WHISKEY (LAWS 285 and 312-85)	0.0044%	0.0004%
TAX ON LAND REGISTRY RECORDS (LAW 1542-47)	0.0001%	0.0002%
Total	**0.175%**	**0.164%**

Box 1: Minor taxes

The DR imposes numerous minor taxes that generate extremely small amounts of revenue. These include a tax on telephone-based games established under Law 139-11 that accounts for only 0.018 percent of the total revenue collected by the DGII. Other relevant examples include a stamp tax on matches, established under Law 84-71, which contributes only 0.011 percent of the revenue collected by the DGII. Also, the stamp tax on imported alcoholic beverages (Law 259-66) only generates 0.001 percent of the total revenue collected by the DGII. Article 1 of this law, enacted in 1966, states that manufacturers desiring to introduce their products in the country are required to obtain identification stamps specifically designed for this purpose through national importers. The stamps referred to in this law are sold at the request of importers for RD$ 0.01 for bottles of one liter or larger. The price for bottles smaller than one liter is RD$ 0.005. Article 3 exempts beer, wines, liqueurs, and similar spirits from the provisions of this law.

[16] Annex A provides a more detailed inventory of minor taxes in the DR.

One of the taxes that that brings in the least revenue is the one that assesses sports betting shops, established under Law 139-11. In 2015 this tax generated a sum equivalent to 0.008 percent of the total tax income collected by the DGII. The law imposes a tax of 1 percent on the gross sales or operations of sports betting agencies,[1] drawing a distinction between these operations and lotteries. The text of the law goes on to justify this measure, citing among other reasons that the tax revenue derived from betting and games of chance does not correspond to the volume of activity and the income generated by this sector. However, the low level of collection makes one wonder if this tax is adequately capturing its target base.

Other three taxes that collect very little revenues are the tax on cigarettes, the tax on rum, gin, and whiskey, and the tax on registration of land ownership. The additional tax on cigarettes, introduced under Law 137-87, imposes RD$ 50 on every 1,000 packs of 10 cigarettes and RD$ 100 on every 1,000 packs of 20 cigarettes. Although Law 225-01, passed in 2001, repealed this provision, the DGII records continue to show income from the earlier law, which represents 0.0006 percent of its total revenue collected. The additional tax on rum, gin, and whiskey, established under Law 285-85 and amended by Law 312-85, imposes an additional tax of RD$ 0.1 per liter of rum, gin, or whiskey. In 2015, the DGII reported collecting an amount equivalent to 0.0004 percent of the total tax revenue processed by the agency. The tax on registration of land ownership was created under Law 1542-47 and amended by Law 5147 in 1959. DGII accounts show different entries corresponding to the taxes, incurred at the time of filing the certificates of land ownership and the various documents associated with the registration process. For example, for each duplicate of the certificate of title required under the Registration Decree, a tax of RD$ 30, equivalent to US$ 0.65, is due. Yet the annual amount collected by the DGII comes to only 0.0002 percent of its revenue.

Estimating the Efficiency of the DR's Tax System

11. The following section estimates collection efficiency for three of the country's most important taxes: ITBIS, CIT, and PIT, using different methods, indexes and techniques to assess the productivity of each of these tax instruments. The following analysis uses multiple indicators of tax efficiency. The first, "revenue efficiency" ratio, is the ratio between tax revenue and the tax rate. A second approximation is the "C-efficiency" index, which is often used for cross-country comparisons. C-efficiency reflects the departure of the given tax instrument (say VAT) from a perfectly enforced tax levied at a uniform rate on all consumption. While revenue efficiency measures actual revenue against the tax rate, the C-efficiency index is normalized according to consumption patterns. Next, the G-inefficiency ratio measures losses in tax efficiency due to tax exemptions. G-inefficiency is also referred as "the policy gap," as it measures the potential revenue collection that is lost due to tax exemptions, rate reductions, and deferrals. Finally, the X-inefficiency ratio measures losses due to fraud and evasion. X-inefficiency, which is computed residually, is also often referred as "the compliance gap" because it reflects the cost of noncompliance with the tax administration.

Value-Added Tax (ITBIS)

12. ITBIS generates more revenue than any other tax in the DR. Between 2013 and 2014 it accounted for an average of almost one third of total tax collection and roughly 4.6 percent of GDP. The DGII collects domestic ITBIS, and the DGA collects ITBIS on imports. Between 1990 and 2015, domestic ITBIS (collected by the DGII) has represented roughly 57 percent of total value-added tax revenue, while import ITBIS (collected by the DGA) has comprised the remaining 43 percent. A 2007 law exempting imported raw materials, machinery, and capital goods from ITBIS has reduced total DGA revenue relative to DGII revenue.

13. The standard ITBIS rate tripled from 6 to 18 percent between 1990 and 2016. The largest one-year rate increase (4 percent) occurred in 2000 as part of a set of general tax reforms. This increase coincided with an expansion of the tax base, as a wider range of goods and services became subject to ITBIS (Figure 3).

Box 2: Summary of indicators commonly utilized to assess tax efficiency.

Tax efficiency losses can typically be assessed against three areas: the efficiency related to the rates, the losses due to existing tax exemptions, and those due to deficiencies on the administration front or fraudulent behavior. Along these lines, we can break down the tax efficiency losses along three indicators: the C-efficiency, the G-inefficiency, and the X-inefficiency.

C-efficiency: The C-efficiency index is the ratio of actual tax collection to the tax rate times the volume of consumption. A perfectly enforced tax levied on all consumption at a uniform rate would register a C-efficiency index of 1. The C-efficiency index is often used for cross-country comparisons: most advanced and emerging economies have C-efficiency index values of around 0.5, albeit with large variations, suggesting scope to improve collection efficiency without raising tax rates. The C-Efficiency Index is defined as the actual tax collection expressed as a percentage of Total Consumption net of VAT. The formula is $IEC = \frac{TC}{Rate}$ where IEC is the c-efficiency index, TC represents VAT revenues as a percentage of Total Consumption (net of VAT), and Rate is the VAT tax rate.

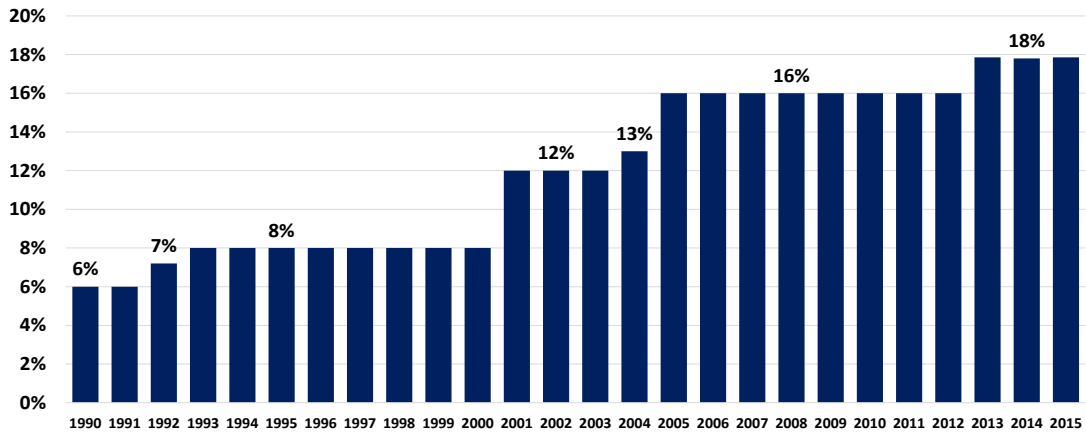
G-inefficiency: The G-inefficiency ratio is calculated by dividing the forgone tax revenue due to the existing incentives by the actual tax collections.

X-inefficiency: The remnant of potential collection which is not explained by the sacrifice due to tax exemptions (G-inefficiency) is attributable to fraud and distortions in tax management: the so-called X-inefficiency ratio. Its formula is $IEX = 1 - IIG - IEC$ where IEX is the Fraud or Distortion index, IIG is the G-inefficiency ratio, and IEC is the C-efficiency index.

The formula above shows that the last three indexes are interrelated, as their sum is indexed to 1.

For more details, see among others: Gómez Sabaini et al., 2012, Keen (2013) and Summers et al. (2001).

Figure 3: The General ITBIS Rate, 1990-2015 (%)

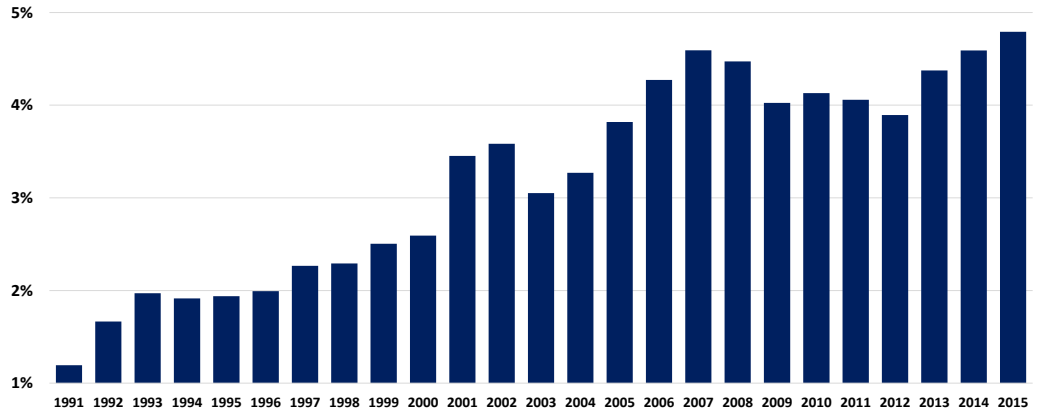


* A weighted rate is used in the years 2013, 2014, 2015 given the implementation of the reduced rates during those periods.
* In the year 2004 we use the weighted rate for the months of entry into force of the rate of 16%.

14. Rising ITBIS revenues mostly reflect periodic rate increases. Between 1991 and 2015, ITBIS revenue rose from a low of 1.2 percent of GDP to a high of 4.8 percent. While this increasing

trend was broadly stable, there were several periods, such as between 2007 and 2012, when collections dropped by up to 0.4 percentage points of GDP (Figure 4). The increase in ITBIS collection largely reflect an increase in the ITBIS rate rather than other factors.

Figure 4: ITBIS Revenue, 1991-2015 (% of GDP)

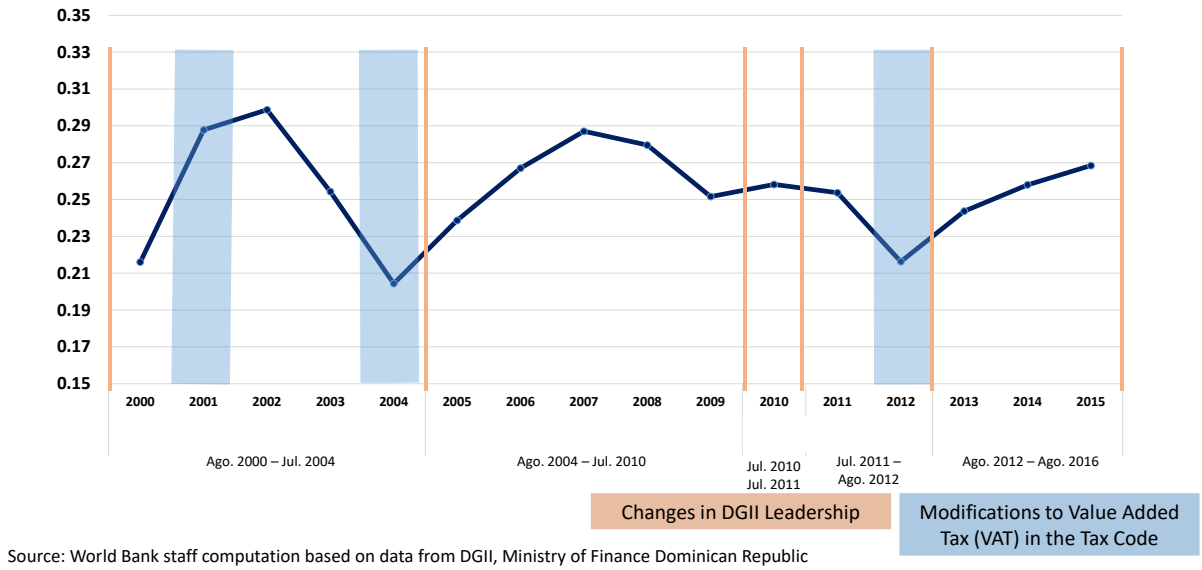


Source: DGII, Ministry of Finance, Central Bank

15. Fluctuations in ITBIS collection efficiency display cyclical patterns that are sensitive to tax policy and administrative changes. The VAT revenue efficiency enables a first approximation of ITBIS efficiency in the DR and facilitates comparisons with similar VATs in other countries. The VAT revenue efficiency is defined as VAT revenue (expressed as a percentage of GDP) divided by the tax rate.[17] In the DR, the ITBIS revenue efficiency tends to rise whenever changes are made to the tax code or the tax administration. The appointment of each new GDII leadership is also associated with a rapid improvement in collection efficiency followed by a gradual decline (Figure 5). Similarly, the Revenue efficiency index rises with changes in the tax code, reaching a peak and then gradually falling until there is a new adjustment in the tax rates and/or the tax base. The ITBIS revenue efficiency was highest in 2002 at 0.299 and lowest in 2004 at 0.204.

[17] The VAT revenue efficiency (or in literature also identified as VAT Productivity Index) is defined as the actual tax collection expressed as a percentage of GDP. The formula is $TPROD = \frac{TY}{rate}$, where TPRO is the efficiency or productivity of the tax instrument, TY is the collection of taxes expressed as a percentage of GDP, and rate is the tax rate. For more details, see among others: Gómez Sabaini *et al.*, 2012.

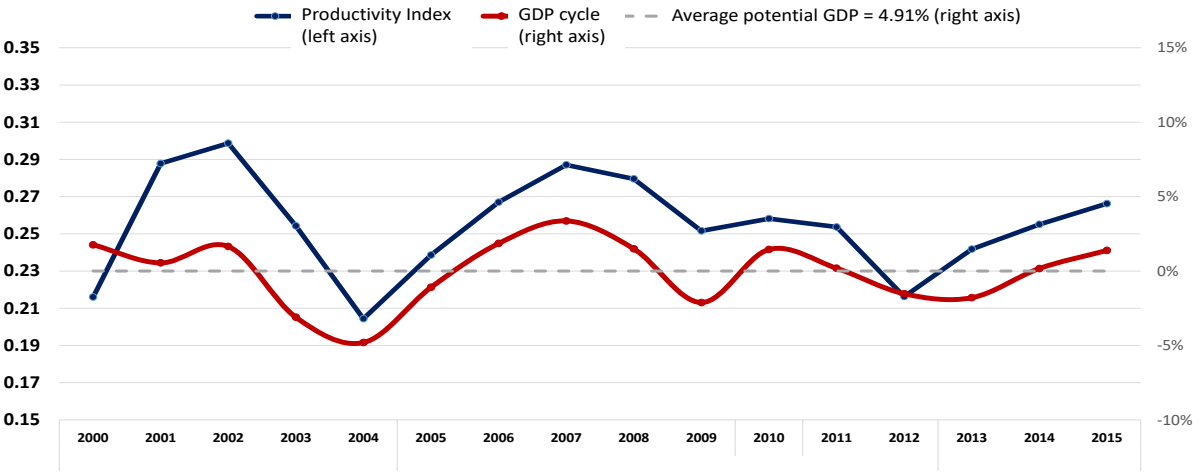
Figure 5: The ITBIS Revenue efficiency, Political Administrations, and Changes to the Tax Code, 2000-2015



Source: World Bank staff computation based on data from DGII, Ministry of Finance Dominican Republic

16. Between 2000 and 2015, ITBIS revenue efficiency was positively correlated with the economic cycle. A rising GDP growth rate was typically matched by an increase in ITBIS efficiency, and vice versa (Figure 6). During economic expansions, households tend to spend a smaller share of their income on staple goods, which are often subject to ITBIS reductions or exemptions, and they spend a larger share on non-necessities that are subject to the standard ITBIS rate. This largely contributes to explain the improvements in the overall productivity of the tax instrument[18]

Figure 6: The ITBIS Revenue efficiency and the GDP Growth Rate, 2000-2015



17. The C-efficiency index [19] for ITBIS confirms that changes in tax policy and administration influence collection efficiency, although the effect appears to be short-lived.

[18] Ref. Tax Revenue Response to the Business Cycle, IMF Working Paper, 2010, C. Sancak, R. Velloso, and J. Xing

[19] The C-Efficiency Index is defined as the revenues collected expressed as a percentage of Total Consumption net of VAT. The formula is $IEC = \frac{TC}{Rate}$ where IEC is the c-efficiency index, TC represents VAT as a percentage of Total Consumption (net of VAT), and Rate is the tax rate. The index ranges between 0 and 1. The closer it is to 1, the more it approaches the case of a perfectly enforced tax, levied at a uniform rate on all consumption.

Like VAT revenue efficiency, the C-efficiency index confirms that changes in tax policies and administration tend to increase collection efficiency, but that this effect diminishes over time until a new reform is introduced (Figure 7). The C-efficiency index is also broadly correlated with the economic cycle (Figure 8). Like VAT revenue efficiency, the C-efficiency index peaked in 2002 (0.389), but it did not reach its nadir until 2012 (0.277). The wide variations in the C-efficiency index over time reveal considerable scope to permanently improve collection efficiency.

Figure 7: The C-efficiency index, Political Administrations and Changes in the Tax Code, 2000-2015

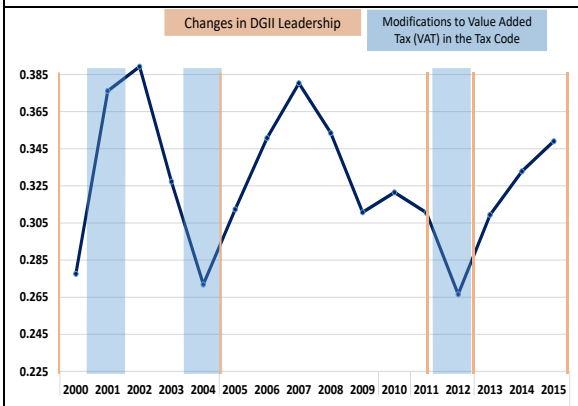
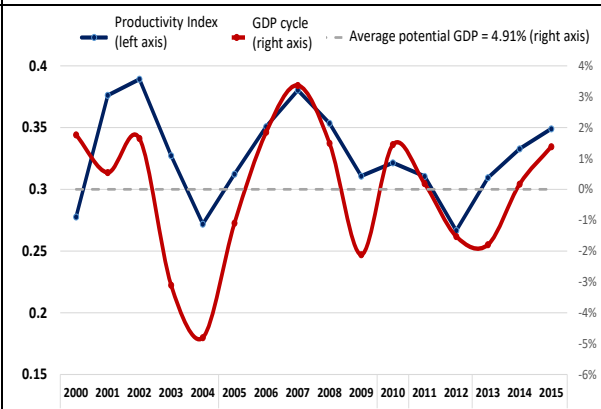


Figure 8: The C-efficiency index and the GDP Growth Rate, 2000-2015



18. The C-efficiency index is based on private net consumption, and displays a pattern similar to that of the VAT revenue efficiency. The former observation is explained by the large share of private consumption in aggregate consumption, as a result of which the C-efficiency index for private and aggregate consumption are very similar (Figure 9). The latter, on the other hand, suggests that both indicators (i.e. the C-efficiency index and the VAT revenue efficiency trend) reinforce the robustness of the conclusions (Figure 10).

Figure 9: C-efficiency index for Aggregate Consumption and Private Consumption, 2000-2015

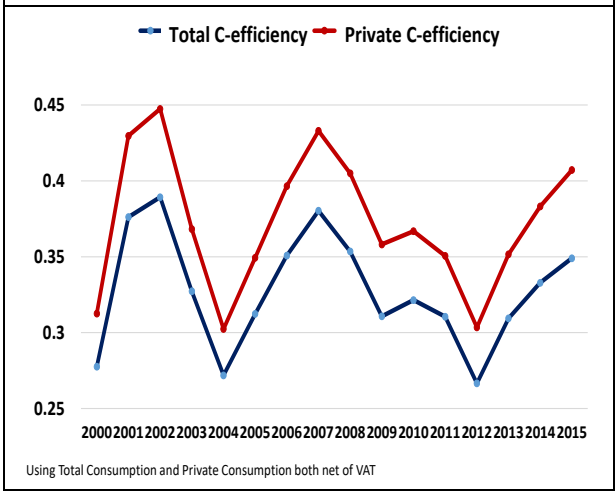
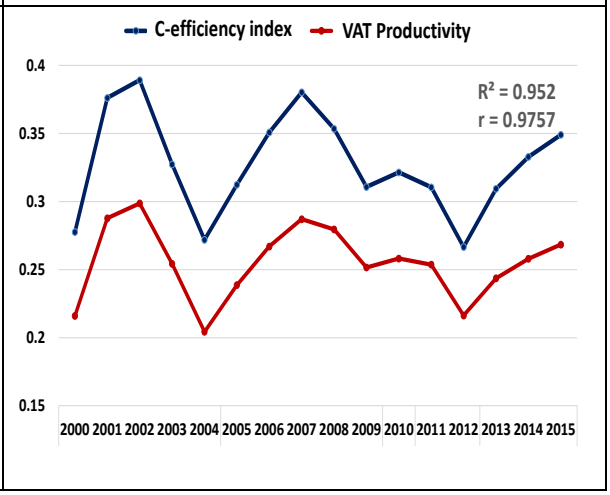


Figure 10: The VAT C-efficiency index and the VAT Revenue efficiency, 2000-2015



19. The DR's general ITBIS rate is 17.9 percent, above the regional average VAT rate of 14.5 percent, but ITBIS collection efficiency is far below both the LAC average and the levels of comparable countries. Only Uruguay, Chile, and Peru have general VAT tax rates that are higher than the ITBIS (Figure 11). In 2015, the DR's C-efficiency indicator was 0.35, well below

the average of 0.56 for the comparator countries. Of the countries analyzed, only Mexico had a lower C-efficiency index than the DR (Figure 12).

Figure 11: Standard VAT Rates, Dominican Republic and Regional Comparators, 2015

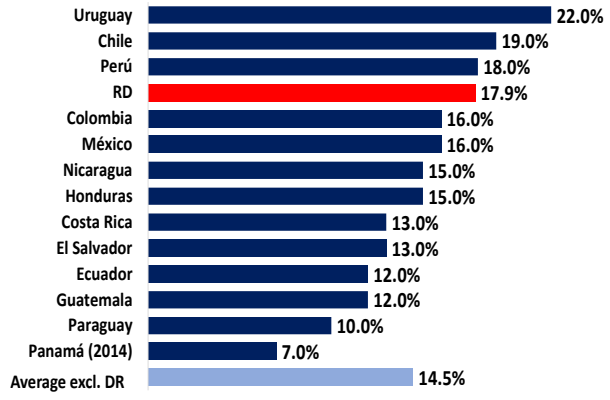
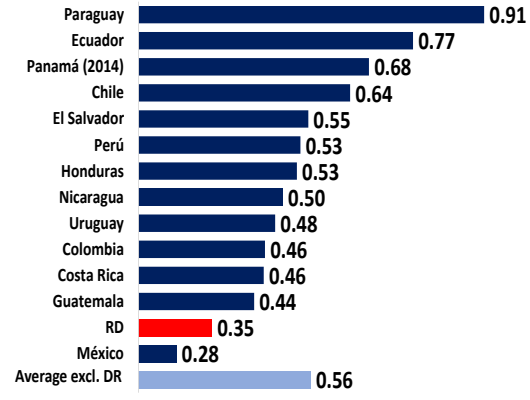


Figure 12: C-efficiency index for VAT, Dominican Republic and Regional Comparators, 2015



20. Tax exemptions significantly reduce ITBIS collection efficiency. Foregone revenue from ITBIS exemptions averaged 3.3 percent of GDP during 2008-2015, reaching a peak of 3.9 percent of GDP in 2009 (Figure 13). ITBIS tax exemptions comprise for the most part some general exemptions such as rate reductions on specific food-items (like milk, unprocessed fruit, or also books and schooling material) and medicines; together the general exemptions represent almost 85 percent of all ITBIS exemptions. The remaining 15 percent concerns very specific exemptions related to ad-hoc items concerning tourism, religious institutions, internet sales, and public concessions, among others. The G-inefficiency ratio measures revenue losses due to tax expenditures, supplementing the C-efficiency index. It is calculated by dividing foregone ITBIS revenue by actual ITBIS collections.[20] The G-inefficiency ratio for the DR compares relatively poorly with those of peer countries. Between 2008 and 2015, the DR's ITBIS G-inefficiency ratio averaged 0.246, ranging from a low of 0.215 in 2012 to a high of 0.30 in 2009 (Figure 14). Even at its lowest point, the DR's G-inefficiency ratio was above the LAC average of 0.21.[21] ITBIS tax expenditures do not include in their computation: a) fuel consumption; b) insurance (as they are both levied at similar rates to selective consumption tax); c) auto-consumption of households, as there is no chargeable event. If, on the contrary, these items are taken into account in the computation of tax expenditure, the level of inefficiency X of that tax can be re-estimated. Such estimation is presented in the Annex, as an additional effort to better assess the level of inefficiency of the country's tax system[22].

[20] See: Corbacho *et al.*, 2013.

[21] These data are for 2010. Note that unlike the VAT revenue efficiency and the C-efficiency index, for which higher scores denote greater levels of collection efficiency, higher scores for the G-inefficiency ratio and the X-inefficiency ratio (described below) indicate greater revenue losses. See: OECD, 2012.

[22] Such an exercise is (purely) theoretical and only meant to provide additional analytical perspectives on inefficiency.

Figure 13: Foregone Revenue from ITBIS Exemptions, 2008-2015 (% of GDP)

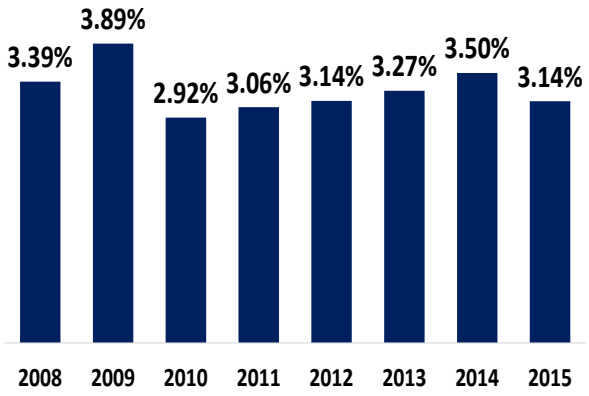
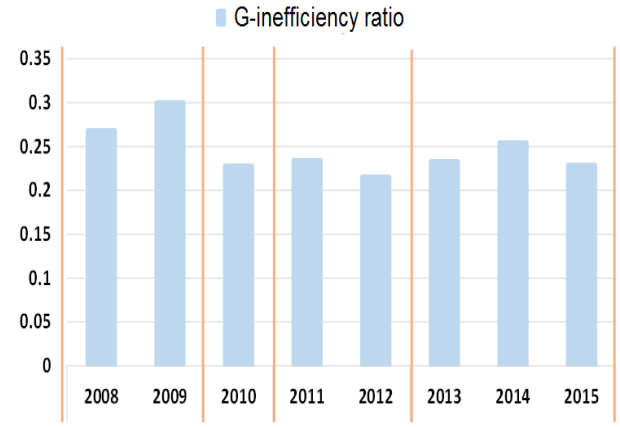
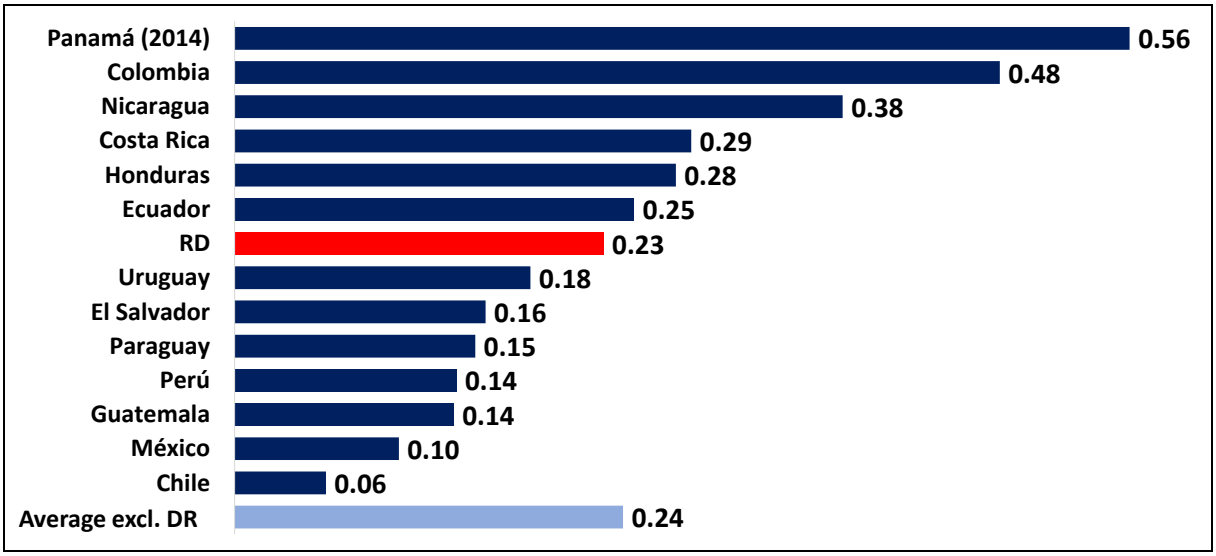


Figure 14: The G-Inefficiency Ratio for ITBIS, 2008-2015 (orange lines = changes in leadership)



21. Several comparable countries in the LAC region have higher levels of G-inefficiency than the DR. On the front of the G-inefficiency rating, instead – which measures the efficiency losses related to tax exemptions on goods and services – the DR registers a score that is in line with the LAC regional average. More specifically, VAT exemptions in Panama, Colombia, and Nicaragua represent a larger share of VAT revenue than ITBIS exemptions in the DR (Figure 15). Nevertheless, this analysis is an additional confirmation that the DR has considerable scope to boost tax revenue by streamlining ITBIS exemptions.

Figure 15: G-Inefficiency Ratios (VAT), Dominican Republic and Regional Comparators, 2015



22. Finally, the DR's X-inefficiency ratio, calculated as a residual, does not compare favorably with those of other countries in LAC. The X-inefficiency ratio represents the difference between potential and actual ITBIS revenue that is not explained by collection efficiency (the C-efficiency index) or tax exemptions (the G-inefficiency ratio). X-inefficiency reflects losses due to tax evasion, fraud, and mismanagement. Between 2008 and 2015, the DR's X-inefficiency ratio averaged 0.434, with a high of 0.518 in 2012 and a low of 0.379 in 2008 (Figure 16). Although

it has been on a slight declining trend since 2012, the DR's X-inefficiency ratio remains well above the LAC average of 0.26.[23]

Figure 16: The X-Inefficiency Ratio (ITBIS) in the Dominican Republic, 2008-2015

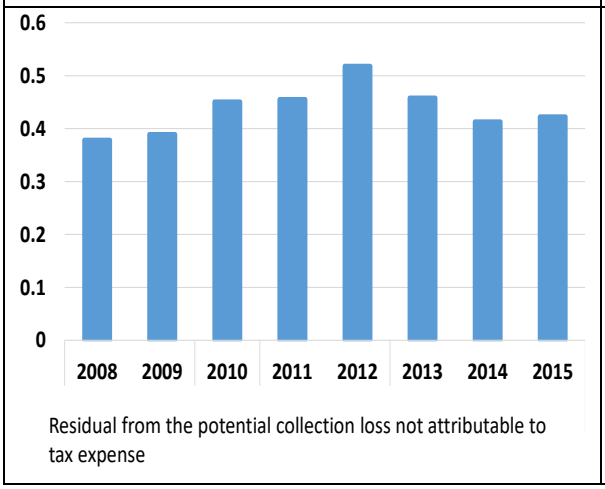
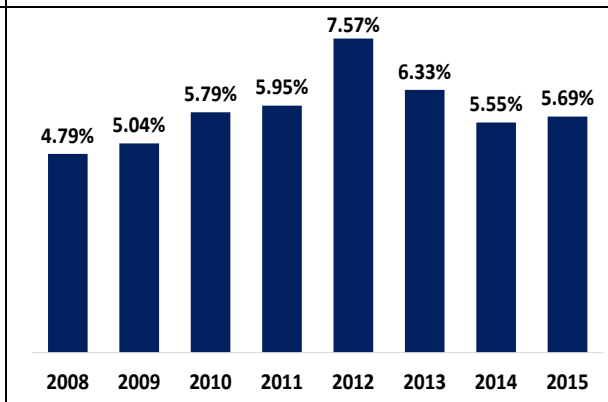
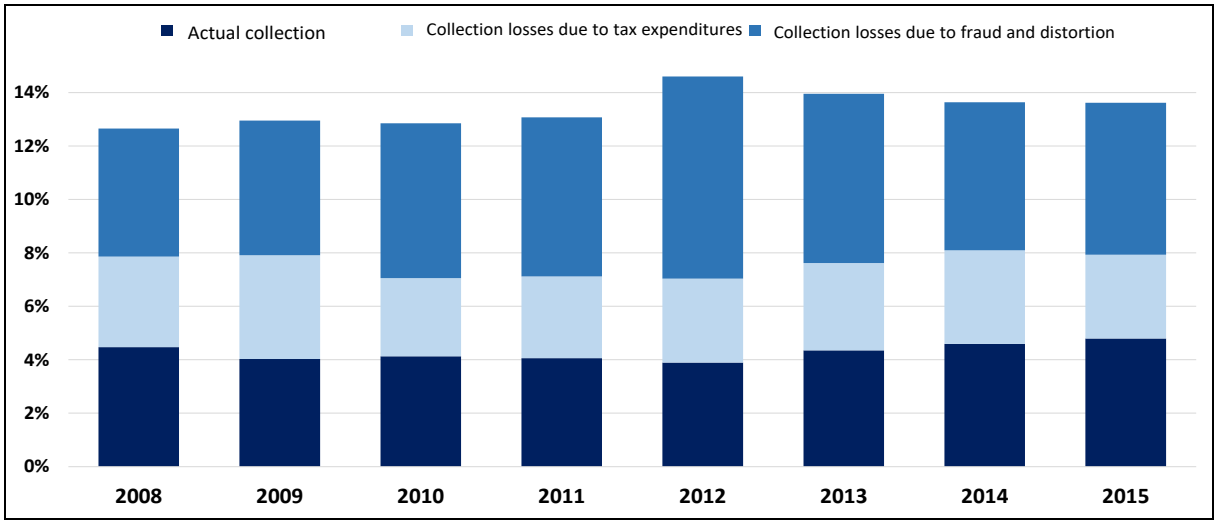


Figure 17: ITBIS Revenue Losses from Tax Evasion, Fraud, and Mismanagement in the DR (% of GDP)



23. The X-inefficiency ratio reveals the considerable ITBIS losses imposed by tax evasion, fraud, and mismanagement. These losses increased between 2008 and 2012, when the X-inefficiency ratio rose from 4.8 to 7.6 percent of GDP. Since 2012, losses due to evasion, fraud and mismanagement have declined as a percentage of GDP, but they remain above their 2008 level (Figure 17). Between 2008 and 2015, ITBIS losses due to X-inefficiency averaged 5.8 percent of GDP, greater than both the cost of ITBIS exemptions (3.3 percent of GDP) and the total value of ITBIS revenue (4.3 percent of GDP) (Figure 18).

Figure 18: Decomposition of Potential ITBIS Revenue, 2008-2015 (% of GDP)

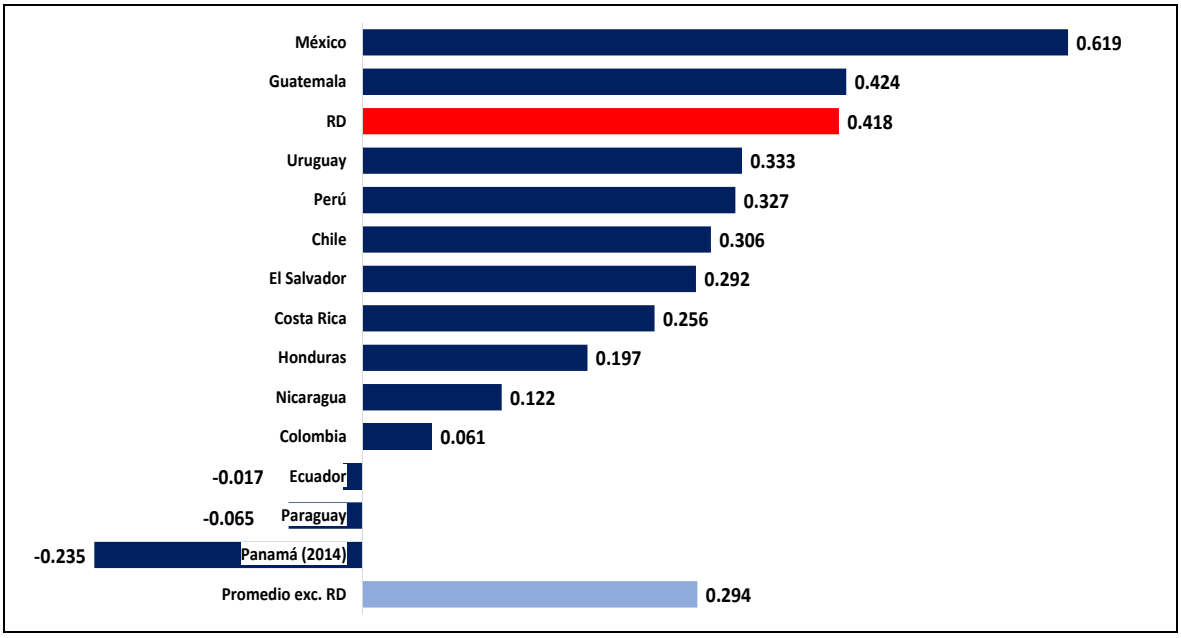


24. The DR's incidence of VAT evasion, fraud, and mismanagement is among the highest in LAC. Only Mexico and Guatemala lose a larger share of VAT revenue to X-inefficiency than the DR (Figure 19). In 2015, the DR's X-efficiency ratio (0.418) was far above the average for the LAC region (0.294). VAT collection inefficiency is much higher in the DR than in Nicaragua,

[23] $IEX = 1 - IIG - IEC$ where IEX is the X-inefficiency index, IIG is the G-inefficiency ratio, and IEC is the C-efficiency index.

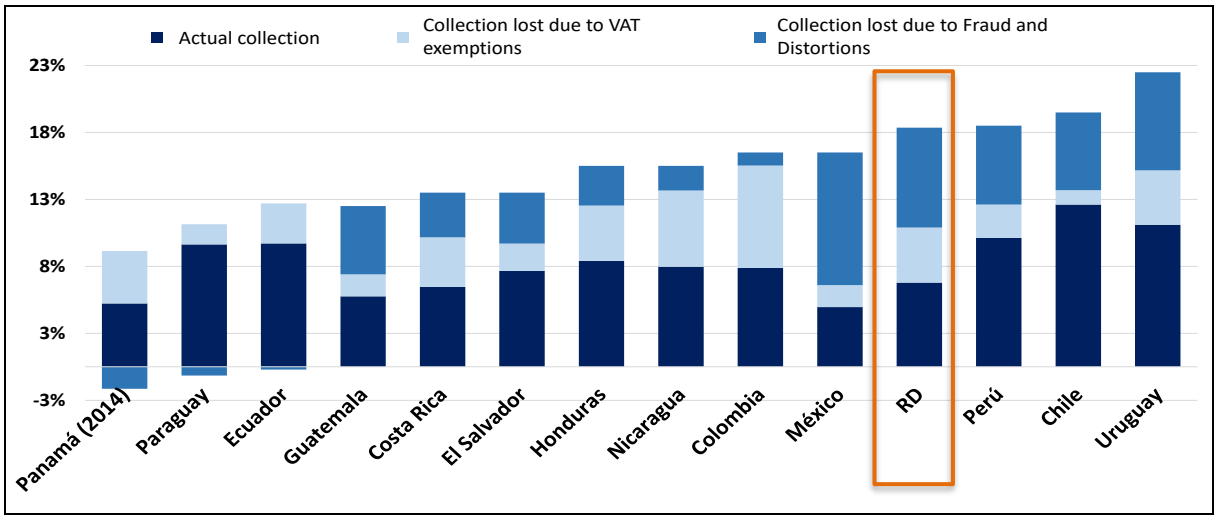
Honduras, or El Salvador, which are all situated at lower levels of economic development (if using the GNI per capita as a general proxy for this).

Figure 19: X-Inefficiency Ratios (VAT), Dominican Republic and Regional Comparators, 2015



25. Due to its generous VAT exemption and high levels of evasion, fraud, and mismanagement, ITBIS collection is far below its potential. The ITBIS is among the LAC region's least efficient VATs. Increasing the C-efficiency index of the ITBIS from its current level (0.35) to the LAC average (0.56) would increase total revenue by an estimated 2.8 percentage points of GDP.

Figure 20: Decomposition of Actual and Potential VAT Revenue, Dominican Republic and Regional Comparators, 2015 (% of total net consumption)

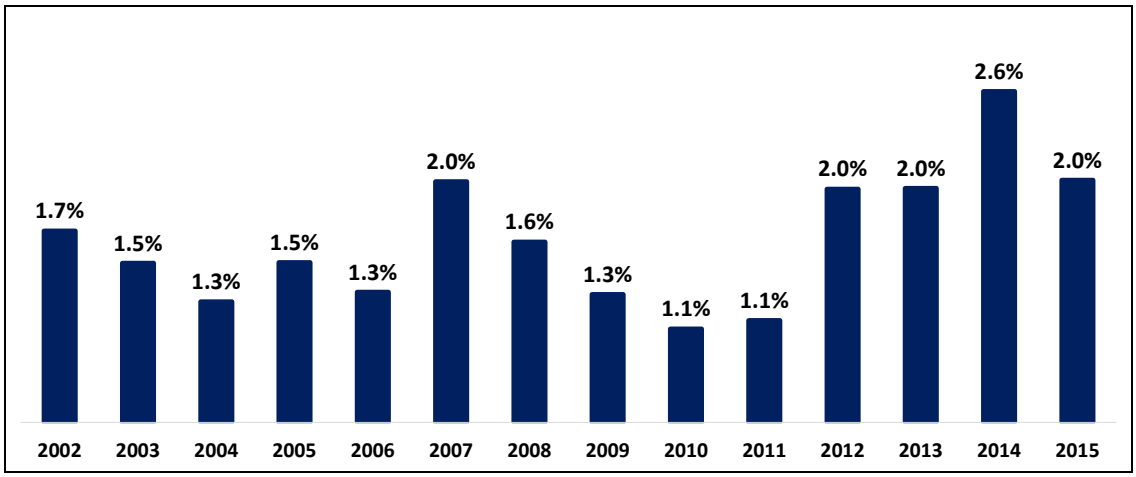


Corporate Income Tax

26. CIT is the DR's second-largest source of tax revenue. Between 2014 and 2015, the CIT accounted for 17.5 percent of total tax revenue, the equivalent of 1.6 percent of GDP (annual average for the period 2002-2015) ranging from a low of 1.1 percent in 2010 to a high of 2.6 percent

in 2014 (Figure 21). In 2006, the government increased the CIT rate from 25 to 30 percent,[24] boosting revenue to 2 percent of GDP in 2007. However, the authorities returned the rate to 25 percent the following year; annual CIT revenue dropped to 1.6 percent of GDP in 2008 and then gradually declined to 1.1 percent of GDP in 2010. In 2012, the government again increased the CIT rate, this time to 29 percent, and annual revenue rose steadily to 2.6 percent of GDP in 2014. The government then lowered the CIT rate to 27 percent, and annual CIT revenue fell to 2.0 percent of GDP in 2015.

Figure 21: Annual CIT Revenue, 2002-2015 (% of GDP)



27. Similarly to the ITBIS calculation, CIT collection efficiency can be expressed as actual revenue (as a share of GDP) divided by the tax rate.[25] Since 2002, CIT revenue efficiency has averaged 0.062. Like the ITBIS, CIT collection efficiency appears to be sensitive to changes in the tax rate, while administrative changes alone appear to have (relatively to other factors) a lesser effect on the efficiency of CIT under analysis (Figure 21). During periods when the tax rate was unchanged, collection efficiency tended to decline. Changes in CIT revenue efficiency broadly correlate with trends in the business cycle (Figure 23). The increase in CIT revenue efficiency in 2011 appears to have been driven by an increase in the tax rate than by the economic recovery, which did not begin in earnest until the end of 2013.

[24] Article 4 of Law 557-05 on Tax Reform set the corporate income tax rate at 30 percent for fiscal year 2006. Paragraph I of this article stated that the tax would be 29 percent in 2007, 27 percent in 2008, and 25 percent in 2009. However, Law 172-07 of 2007 amended Article 297 of Law 11-92 to set the corporate income tax rate at 25 percent starting in year fiscal 2007. Subsequently, Article 10 of Law 139-11 again amended Article 297 of the Tax Code and raised the corporate tax to 29 percent starting in fiscal year 2011. Furthermore, Article 11 of Law No. 253-12, passed in November 2012, set a rate of 28 percent for fiscal year 2014 and 27 percent starting in 2015. Law 495-06 on Tax Reform was enacted in 2006, but it did not alter the income tax rate.

[25] See Gómez et al. (2012).

Figure 22: CIT Revenue Efficiency, Political Administrations, and Changes in the Tax Code, 2002-2015

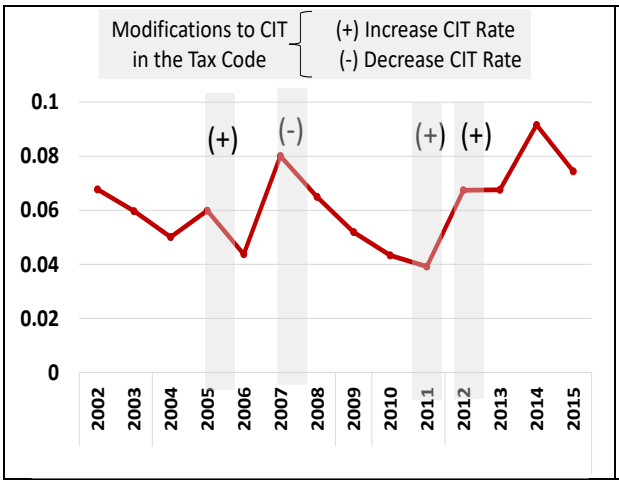
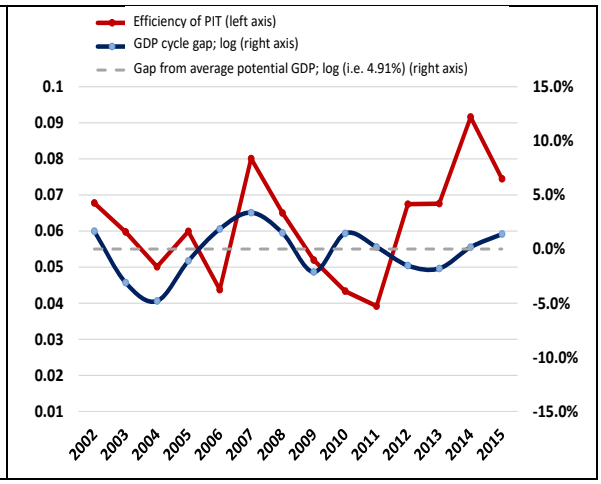


Figure 23: CIT Revenue Efficiency and the GDP Growth Rate Cycle, 2002-2015



Note: (right-hand figure) The GDP cycle and potential GDP are expressed as a percentage of the gap between actual GDP (log) and potential GDP (log)

28. The DR has one of the highest CIT rates among peer countries, but its CIT revenue efficiency is below those of most comparators. The DR's CIT rate is 2.2 percentage points higher than the average for peer countries. Only Paraguay, Mexico, and Peru have higher rates, and only Ecuador and Guatemala have lower efficiency indicators. Brazil, Chile, and Colombia have lower CIT rates and significantly higher revenue efficiencies. Increasing the DR's CIT revenue efficiency from 0.074 to the comparator-group average of 0.108 would boost revenue collection by an estimated 0.9 percent of GDP.

Figure 24 Standard CIT Rates, Dominican Republic and Regional Comparators, 2015

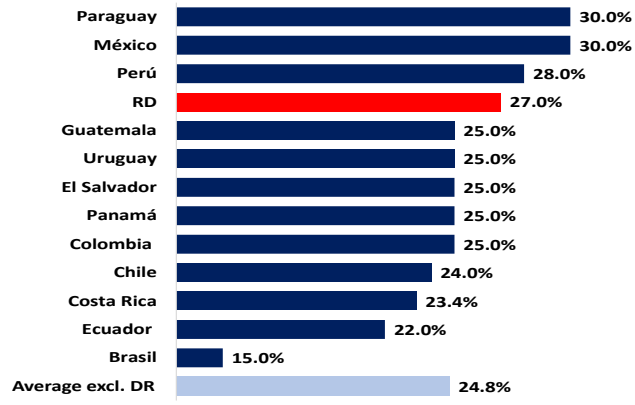
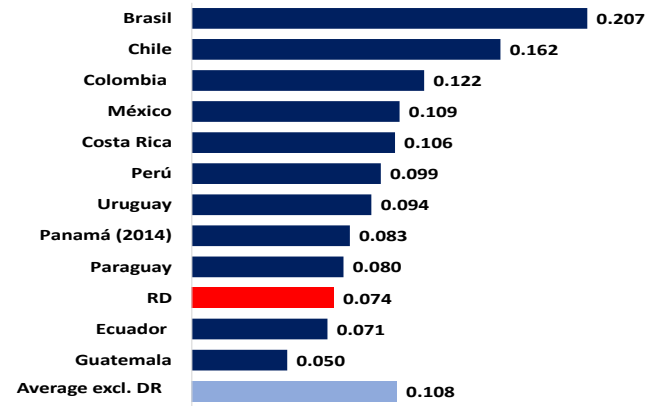


Figure 25: CIT Revenue efficiencies, Dominican Republic and Regional Comparators, 2015

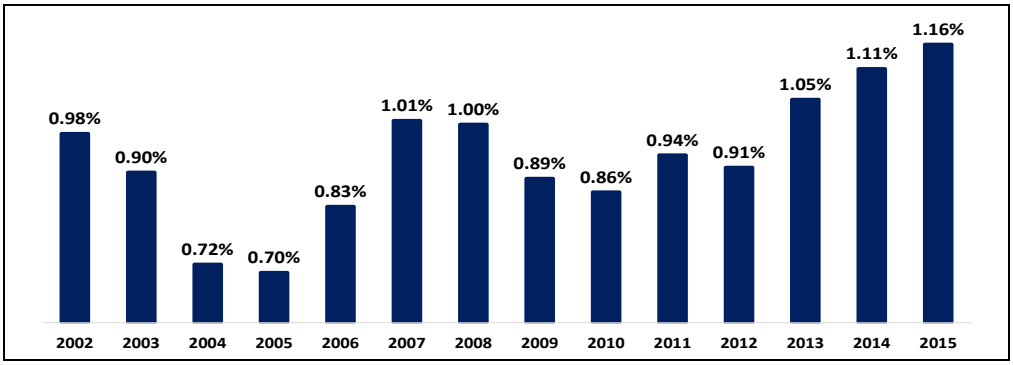


Personal Income Tax

29. The personal income tax (PIT) represents about 10 percent of total tax revenue, or 0.87 percent of GDP.[26] PIT revenue fell to a low of 0.7 percent of GDP in 2005 and reached a peak of 1.16 percent in 2015.

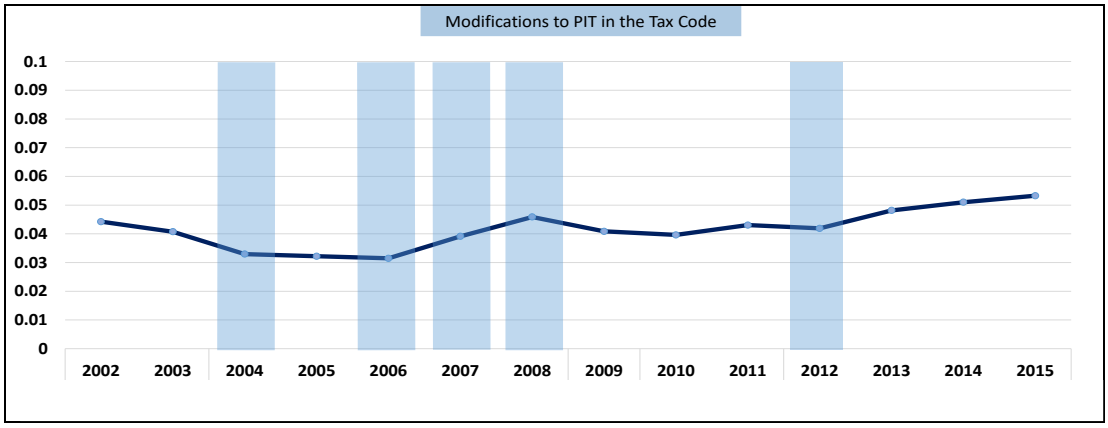
[26] Between 2002 and 2015, the average annual revenue collected from the personal income tax represented

Figure 26: Annual PIT Revenue, 2002-2015 (% of GDP)



30. PIT collection efficiency can be estimated by dividing PIT revenue (expressed as a percentage of GDP) by the average weighted tax rate.[27] As with other taxes, PIT revenue efficiency tends to rise in response to changes in tax policy and then decline gradually over time.[28] A fifth income bracket with a maximum marginal rate of 30 percent was introduced in 2006. In 2007, this rate was reduced to 29 percent, and in 2012 the fifth bracket was eliminated, returning the maximum marginal rate to 25 percent.

Figure 27: PIT Revenue Efficiency, 2002-2015



31. The average weighted personal income tax in the DR is 21.8 percent, below the LAC average of 25.5 percent, and its PIT revenue efficiency (0.053) is also below the average for the region (0.065). Among the DRs regional comparators, only Brazil, Costa Rica, and Paraguay have lower PIT rates, while Chile, Ecuador, and Colombia all impose rates that are substantially higher (Figure 28). Collection efficiency is also low by regional standards. The DR's PIT revenue efficiency is just half those of Mexico and Costa Rica and close to those of Peru and Chile (Figure 29). Bringing the DR's PIT revenue efficiency in line with the regional average would increase its total tax revenue by 0.26 percent of GDP.

[27] The average weighted tax rate is obtained by calculating the minimum and maximum marginal tax rates based on two factors and then adding them together. The first factor is the ratio that results from dividing the income threshold for the lowest marginal rate by the sum of the income thresholds for the lowest and highest PIT rates. The second factor is the ratio that results from dividing the income threshold for the highest marginal tax rate by the same denominator used in the first factor. See: Gómez *et al.*, 2012.

[28] Law 557-05 created a fifth bracket with a maximum marginal rate of 30 percent for fiscal year 2006 with rate reductions to 29 percent, 27 percent, and 25 percent in 2007, 2008, and 2009, respectively. Then Law 172-07 eliminated the fifth bracket, thereby leaving the maximum marginal tax at 25 percent effective from fiscal year 2007 onward. Finally, Law 253-12 eliminated the indexing of brackets for the application of rates for the period 2013-2015.

Figure 28: Average PIT Rates, Dominican Republic and Regional Comparators, 2015

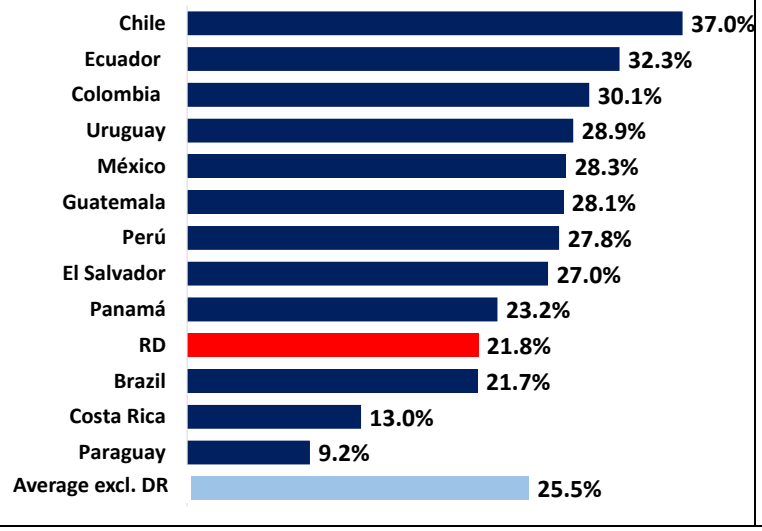
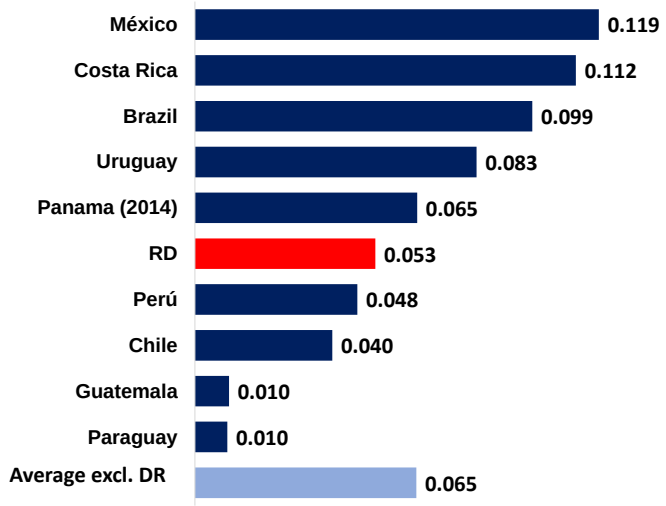


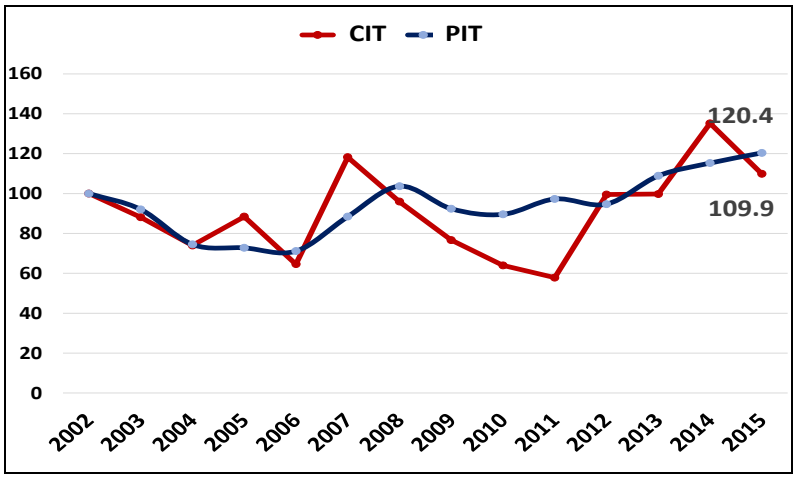
Figure 29: PIT Revenue efficiencies, Dominican Republic and Regional Comparators, 2015



32. Comparing the PIT and CIT revenue efficiencies reveals that the PIT is both more efficient and less volatile. Between 2002 and 2015, the PIT revenue efficiency rose by just under 10 percent, while the CIT revenue efficiency fluctuated by over 20 percent (Figure 30). This suggests that efforts to improve tax administration should focus on the CIT, as its efficiency trend is much more unstable.

Figure 30: PIT and CIT Revenue Efficiency Indices, 2002-2015

(Indexed: base year 2002 = 100)



Tax Expenditures

33. Tax expenditures represent a substantial share of total tax revenue foregone, yet they are far less visible than other expenditure types. Tax expenditures are provisions in the tax law that include tax deductions, exemptions, deferrals, and preferential rates. The objective of tax expenditures is to reduce the tax liability of specific firms and individuals. Tax expenditures are not recorded as outlays in the budget, and the most common technique for estimating them is the foregone-revenue method, a methodology that is also used in the Dominican Republic. This is

typically a static exercise that calculated the loss incurred by tax concessions without taking into consideration potential changes in taxpayer behavior.[29]

34. Like many other countries, the DR has introduced various tax expenditures to advance strategic, economic and social policy objectives. The concept of tax expenditure was introduced relatively recently, in 1968, by Stanley Surrey during his tenure as Assistant Secretary of the US Treasury. The use of tax incentives in a large number of countries has been at the same time very popular and also very controversial. While such incentives manage to affect investment decisions under some circumstances, it is often unclear whether their overall benefits outweigh their costs. A large literature suggests that tax incentives are less effective in attracting investment than basic economic conditions, including adequate levels of human capital, infrastructure, and a well-functioning regulatory system.[30] In particular, tax incentives are rarely able to overcome a fundamentally unfavorable investment climate.[31]

35. The Dominican government has systematically monitored tax expenditures since 2008. The authorities publish these estimates in a dedicated annex to the annual Budget Law according to the provisions of the Organic Budget Law for the Public Sector (Law No. 423-2006). The report is prepared by an inter-ministerial commission coordinated by the Directorate General of Policy and Tax Legislation (DGPLT) and composed of the Directorate General of Internal Revenue (DGII), the Directorate General of Customs (DGA), and representatives from the Ministry of Economy, Planning and Development (MEPyD). The Ministry of Finance prepares an explanatory report to accompany the Draft Budget Law. The latest report, attached to the 2017 Budget Law, was published at the end of 2016.

36. The government has prioritized improving the technical efficiency of tax expenditures. The National Development Strategy 2030, approved in 2012, describes the government's plan to establish a "Fiscal Pact." Among other objectives, the Fiscal Pact would attempt to consolidate all existing tax expenditure schemes into a single section of the tax code, establishing a coherent and sustainable approach to tax that reduces their fiscal impact and minimizes their distortive effect on economic incentives.

37. The cost of tax expenditures in the DR is high by regional standards, although it should be stressed that cross-country comparisons of tax expenditure magnitudes face severe technical limits and should be taken with a grain of salt. In 2016, tax expenditures cost the government an estimated 6.4 percent of GDP in foregone revenue.[32] According to this methodology, the DR's tax expenditures were the third-largest in LAC, after Guatemala and Uruguay, and well above the regional average of 4.5 percent of GDP (Table 4).[33] Moreover, tax expenditure appear to have risen in the wake of the 2012 tax reforms. Forgone revenues increased by an average of 1 percentage point of GDP between 2009-2012 and 2013-2016.[34] Countries define fundamentally different fiscal benchmarks, whose exceptions represent the tax expenditures:

[29] This technique is commonly used in the DR. However, two other methodologies exist: The revenue-gain method estimates the additional revenue that eliminating tax expenditures would generate. This method accounts for behavioral changes by taxpayers. For example, if the preferential VAT rate for a certain good were raised to the regular VAT rate, the price increase might reduce consumption, and thus the estimated revenue gain from eliminating the tax expenditure would be lower than what the foregone-revenue method would predict. The outlay-equivalent method calculates tax expenditures as the amount of direct spending necessary to deliver the same benefit to the taxpayer. Because this direct spending would itself be taxable, the outlay-equivalent method would also yield a lower tax-expenditure estimate than the foregone-revenue method.
[30] Quoting: "Taxation and Developing Countries", EPS Peaks, September 2013.
[31] Cfr.: Tax Incentives: Using Tax Incentives to Attract Foreign Direct Investment; Morisset, 2003
[32] DGII, 2016.
[33] Data sourced from CIAT, Inter-American Center of Tax Administrations (www.ciat.org)
[34] This refers to total tax expenditures.

in other words, even if two countries had the same "amount" of tax expenditure, we would likely not be comparing apples with apples, at the disaggregated level.

Table 4: Tax Expenditures, Dominican Republic and Regional Comparators, 2008-2012 (% of GDP)

	2008	2009	2010	2011	2012
Guatemala	8.01	7.87	7.81	7.54	8.39
Uruguay	5.67	5.74	6.31	6.31	6.40
Dominican Rep.	6.41	6.24	5.50	5.11	5.13
Ecuador	n.d.	4.22	4.17	4.67	4.86
Peru	1.96	1.95	2.08	1.84	1.91
Chile	5.00	4.83	4.69	5.04	4.46
Mexico	4.71	3.80	3.60	3.87	3.82
Brazil	2.51	3.15	3.02	2.80	3.32
Argentina	2.11	1.98	2.33	2.46	2.59
LAC average	4.14	4.07	4.12	4.67	4.60

38. ITBIS exemptions are the largest category of tax expenditures in the DR, followed by preferential rates for fuel products, estate tax deductions, and CIT incentives. Indirect taxes account for three-fourths of all tax expenditures (6.4 percent equivalent of GDP, in 2016). Total ITBIS expenditures are equal to 3.0 percent of GDP. Reduced rates on fuel products represent 0.8 percent of GDP, estate tax deductions are equal to 0.8 percent, and CIT incentives equal 0.7 percent. Moreover, these figures excluded administrative exemptions that are not classified as tax expenditures, such as exemptions on stock market transactions, fuel rebates for public transportation, and exemptions from natural gas excise taxes. A sectoral decomposition of tax expenditures in the DR shows that the general exemptions for individuals (*exenciones generalizadas para las personas físicas*[35]) are the largest single item, representing just under one-third of all exemptions. SEZ exemptions are the second largest item, representing roughly 17 percent of all exemptions, followed by exemptions on the electricity sector (11 percent) and tourism (3 percent). Together, these four tax instruments account for over 60 percent of all tax expenditures in the country.

Table 5: DR Tax Expenditures by Tax Instrument, 2016

	% of GDP	% of Total Tax Expenditure
ITBIS	3	47.1
Estate taxes	0.8	13.3
Fuel taxes	0.8	12.7
Import duties	0.7	10.8
CIT	0.7	11
Other excises	0.4	5.1
Total	**6.4**	**100**

[35] This corresponds to ITBIS exemptions, schooling/education-related expenses, exemption on 13th salary (Christmas salary), among others.

Table 6: Tax Expenditures by Sector, 2016

	% of GDP	% of Total Tax Expenditure
SEZs	1.1	17.2
Tourism	0.2	3
Electricity (generation)	0.7	10.6
Health	0.6	8.8
Education	0.3	4.9
Mining	0.2	2.8
Internet sales	0.1	1.5
Public sector contracts/concessions	0.2	2.6
General exemptions for individuals	1.9	30.3
Other	1.1	18.3
Total	**6.4**	**100**

Source: DGII, Ministry of Finance

39. While tax exemptions are established by law, they are applied by administrative agencies (*consejos*) that exercise considerable discretion. These agencies are composed of public and private sector representatives, and they are responsible for determining whether individual firms qualify for specific exemptions. Firms can only receive a tax exemption if their request for it is approved by the respective agency. The large number of agencies granting tax exemptions, and their relative autonomy and limited oversight, increase the complexity of tax administration and create the potential for misjudgments as well as possible conflicts of interest.

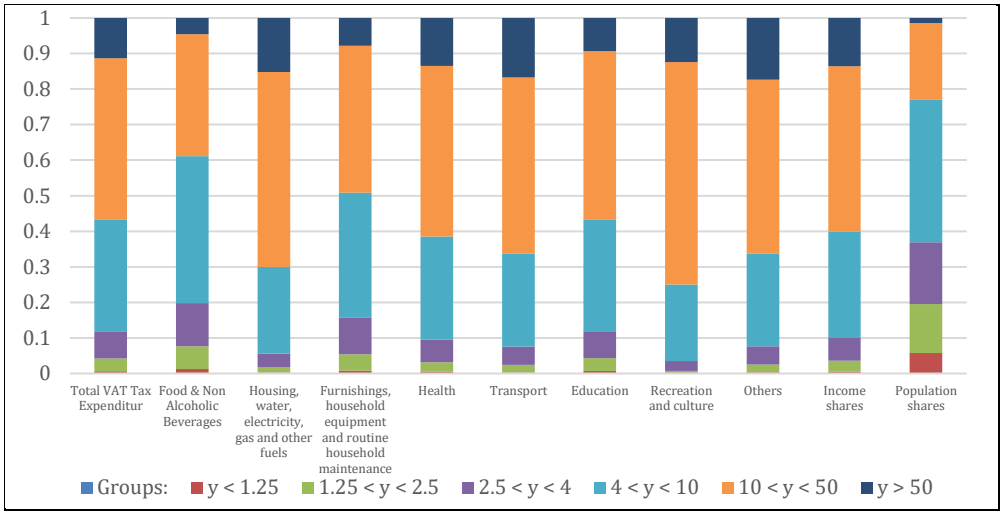
VAT-Related Tax Expenditures

40. The DR's indirect taxes in general, and ITBIS specifically, are barely progressive.[36] Individuals in the top income decile appear to contribute slightly over 41 percent of total ITBIS revenue, which is just above their 40 percent share of market income. Overall, the ITBIS reduces average market income by an estimated 4.4 percent. It reduces the market income of individuals living on less than US$1.25 per day in purchasing-power-party (PPP) terms by 3.5 percent, and it reduces the market income of those living on between US$1.25 and US$2.50 per day in PPP terms by 4 percent.

41. Of more interest to the present study, forgone revenue from ITBIS exemptions is very large and regressive. ITBIS exemptions amount to around 3 percent of GDP,[37] and as noted previously they comprise for the most part general exclusions such as rate reductions on specific food-items and medicines. Recent WB analysis found that 88 percent of total tax expenditures in the DR benefit non-poor households (Figure 31). On the other hand, tax expenditures on food and furnishings generate the most benefit to households with income levels below US$4 per day in PPP terms.

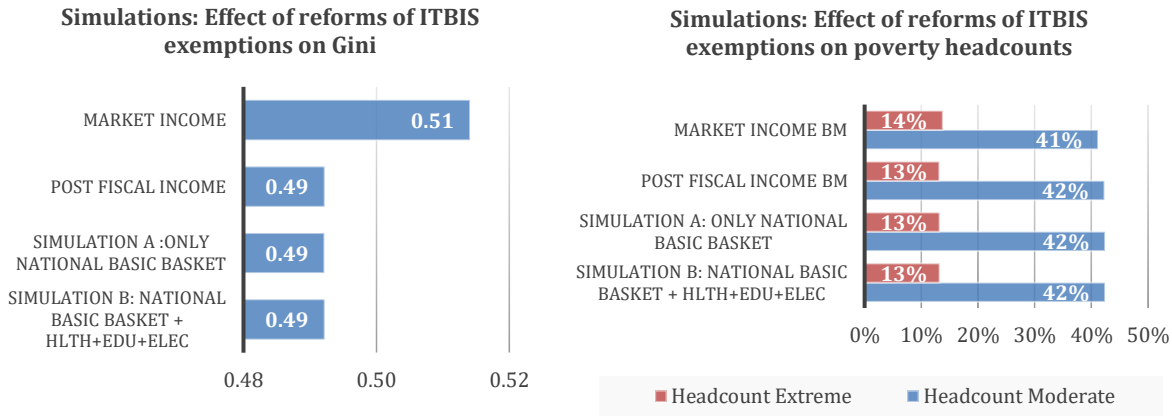
[36] World Bank, 2016. "Fiscal Policy and Redistribution in the Dominican Republic." Washington DC: The World Bank
[37] DGII, 2015.

Figure 31. Beneficiaries of VAT Tax Expenditures by Household Income Level



Source: WB estimates based in ENIGH 2007 and DGII.
Note: Income levels are in US dollars expressed in 2005 PPP terms.

Figure 32: Alternative ITBIS Reform Scenarios and their Effects on Poverty and Inequality



42. The government could thus raise additional revenue by reducing ITBIS exemptions. Short-term simulations reveal that reducing ITBIS exemptions on all goods in the basic consumption basket would significantly increase the poverty rate, but eliminating ITBIS exemptions except those on the basic basket[38] on goods would have a negligible impact on poverty which could be compensated through other instruments.[39] Exempting only goods that are included in the basic consumption basket used in the national poverty-measurement methodology, along with health and education services, while eliminating less progressive exemptions, could increase revenue by as much as 0.5 percent of GDP, with a very minor impact on poverty rates (Figure 32). Any negative effects resulting from the elimination of ITBIS electricity exemptions could be offset by a slight increase in direct cash transfers executed through existing transfer programs, for example like the *Bono Luz* program, while the *Solidaridad* program could compensate for similar effects on other goods and services.

[38] ONE identified in 2012 the basic basket of goods, which could be used to select which remain exempt. See ONE annual report, 2012.
[39] World Bank, 2016. It is important to note that this conclusion is based on a static incidence analysis that does not consider potential changes in taxpayer behavior caused by changes in ITBIS rates.

Corporate Tax Expenditures

43. The impact of corporate tax expenditures on investment and growth has yet to be fully assessed. Benefits equal to almost 1 percent (rounded up) of GDP accrue to the private sector through CIT expenditures. While the estimated size of the revenue loss is closely monitored, little analytical work has examined how these incentives affect the economy or contribute to investment and job creation.

44. Thus, this section analyzes the net benefits of tax incentives granted to firms in the DR by comparing the employment and investment gains generated by the incentive system against their cost in terms of forgone revenue. Typically, corporate tax expenditures are designed to promote the growth and development of specific sectors or firm types. A difference-in-difference estimation is used to provide quantitative evidence of a "profitability gap" between enterprises receiving incentives and those not receiving them; subsequently, a regression estimation is utilized to assess the actual cost-benefit outcomes of incentives on the economic system. The difference-in-difference estimation measures the impact of reforms to tax expenditures passed during the 2006-2015 period by comparing a group of eligible firms with a group of ineligible firms. To make the comparison more rigorous, the characteristics of the control group—such as firm size, location and sector—are similar to those of the treatment group. The regression estimation then examines whether tax expenditures effectively promote private investment by employing the concept of the UCC to estimate the elasticity of investment in physical assets vis-à-vis changes in UCC at the firm level. Policy simulations based on these estimates suggest that tax expenditures may generate substantial additional investment in some sectors, but the employment gains created by that marginal investment are modest and unlikely to withstand a simple cost-benefit analysis.

45. The analysis presented herein focuses on the 100-percent CIT exemptions granted to firms in SEZs. However, it should also be noted that SEZ-based firms benefit from other incentives, such as a 100 percent exemption from import and export tariffs, municipal taxes, ITBIS, and other taxes. Moreover, this analysis focuses on the intensive margin of long-term investment, rather than on the extensive margin of investment attraction—i.e., how many new enterprises would join the SEZs, in net terms, due to the incentive scheme. The 'effectiveness' of investment tax incentives is usually defined as the extent to which they stimulate investment, but this approach focuses almost exclusively on quantity of investment, whereas the quality of that investment is equally important.

Data Specifications

46. The analysis uses anonymized administrative income tax return data provided by the Ministry of Finance for the years 2006-2015. The dataset contains the main elements of the CIT form (IR-2), including profit and loss accounts and corporate balance sheets with detailed information on fixed assets. The information on fixed assets is disaggregated into three types to separately observe the value of buildings, equipment (including vehicles), and other fixed assets. As in other developing countries, firms in the DR tend to be small, and thus there is a large share of small firms in the data. As the analysis focuses on tax expenditures, all firms with annual sales revenue below RD$100,000 (approximately US$2,000) were omitted. While these firms represent approximately 40 percent of the available observations, they only contribute 0.3 percent of the total CIT revenue.

47. The Central Bank of the Dominican Republic provided data on price deflators, for assets and outputs by sector. The central bank made available producer price indices for the period 2005-2015 disaggregated by sector of activity, and deflator series for asset prices by year for the same period under consideration.

48. The difference-in-difference estimation examines the effects of a tax policy changes on a treatment group of firms and a control group of firms. The "winsorizing" technique is used to minimize the possible influence of outliers by coding extreme observations and values. More specifically, the values of the 1st and the 99th percentiles for all outcome variables are applied to observations below or above those limits, respectively. This smooths the graphical and regression results presented below.

49. The following analysis estimates the elasticity of firms' marginal investment to changes in tax policy. The firm-specific interest rate (r_{it}) is assumed to equal the ratio of financial expenses to total fixed assets. Since this ratio takes extreme values for a small fraction of firms, it is estimated using a data subset that excludes outliers. To minimize the loss of information from the dataset, a subsample of firms is selected for which the estimated interest rate takes a value in the interval $(r_t^B - 0.01, r_t^B + 0.05)$, where r_t^B is the central bank's policy rate.[40]

Box 3: Overview of Special CIT Regimes in the DR

The DR's CIT (known locally as the *Impuesto Sobre la Renta*, or ISR) taxed profits at a flat rate of 27 percent during the 2015 fiscal year. The rate has been modified several times. It was lowered from 30 percent in 2006 to 25 percent in 2007-2010, then raised to 29 percent in 2011-13, then lowered again to 27 percent in 2014. Numerous exemptions and tax credits are associated with the CIT, including:

Special Economic Zones

Law 8-1990 established the regulatory framework for Special Economic Zones (SEZs or *Zonas Francas*) for firms primarily oriented to the export market. Firms located in SEZs may sell to the domestic market, but these sales are treated as imports. Likewise, sales from the domestic market to SEZs are treated as exports. Firms operating in SEZs are fully exempt from the CIT, ITBIS, and all local taxes. Commerce between domestic and SEZ firms is not subject to import tariffs or export duties, but in June 2011 the government introduced a 2.5 percent tax on sales from SEZ firms to the domestic market (Law 139-2011). In November 2012, this rate was raised to 3.5 percent (Law 253-2012). However, SEZ firms are not subject to CIT or any other profit tax.

Touristic Development Clusters

Law 158-2001 established tax incentives for the tourism industry, exempting businesses in several tourism-development clusters (*polos de desarrollo turístico*) around the country from CIT, ITBIS, and other taxes and fees. Each new establishment receives a 10-year tax exemption from the start of its operations, which was extended to 15 years in 2013 (Law 195-2013).

Other Special Tax Regimes

Firms located in border regions may be eligible for special tax treatment (Law 28-2001). Other special tax regimes apply to the film industry (Law 108-2010), renewable energy companies (Law 66-1997), and other targeted sectors. See Annex for a complete list of all existing legal instruments establishing tax expenditures in the DR.

[40] For further information on the data and analytical methodology, see Appendix B.

Difference-in-Difference Estimates for Special Economic Zones

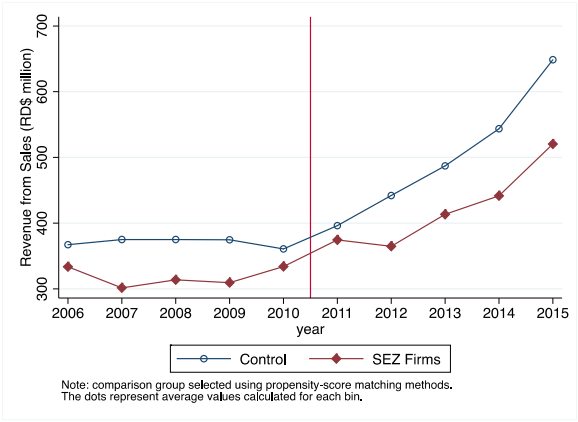
50. This section evaluates the impact of the introduction of taxes on domestic sales by SEZ firms in 2011 and the subsequent increase of the rate from 2.5 to 3.5 percent in 2012. Figure 33 shows the evolution of SEZ firms compared with their matched control group. All monetary values are in constant 2015 RD$.

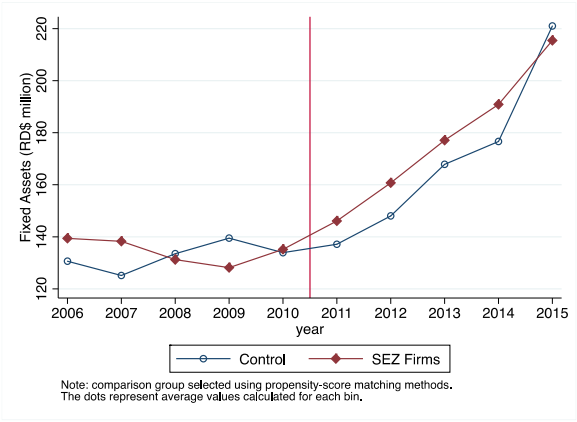
51. The analysis in this section uses a combination of differences-in-differences and propensity-score matching methods. We use a group of firms not affected by the reform (i.e., non-SEZ firms) as a control group for those that were affected. This matched control group of non-SEZ firms is constructed using propensity-score matching, applying the nearest-neighbor criterion. The calculation of the propensity score takes into account the following variables: turnover, fixed assets, gross profits, sector and province.

52. Panel A plots revenue from sales (left) and fixed assets (right). Each dot represents the average value of the outcome variable for firms in each group. In both cases, SEZ and control firms follow a similar pattern, with stable revenue in the 2006-2010 period followed by a steady increase in the 2011-15 period. By construction, the two groups are comparable in size in the pre-2011 period. The patterns of total turnover are consistent with the growth rates of the Dominican economy during the two periods.

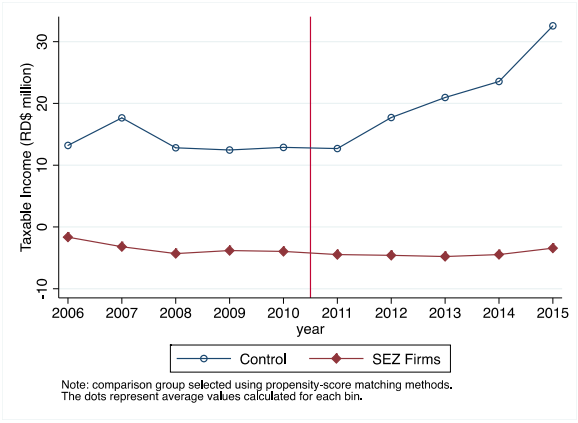
Figure 33: Firms in Special Economic Zones versus a Matched Control Group

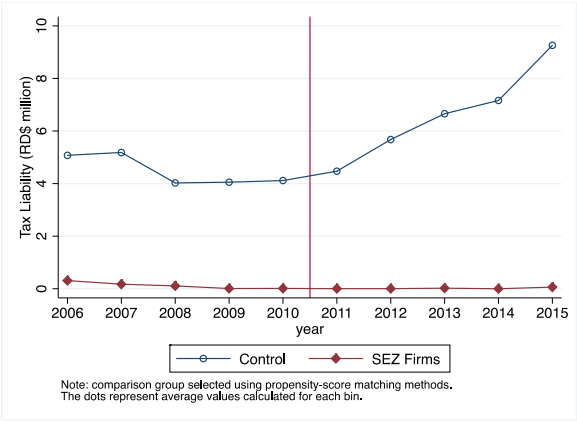
Panel A: Sales and Fixed Assets



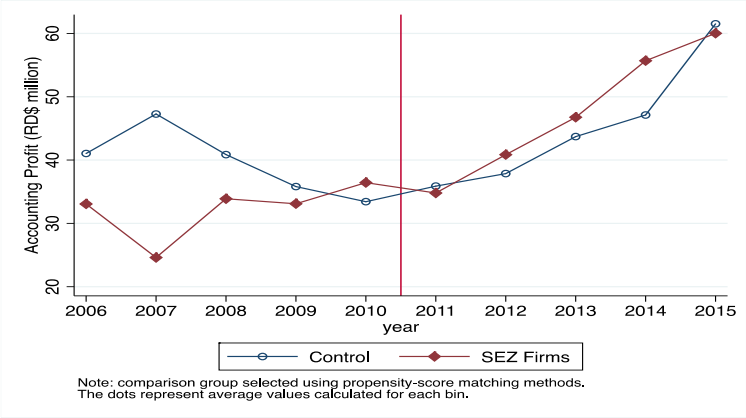


Panel B: Taxable Profits and Tax Liability

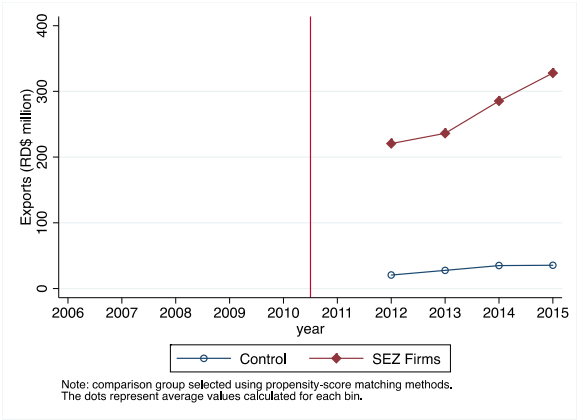


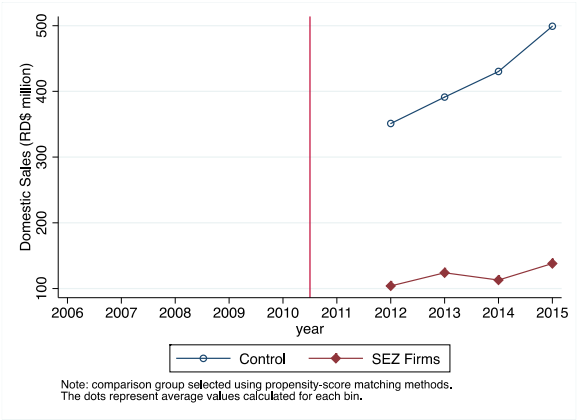


Panel C: Gross Profits



Panel D: Exports and Domestic Sales





53. Panel B shows the evolution of average taxable profits (left) and tax liability (right). Given the large and generous amount of exemptions, firms in SEZs even report negative taxable profits (on average), while those in the control group report much higher taxable profits. The average corporate income taxes are essentially zero for SEZ firms and around RD$5 million for control firms, which have a comparable size in terms of turnover and assets, as shown in panel A.

54. Panel C shows that the gross profits of SEZ firms have grown at a faster rate than those of control firms since the introduction of the policy change under consideration (i.e. SEZ sales taxes in 2011). This trend is surprising, and may be attributable to a variety of factors (e.g. business cycles, or the end of the effects of the global financial crisis, among other) besides the tax rates alone, however it is of interest – to the extent of our analysis – that this occurred while SEZ firms faced higher taxes on their domestic sales in 2011 and 2012.

55. Finally, Panel D shows the evolution of average exports (left) and domestic sales (right) in the 2012-15 period, after the reforms were passed. As expected, SEZ firms tend to export much more than control firms, and they sell less in the domestic market. While data constraints prevent an assessment of how the tax increases on domestic sales in 2011 and 2012 may have affected the destination of sales, SEZ exports increased after 2012, while their domestic sales remained broadly constant. The opposite is true for the control group: domestic sales increased, but exports were essentially unchanged.

56. Tax reforms taken into account do not appear to have had any significant influence on SEZ-based firms' total revenue from sales, fixed assets, or on gross profits. The coefficient on the interaction between the treatment and the post-reform dummy (Treat*Post) captures the difference-in-difference estimator (Table 7). The results are broadly consistent with the graphical

evidence: the tax reforms do not appear to have had any significant effect on total revenue from sales and fixed assets (columns 1 and 2) or gross profits and net investment (columns 5 and 6), but taxable profits and tax liability decrease significantly (columns 3 and 4)—though the graphical evidence suggests that this is due to an increase in reported taxable profits by control firms. The existence of a generous tax expenditure regime enables firms to circumvent the increase in taxation, as shown by the fact that the average SEZ-based firm declares a negative taxable income. More specifically, the introduction of new tax instruments like the one considered in this analysis has practically no statistically-relevant effect on the overall tax liability from SEZ-based firms[41].

Table 7: Difference-in-Difference Regressions for SEZs

	(1) Sales	(2) Fixed Assets	(3) Taxable Profit	(4) Tax Liability	(5) Gross Profit	(6) Net Investment
Treatment	-52.203	1.057	-17.209***	-4.325***	-6.852	1.327
	(55.289)	(24.307)	(2.664)	(0.667)	(10.540)	(3.545)
Post	255.195***	45.743***	10.597***	2.872***	19.589***	2.341
	(49.683)	(15.917)	(2.790)	(0.715)	(6.121)	(3.165)
Treat*Post	-24.222	7.622	-7.815***	-2.093***	9.348	0.515
	(38.506)	(14.357)	(1.954)	(0.468)	(6.222)	(2.893)
Observations	7,426	7,303	7,426	7,426	7,426	6,377
R-squared	0.007	0.005	0.059	0.062	0.002	0.001
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	427.13	148.49	16.98	5.38	41.67	15.77

Note: the treatment is the 2011 introduction of taxes on domestic sales for firms in SEZs. The coefficient on the interaction treat*post measures the impact of this reform on the outcomes listed at the top of each column. The comparison group for the treated SEZ firms is constructed using propensity-score matching. Robust standard errors are in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.
All outcome variables measured in millions of constant 2015 RD$.

57. Firms located in SEZs appear to derive substantial benefits from CIT expenditures. The establishment of taxes on the domestic sales of SEZ firms in 2011 and the rate increase in 2012 do not seem to have negatively affected their revenue from sales, or gross profitability levels. Indeed, these firms appear to be enjoying higher profit margins than they were before the taxes were introduced, though other exogenous factors related to the improving economic cycle for the DR in those years may have contributed to this outcome. On the other hand, the coefficients of the interaction (among the dummies for the two groups) for taxable profits and tax liability are negatively and statistically very significant, relatively to the enterprises in the control group (i.e. those outside the SEZs); this result reflects higher leeway that SEZ-based enterprise enjoy – relative to non-SEZ firms –, as they are more likely to leverage multiple tax expenditure instruments, which facilitates the identification of effective ways to avoid large tax increases. In addition, firms that receive tax incentives perform better than those that do not, and these performance differences can be attributed exclusively to the existence of the tax incentives (Box 4).

[41] The curve for SEZs-based firm in fact remains fundamentally flat (Panel B), despite a marginal rise – in nominal term – is registered, in the order of 0.01 percent (y-o-y) of total corporate tax revenue. Other than statistically negligible, this is graphically not perceivable due to the scale.

Box 4: Do the DR's fiscal incentives influence firm performance?

In order to further strengthen the analysis, an alternative Propensity Score Matching (PSM) estimation is conducted, to assess the relationship between tax incentives and firm-level performance in the DR. Selected performance indicators were taken into account, including: liquidity, return on assets, financial expenses-to-sale, and expenses-to-total active. Within the liquidity dimension, liquidity 1 reflects the ratio of sales to total assets, and liquidity 2 reflects the ratio of total liabilities to total assets. Return on assets is net income over total assets. Financial expenses-to-sales is a proxy for the operating structure of the enterprises, and expenses-to-total-active is a proxy for the size and capitalization of the firm.

A propensity score matching[42] exercise examining four covariates—property value, personnel costs, economic activity, and location—was performed on the entire dataset provided by the Dominican authorities. In other words, firms were divided into a treatment group (i.e. firms that benefit from fiscal incentives) and a control group (i.e. firms that do not receive fiscal incentives), thanks to a PSM based on the four firm-level characteristics listed above. This permits to obtain two groups of "twin" enterprises, which have the very same characteristics in terms of building valuation, employees costs, economic sector of activities and physical location. Consequently, this allows to isolate the effect of fiscal incentives on economic performance.

Following the propensity score matching, a treatment-on-the-treated analysis was conducted using two estimation techniques: nearest-neighbor matching[43] and radius matching,[44] which confirmed that firms receiving fiscal incentives exhibit better outcomes than firms which do not receive them. Both the nearest-neighbor matching exercise and the radius matching exercise found that firms in the treatment group outperformed firms in the control group, as demonstrated by their systematically positive values for expenses to total active across each tested variable. These results, obtained with additional evaluation methodologies further corroborate the finding that firms in the DR derive substantial benefits from corporate income tax expenditures.

Table: Singling out the impact of tax expenditure on DR's firms' performance

	Nearest-Neighbor Matching	Radius Matching
Liquidity1	**ATT= 2.35**	**ATT= 2.35**
Liquidity2	**ATT= 2.57**	**ATT= 2.57**
Financial expenses-to-sale	**ATT= 16946.10**	**ATT= 16949.33**
Return on assets	**ATT= 1.12**	**ATT= 1.12**
Expenses to total active	**ATT= 2.47**	**ATT= 2.471**

Notes: The Average Treatment Effect on the Treated (ATT) performed is considering the dependent variables at time t; the treatment (Tax) at time t-1; the continuous independent variable at time t-2. The dummies for area and economic activities are fixed in the time.

[42] See Annex E for the methodological empirical specifications.

[43] The NNM consists of matching each treated firms with the control firms that has the closest propensity score. It allows for replacement of the matches which increases the average quality of matching, but reduces the number of distinct non-participant observations used to construct the counterfactual mean, thereby increasing the variance of the estimator (Smith and Todd, 2005)

[44] In Radius Matching (RM) approach, a firm from the control group is chosen as a matching partner for a participant that lies within the specified radius in terms of propensity score. Usually a smaller radius results in better quality matching. See DEHEJIA and WAHBA (2002) and SMITH and TODD (2005) for more ample methodological details.

The Response of Investment to Tax Incentives

58. This section examines the contributions of tax incentives (in the SEZ and other regimes) to growth and employment. Whereas the analysis presented above aimed to quantitatively assess whether or not there is a substantial difference in the benefits accrued to SEZ firms through the tax code—and the analysis confirms that this is the case—the following section attempts to understand whether the difference in tax treatment is justifiable, on the basis of a larger contribution of SEZ firms to growth and job creation. This section, in other words, provides a cost-benefit assessment of the special fiscal regime for SEZ firms and estimates the impact of prospective changes in corporate income tax exemptions on long-run investment, to support decision-makers on policy reform options.

59. What is the user cost of capital? When making investment decisions, companies compare the cost of investment with the expected rate of return. The concept of the UCC can help to evaluate investment incentives. The UCC is defined as the minimum rate of return (before taxes) required for an investment to be profitable. Importantly, the UCC is a function of both economic variables, such as asset-depreciation rates, and the tax regime.[45] Consequently, investment elasticities to UCC will differ for each country and each sample group of firms.

60. The elasticity of investment to tax incentives reflects the ability of those incentives to generate new investment within the economic system (proportionally more or less) sufficient to offset their costs. Many studies have estimated the elasticity of investment with respect to UCC using macroeconomic data, finding estimates at around -1; however, some studies, especially those using microeconomic data, have found elasticities between 0 and -1, sparking a debate about the policy implications of the different estimates.[46] Whether the elasticity is greater or less than -1 has important implications for tax policy: if tax incentives encourage a more-than-proportional increase in investment, then this policy is surely welfare-improving. Conversely, if the elasticity is closer to zero, the benefits in terms of investment may not be sufficient to compensate the costs (to the economic system) in terms of foregone tax revenue, and in such case the efficiency of the policy may be difficult to justify.

61. The econometrics for estimating the elasticity of investment are challenging, and a range of methodological approaches can be used. The dynamic nature of investment decisions and the increased availability of large firm-level panel datasets led Chrinko, Fazzari and Meyer (1999) to apply a distributed-lag model to a panel of US manufacturing firms, obtaining an elasticity of -0.25. A more recent study by Bond and Xing (2013), using data from seven European countries and an instrumental-variables strategy, found elasticities ranging from -0.98 to -1.7. In an attempt to reconcile the different estimates, Dwenger (2014) demonstrated that an error-correction model can more accurately account for the long-term equilibrium relationship between capital, UCC, and sales revenue, finding an elasticity of -0.97 for a panel of German firms when using the error-correction model versus -0.5 when using the distributed-lag model.[47] The bottom line is that there is no reason to expect the same elasticity to apply everywhere, since the user cost of capital itself depends on existing policies and economic conditions.

[45] See: Jorgenson, 1963; and Hall and Jorgenson, 1967.
[46] See, e.g.: Eisner and Nadiri, 1968; Hassett, 1992; Hassett and Hubbard, 1994 and 1996.
[47] These results are similar to those obtained by Chirinko, Fazzari and Meyer (1999).

Calculating the User Cost of Capital: Methodological Outline[48]

62. The objective of this analysis is to identify the relationship between corporate tax incentives and firm investment outcomes. Evaluating information on corporate tax rates, capital allowances, and other tax incentives reveals substantial variation in the UCC across firms. Comparing these variations across firms and over time can indicate how changes in the tax treatment affect investment levels. By doing so, we are able to derive the pretax real marginal rate of return on investment that is necessary to earn a minimum after-tax rate of return: this will be a function of economic variables, the general features of the tax system, and the specific tax treatment of investment expenditures.

63. This approach is flexible enough to manage differences in national tax regimes and incentive types, but it requires firm-level information on investment expenditures and tax incentives. While previous analyses computed the UCC at the country-industry level, computing UCC at the firm level can account for differences in asset composition, value addition, and tax structures. Unlike some empirical studies that assume away these differences between firms, we exploit firm-level variation to isolate the "tax component" of the UCC specific to each firm.

64. First, the firm-level UCC is estimated for each type of asset.[49] Data provided by the Dominican Ministry of Finance allows the stock of tangible fixed assets to be disaggregated into three asset types: buildings and real property, facilities and equipment, and other fixed assets.

65. The formal definition of the UCC for firm i in industry j to invest in asset a in year t is as follows:

$$UCC_{ijat} = \frac{P_{jt}^{K}}{P_{jt}}\left(r_t + \hat{\delta}_{jat}\right)\left(\frac{1 - \tau_t A_{jat}}{1 - \tau_t}\right),$$

where:

P_{jt}^{K} is price of investment goods in sector *j*

P_{jt} is the industry-level price of output in sector *j*

r_{it} is the cost of financial capital for firm *i*

$\hat{\delta}_{jat}$ is the economic capital allowance rate for asset *a* in sector *j*

A_{jat} is the present value of capital allowances for asset *a* in sector *j*

τ_{it} is the corporate income tax rate applied to firm *i*

Therefore, the UCC at the firm level is the weighted sum of the UCC for each asset class:

$$UCC_{it} = \sum_{a} w_{iat} UCC_{ijat}$$

where the weights w_{iat} indicate the firm-specific share of asset a in total assets.

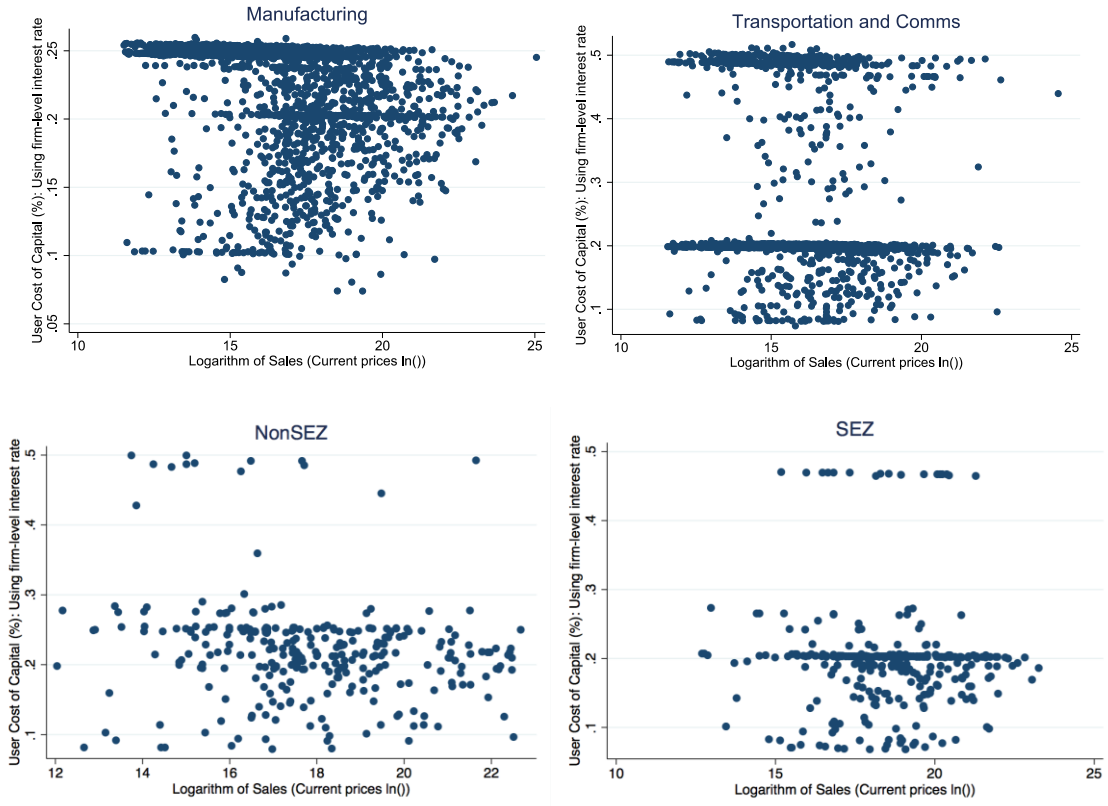
66. Variations in the UCC for Dominican firms during the 2006-2015 period come mainly from two sources: differences in the tax regime, and changes in asset and output prices. The first is variation across tax regimes, as firms located in SEZs or border provinces or that operate in favored sectors receive substantially different tax treatment than that applied by the

[48] This section reflects the methodology in use by a 2015 World Bank report on South Africa, titled: "South Africa Country-level fiscal policy notes: Sector Study of Effective Tax Burden & Effectiveness of Investment Incentives in South Africa-Part II", by Sebastian James

[49] See: Bond and Xing, 2013.

standard regime. The second is variation over time due to changes in asset and output prices at the industry level. The establishment of taxes on domestic sales by SEZ firms also causes a minor variation in the UCC, as explained in the first part of this document. Figure 34 shows scatterplot of the UCC for two representative sectors (Manufacturing and Transportation & Communication) compared with turnover[50]. As it can be seen there is a significant amount of variation in the estimated UCC across firms, with a weak negative correlation implying that the UCC is somewhat lower for large firms compared to smaller ones. The analysis is performed at the sector level, as well as by comparing SEZ-firms to the matched group of non-SEZ firms, constructed as described in the previous section. Please refer to Annex C for the full econometric approach of the User Cost of Capital Elasticity, including the details of the regression analysis and the full regression tables.

Figure 34: UCC Distribution by Sector, 2015



67. Before moving to the results, it is useful to clarify some sector definitions: "Consumer services" includes all activities labeled in the original data as services for households, whereas "Business services" refers to activities labeled as services that are specifically oriented to business. "Trade" includes both retail trade and wholesale trade firms. The SEZ and matched non-SEZ groups are defined in the way described in the previous section. Note that most SEZ firms belong to the manufacturing sector (about 60% of all SEZ firms), very few to the construction sector (less than 1.5%), and virtually none to the mining sector.

Policy Simulation Results

68. Table 8 presents the difference between the actual UCC for each sector and what the UCC would be in the absence of tax incentives. Several factors drive differences across sectors, including rates of depreciation allowances, corporate tax incentives, and asset compositions. Asset compositions in particular may also lead to variations in firm-level UCC within sectors. The size

[50] Expressed as a logarithm.

of the tax incentives for investment ranged from 5.8 percent – for consumer services, tourism, and transportation and communications in 2010 – to 10 percent for mining in 2006. It is also clear from the table that the incentives for all sectors move together over time due primarily to the series of changes in the general corporate income tax, which underwent several reforms in the period under consideration.

Table 8: Difference between Actual UCC and No-Tax-Incentives UCC (%)

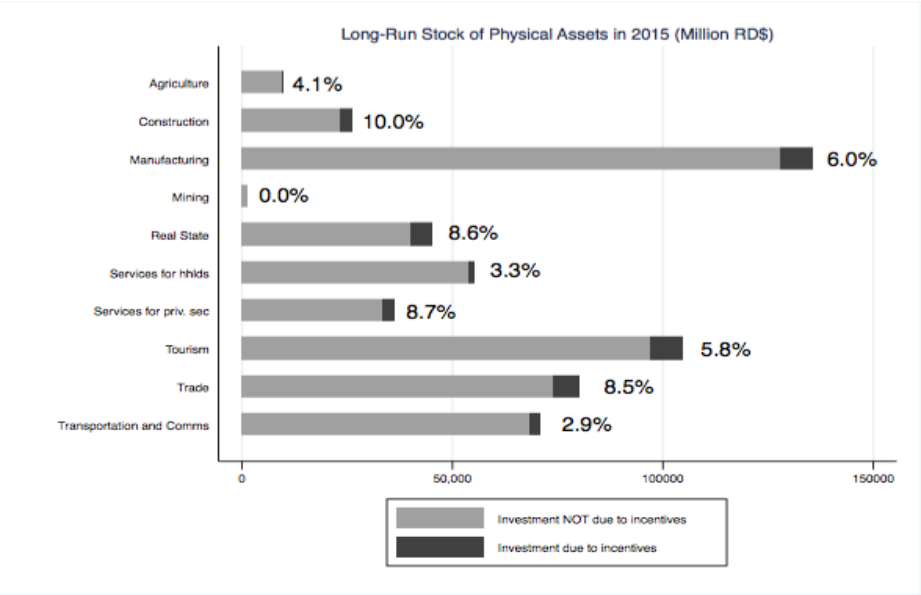
	Fiscal Year									
Sector	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Agriculture	-9	-7	-7.4	-6.7	-6.2	-8.2	-8.3	-8	-7.9	-7.4
Construction	-9	-6.9	-7.3	-6.3	-5.9	-8	-7.9	-7.6	-7.7	-7.1
Manufacturing	-9.5	-7.2	-7.8	-6.7	-6.1	-8.5	-8.4	-8.1	-8.2	-7.4
Mining	-10	-7.2	-7.6	-6.2	-5.9	-8	-8	-7.7	-7.7	-6.4
Real estate	-8.5	-6.9	-7.1	-6.8	-6.5	-8.2	-8.2	-8.1	-7.9	-7.5
Consumer services	-8.6	-6.6	-7	-6.2	-5.8	-7.8	-7.7	-7.5	-7.4	-6.9
Business services	-9.2	-7	-7.5	-6.4	-6	-8.2	-8	-7.8	-7.8	-7.2
Tourism	-8.5	-6.6	-6.9	-6.2	-5.8	-7.8	-7.7	-7.4	-7.5	-7
Trade	-9.2	-7	-7.4	-6.4	-5.9	-8.1	-8	-7.7	-7.7	-7.1
Transportation & Communications	-9.2	-7	-7.5	-6.3	-5.8	-8	-7.9	-7.6	-7.7	-7.1
TOTAL	-9.1	-7	-7.4	-6.4	-6	-8.1	-8	-7.7	-7.8	-7.2

69. Table 9 shows the change in the stock of tangible assets in each sector that is estimated to materialize because of tax incentives received. Combining the information in Table 8 with the user-cost elasticity estimates presented in Annex C enables an estimation of the expected change in the stock of tangible assets for each sector and year. Table 9 shows the marginal change in investment attributable to tax incentives. For example, in 2015 the stock of tangible fixed assets in the construction, business services, and trade sectors were an estimated 10 percentage points, 8.7 percentage points, and 8.5 percentage points higher, respectively, than they would have been without tax incentives. The estimated effects are smaller, but still substantial, in other economic sectors.

Table 9: Estimated Change in Tangible Fixed Assets Stock Due to Changes in UCC (%)

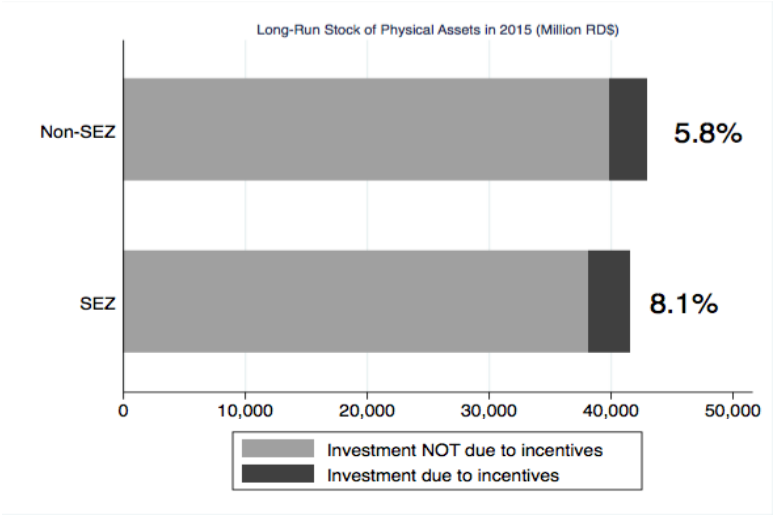
	Fiscal Year									
Sector	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Agriculture	5	3.9	4.1	3.7	3.4	4.5	4.6	4.4	4.4	4.1
Construction	12.6	9.7	10.3	8.9	8.3	11.3	11.1	10.7	10.8	10
Manufacturing	7.7	5.8	6.3	5.4	5	6.9	6.8	6.5	6.6	6
Mining	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Real estate	9.9	8	8.2	7.8	7.5	9.4	9.4	9.3	9.1	8.6
Consumer services	4.2	3.2	3.4	3	2.8	3.8	3.7	3.6	3.6	3.3
Business services	11.2	8.5	9.1	7.8	7.2	9.9	9.7	9.4	9.4	8.7
Tourism	7.1	5.5	5.8	5.2	4.8	6.5	6.5	6.3	6.3	5.8
Trade	10.9	8.3	8.8	7.6	7	9.6	9.4	9.1	9.2	8.5
Transportation & Comms.	3.7	2.8	3	2.6	2.4	3.3	3.2	3.1	3.1	2.9
TOTAL	9.6	7.4	7.8	6.8	6.4	8.6	8.5	8.2	8.2	7.6
SEZ vs non-SEZ firms	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
SEZ firms	11	8.2	8.8	7.2	6.4	9.1	9.1	8.7	9	8.1
Non-SEZ (match)	7.4	5.6	6	5.2	4.7	6.5	6.4	6.2	6.2	5.8

Figure 35: Additional Investment Due to Changes in UCC, by sector, 2015 (RD$ millions)



70. Figure 35 is derived from the same data as Table 9, but it shows the cumulative amount of additional investment in each sector in 2015 due to tax incentives. The use of the nominal values (in RD$) rather than percentages is meant to better illustrate the magnitude of the impact of tax incentives. Figure 36 shows the cumulative amount of additional investment due to tax incentives among SEZ and non-SEZ firms. Interestingly, the amount of investment attributable to tax incentives appears to be similar in both cases.

Figure 36: Additional Investment Due to Changes in UCC among SEZ and Non-SEZ Firms

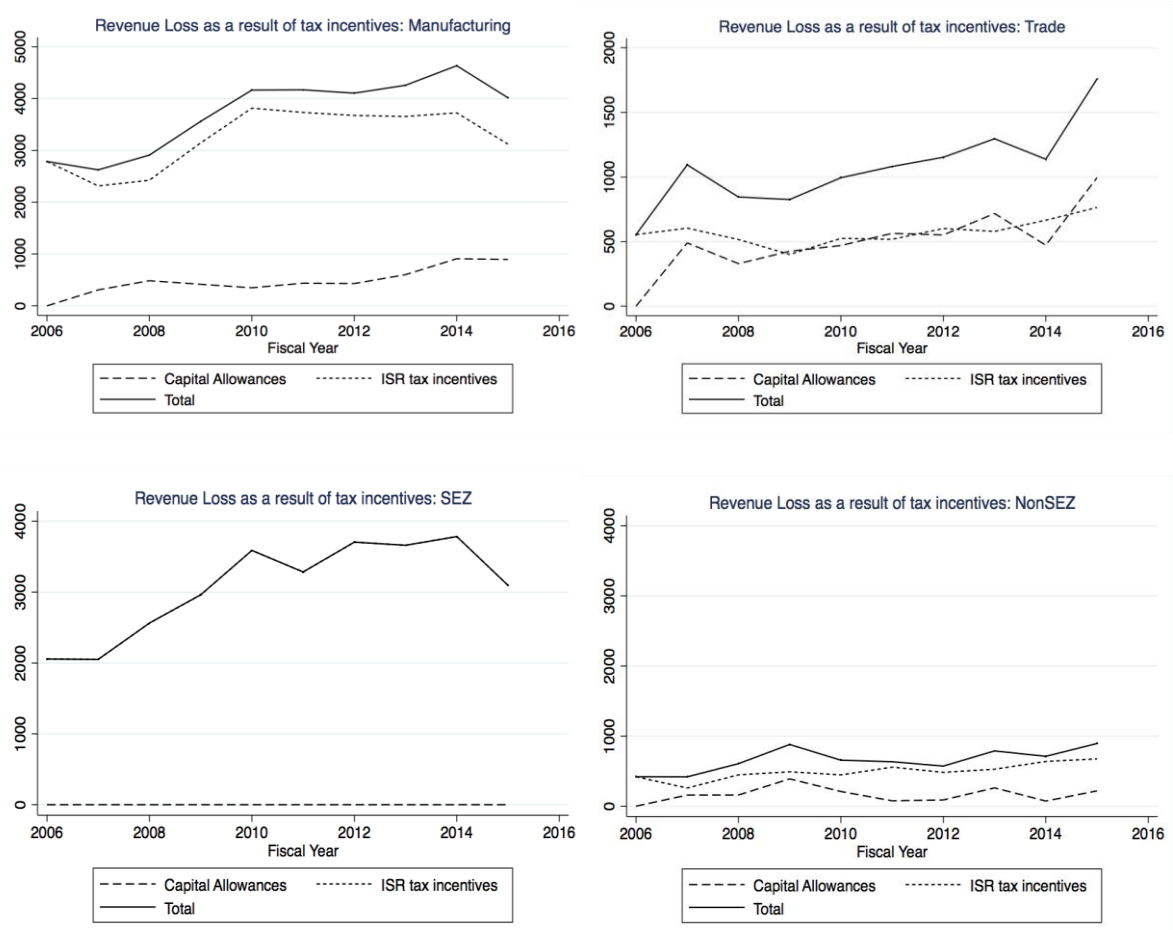


71. Corporate income tax expenditures account for all forgone revenue arising from the preferential tax treatment of firms in SEZs, while capital allowances account for most of the revenue losses in non-SEZ sectors. Capital allowances have the largest impact on tax revenues in the manufacturing and tourism industries, although forgone revenue in other sectors is also substantial (Figure 37). Most corporate income tax expenditures benefit firms in the mining, manufacturing and trade sectors, with very little forgone revenue in other sectors.[51] In the bottom panels, we show the same evidence for the SEZ vs non-SEZ groups of firms. Corporate income tax expenditures account for the overwhelming majority of forgone revenue among SEZ firms,

[51] The full results for all sectors are reported in Tables D3, D4, and D5 in the Appendix.

which are fully exempt from corporate income tax, and capital allowances are irrelevant for this group. Forgone revenues are an order of magnitude smaller for firms in the matched control group and reflect a mix of capital allowances and corporate income tax expenditures.

Figure 37: Forgone Tax Revenue Due to Capital Allowances and CIT Expenditures



72. Table 10 shows the estimated fiscal cost of each additional job created by tax-incentive-induced investment. Column 1 presents the number of additional jobs that an RD$1 million increase in investment would generate in each sector, based on the results from a regression of employment on investment, controlling for firm and year fixed effects. Column 2 indicates the estimated amount of additional investment generated by tax incentives that we calculated. Column 3 multiplies these values to obtain the estimated number of additional jobs created in each sector. Column 4 presents estimates of the revenue forgone from tax incentives, yielding the average cost per job created. In 2015, the DR's GDP per capita was approximately RD$700,000. This implies that if the cost of creating an additional job were greater than RD$700,000, the tax incentive would not be efficient, for the whole economic system. Cost estimates are higher than RD$700,000 in all sectors except agriculture, trade, tourism, and construction.

Table 10: Estimated Additional Jobs Created by Tax Incentives

By Sector	Jobs Created per Million RD$ of Investment	Additional Investment (RD$ millions)	Implied Additional Employment	Forgone Revenue (RD$ millions)	Cost per Job (RD$)	Average. Income per Worker (RD$)	Ratio of Cost to Income per Worker
Agriculture	0,79	3,064	2,425	718	295,948	156,884	1.9
Construction	0,31	22,606	7,087	1,687	238,035	200,706	1.2
Manufacturing	0,19	72,701	13,948	12,065	864,968	201,798	4.2
Mining	0,10	*N/A*	*N/A*	6,327	*HIGH*	275,606	*HIGH*
Real estate	0,00	39,942	*N/A*	2,036	*HIGH*	230,651	*HIGH*
Consumer services	0,06	16,563	1,017	3,167	3,114,165	183,255	17.0
Business services	0,08	31,874	2,562	2,948	1,150,311	267,344	4.3
Tourism	0,18	64,696	11,930	4,231	354,682	188,596	1.9
Trade	0,53	47,843	25,382	8,971	353,443	158,294	2.2
Transportation & communications	0,01	29,433	*N/A*	35,987	HIGH	235,571	*HIGH*
SEZ vs. non-SEZ							
SEZ	0.44	31,732	13,962	30,757	2,202,962	212,927	10.3
Non-SEZ (match)	0.19	23,572	4,585	6,587	1,436,687	215,488	6.7

Source: Authors' calculations based on data from the National Labor Force Survey

73. While their efficiency remains debatable, tax incentives directed toward the tourism, construction, and agriculture sectors appear to generate more employment income than other sectors for the same amount of forgone revenue. Column 5 reports the average income per worker in each sector for 2015, which is treated as a proxy for the marginal product of labor in each sector. Column 6 shows the ratio of the cost in forgone revenue per job created to the income per worker in each sector. The intuition is that the tax expenditures would only be beneficial from the perspective of employment creation if this ratio were close to or below 1:1. However, the ratio is higher than 1.2:1 in all sectors, and it is especially high in services and manufacturing.

74. The fiscal cost of using tax incentives to spur investment and create new jobs appears to be higher in SEZs. The subsamples of SEZ and non-SEZ firms reveal ratios of 10.3:1 and 6.7:1, respectively. This implies that the fiscal cost of creating a job in an SEZ firm through tax incentives is about 10 times higher than the average income per worker. While these results should be viewed with a fair degree of caution, they appear to indicate that tax incentives are not an efficient means to promote employment growth, especially in SEZs.[52]

[52] A similar analysis in South Africa revealed that the fiscal cost of each additional job created by tax incentives is was roughly double the country's per capita GNI. However, a World Bank analysis of tax expenditures in Sri Lanka indicated that the average fiscal cost per job created was equal to just one-tenth of per capita GNI. Moreover, in some sectors tax expenditures were negative, which appears to be reflect a well-targeted incentive scheme. However, only profitable firms were included in the analysis, which may bias the results.

Conclusions and Recommendations

A. Enhancing Tax-Collection Efficiency

75. The analysis shows that the Dominican tax system's institutional and policy framework could be significantly enhanced. A comparison with selected peer countries suggests that well-targeted reforms could greatly increase the productivity of ITBIS, CIT, and personal income taxes. Moreover, the scope for improvements in collection efficiency is so large that the government could substantially increase revenues without altering tax rates. Raising the c-efficiency ratio for ITBIS from its current level (0.35) to the LAC average for VAT (0.56) would increase tax revenue by an estimated 2.8 percent of GDP. Raising the CIT revenue efficiency from its current level (0.074) to the LAC average (0.108) would boost tax revenue by an estimated 0.9 percent of GDP. And raising the personal income tax revenue efficiency (0.053) to the LAC average (0.065) would boost revenue collection by an estimated 0.26 percent of GDP.

76. The section on tax efficiency shows that several tax instruments currently collect very little in the DR compared to their potential, so the Government has options to raise more revenues. The study shows that a significant part of the collection loss is attributable to mismanagement, administrative burdens, tax distortions, fraud, evasion and, to a lesser extent, to a generous system of tax expenditures. Measures to tackle these challenges should focus on increasing the quality, the transparency, as well as the integration and the effectiveness of the tax information and administration system. Policymakers in the DR face a broad range of options for increasing tax revenue through both policy and administration reforms, while the degree of socio-political acceptability of these options is quite varied. Some of the possible concrete options include:

A1. Strengthening cross-referencing capabilities would greatly facilitate the identification of non-compliant taxpayers. The authorities could use tax declarations pre-filled by the tax administration to facilitate tax compliance. For example, the government could impose a "minimum tax" on certain classes of taxpayers (typically, for instance, liberal professions) with a reverse onus clause, which would shift the burden of proof (i.e. demonstrating that their turnover is lower than the 'pre-filled' amount) onto the same taxpayer. Increasing the frequency of audits could further improve compliance by heightening the perceived risk of tax evasion. Finally, more effective information exchange between the DGII and the DGA would help the latter detect inconsistencies in the declarations of importers and exporters.

A2. Leveraging information technology and risk-based verification programs could strengthen tax administration. Improving the quality of the information provided by taxpayers by adopting a system of "early detection" to spot inconsistencies would also reduce tax evasion. This could be achieved by developing econometric models based on samples of audited taxpayers: once the model has been estimated, it could be used to determine whether a given taxpayer's current declaration substantially deviates from the value predicted by the model's parameters. This would place the burden of the proof on the taxpayer, who would be responsible for explaining the causes of the gap. In addition, adopting/extending the use of risk-based verification programs would create disadvantages to poor compliance behaviors, by detecting and deterring noncompliance through risk management. Perceiving a stronger likelihood of detection as well as holding obvious non-compliers publically accountable, could significantly enhance tax compliance. Finally, voluntary compliance could be improved by outreach and communication campaigns using innovative approaches (web-based presentations, TV spots etc.) targeting high-risk sectors/taxpayers.

A3. Reforming the use of the "ITBIS exemption card" to the purchase of selected goods and services could drastically reduce ITBIS evasion, and should be accompanied by a strengthening of audit and oversight functions on the administrative side. Currently, the card is used for purchases linked to SEZ's exports. However, a list of goods and services that are exempt under this provision should be clearly defined. Such a list would focus on equipment, goods and services that are directly and provably linked to the production process. The establishment of a pre-tax refund system could reduce inappropriate uses of the exemption card, thus reducing ITBIS evasion. Such reform should be done in parallel to an intensification of the auditing frameworks that govern the tax administration system, as well as a strengthening of the integration and oversight capacity exerted by key divisions – for instance like the large-taxpayers' one – in order to prevent and/or deter potential opportunities for fraud and detect phenomena like transfer pricing. .

A4. Eliminating 'nuisance' taxes that generate low revenue would streamline tax administration and simplify compliance. The government should thoroughly review all minor taxes and then consolidate or eliminate those that yield minimal revenue or that serve no clear policy purpose. Enhanced tax administration would expand the tax base without the need for legislative changes, allowing policymakers to focus on priority reforms to the tax structure. A cursory assessment within this study suggests that the very modest revenues generated by many of these taxes do not seem to justify either the private cost of compliance or the administrative burden of enforcement**.**

A5. Exploring new taxes and tax-policy mechanisms could further improve revenue mobilization and achieve ancillary policy objectives. Regularly adjusting excise taxes on fuel could better align tax rates with global oil prices. Introducing taxes on high-calorie foods and beverages could have positive health effects. Selectively increasing electricity taxes for large-scale consumers could promote cost-recovery in the electricity sector. Considering the adoption of eco-taxes would provide flexible and cost-effective economic disincentives – based on the 'polluter-pays' principle – to environmentally-harmful activities. Finally, establishing a simplified tax system for small taxpayers could incentivize compliance and reduce evasion.

B. Reducing costly tax expenditures that are inefficient or unequitable

77. The tax incentive regime in the DR can be significantly improved both in terms of equity and efficiency. As the analysis shows, the existing exemptions regime directly affects the competitiveness and the performance of firms, and thus the overall productivity of the economy. Reducing the proven tax liabilities divide between SEZ and non-SEZ firms would not only increase tax revenues, but could also alleviate market distortions and promote economy-wide competitiveness, thus contributing to put to an end the country's dual production and export structure. The DR maintains large incentives for firms operating in the SEZ which appear to be costly and fundamentally inefficient for the economic system. Tackling this aspect, by rethinking and gradually phasing out SEZs subsidies would be a positive first step, although it may likely face strong opposition from vested interests. Increasing the neutrality of the tax system would also help fighting tax avoidance, thus having a positive effect on addressing informality. In addition, past analysis on the distributional impact of ITBIS exemptions has showed that reforming these tax expenditures would also produce positive equity effects, in addition to expanding revenue mobilization.

78. While their impact varies by sector, the DR's tax incentives appear to be an inefficient means to promote employment growth. The fiscal cost per job relative to the income per worker was lowest in the construction sector at about 1:1. This means that creating one additional job in the construction sector costs the government the same amount in forgone revenue as that additional worker will receive in income. Moreover, using tax incentives to create employment in the manufacturing and service sectors through tax incentives would cost the Government significantly more than the income that would be received by the worker, by a factor of 4 roughly. The mining and transportation sectors have very high fiscal-cost-to-average-income ratios due to the very limited additional investment generated by tax incentives in these sectors. This underscores important differences among sectors in terms of the sensitivity of investment to changes in the effective tax rate.

79. …which points to the fact that, overall, investment is more tightly linked to structural reforms that benefit the competitiveness of the business climate than ad-hoc tax incentives. Tax incentives are most effective at the margins, and they cannot substitute for serious shortcoming in the investment promotion policy and growth strategy, or the broader investment climate in a country. If more fundamental factors, such as weaknesses in the investment climate, constrain the ability of investors to fully exploit economic opportunities, tax incentives may prove ineffective.[53]

80. Additionally, the analysis appears to confirm the prevalence of an inclusion problem in the DR economy, and – specifically - a weakening of the labor compensation factor against capital in the DR. The fact that construction and real estate appear to have the highest elasticity of investment to tax incentives (see Table 9), coupled with the fact that other sectors (such as manufacturing and tourism) produce more jobs (see Table 10) overall suggests that the latter sectors tend to produce low-paying jobs, and that a sizeable portion of the DR's growth gains accrue to a limited set of the population. While this finding goes beyond the core objective of this paper, it is an important confirmation of previous analyses about the disconnection between the growing sectors and the remuneration of production factors in the DR.

81. In light of these results, possible policy options include:

B1. Streamlining ITIBS exemptions could substantially increase government revenues with a negligible impact on poor households. ITBIS exemptions cost the government approximately 3 percent of GDP in foregone revenue, and due to their regressive distribution, they do little to benefit poor households. Eliminating regressive exemptions while maintaining exemptions on basic consumption goods, as defined in the national poverty-measurement methodology, along with health and education services, could increase revenue by as much as 0.5 percent of GDP with a minimal impact on poor households. The few poor households that would be negatively affected by this reform could be compensated through one of the country's existing transfer programs. Reducing ITBIS exemptions would also increase the traceability of economic transactions, potentially leading to a decline in tax evasion.

B2. Introduce routine rigorous cost-benefit analyses of all existing corporate incentives and tax expenditures as a first step to reform them, and adopt clear sunset clauses into all legislation that creates or modifies tax incentives. All existing corporate tax expenditures should be regularly reviewed, and any legislation that creates or modifies tax incentives should cease to have effect after a specific date, unless further legislative action is taken to extend the law. During the last 40 years the SEZs have benefitted from a generous system of tax incentives, and numerous incentives have been provided with very long or even

[53] Cf. Sebastian James, "Providing Incentives for Investment", World Bank, 2009

indefinite timeframes. While they have produced significant benefits to the DR economy, the need to increase revenue generation calls for a reform of the current exemption system. Overall, the government should shift corporate tax expenditures from "tax-holiday" model to an "investment-targeting" model. The methodology proposed in this study is one of the ways in which national authorities could monitor the effectiveness of fiscal incentives to the business sector. Unlike many other developing countries, the DR has a functional electronic database of taxpayer information that includes balance sheets and profit-and-loss accounts. This means that there is no additional cost for taxpayers to provide any additional info, and the administrative cost of the analysis would be relatively modest.

B4. Finally, the authorities should consider adopting a moratorium on new incentives until a comprehensive tax-reform program—such as the anticipated Fiscal Pact or a comprehensive tax reform package—can establish a clear and consistent policy framework for tax expenditures.

82. It should be stressed that any reform to the existing tax-incentive scheme needs to be based on a system-wide view of the direction of the tax system and should be phased in gradually to avoid abrupt effects upon concerned individuals/firms. In the past there have been many changes to the tax system in response to fiscal pressures or in response to political interests. Reactionary or ad-hoc approaches should be avoided and the Fiscal Pact or also a Tax Reform could provide a good opportunity to consolidating all tax-expenditure schemes into a single section of the tax code, which would support a more coherent and sustainable approach to tax expenditures that reduces their fiscal impact and minimizes their distortive effect on economic incentives. Any change in the tax system must take into account the interdependency of the different taxes and their impact on the income of households and firms. Ultimately, the decision to maintain or modify a given tax system is not just economic/technical but inherently socio-political.

Chapter Two:

Labor Informality in the Dominican Republic and Its Impact on Income Levels and Tax Revenue

"In the new economy, information, education, and motivation are everything."

Bill Clinton, 2000

Introduction

83. This chapter describes the informal labor market in the Dominican Republic (DR), the characteristics of formal and informal workers, and the impact of informality on labor income and fiscal revenue. The analysis is based on data collected by the Central Bank of the Dominican Republic (*Banco Central de la República Dominicana*, BCRD) in its National Labor Force Survey (*Encuesta Nacional de Fuerza de Trabajo*, ENFT). It uses the same definition of informality applied by the ENFT, which is based on: (i) the size of the production unit, (ii) the worker's occupational group, and (iii) the worker's occupational category. The formal sector comprises all individuals employed by firms with five or more employees, and it includes self-employed workers and sole proprietors in three occupational groups: intellectual professionals; managers and administrators; and technical professionals. The informal sector includes all individuals employed by firms with fewer than five employees, and it includes self-employed workers and sole proprietors in the following five occupational groups: farmers and ranchers; manual equipment operators and drivers; artisans, traders, and salespeople; and unskilled workers. The informal sector also includes domestic services and unpaid labor[54].

84. As in many developing countries, the informal sector is an important component of the Dominican economy (Figure 38). The informal sector employs roughly one-half of the country's labor force. Informal employment is especially common in construction, retail, and transportation. While informality is less common among women than among men, women are more likely to be informal when controlling for economic sector.[55] During the last decade, the establishment of a contributory health insurance scheme and a new social security system appears to have accompanied formalization, although only during a short period.[56] Between 2006 and 2007, the effective coverage of these schemes rose from 23.3 percent to 44.8 percent. However, the expansion of the schemes slowed after 2007, and their effect on formalization weakened over time.[57] 99. The present analysis actually finds that the share of informal workers in the Dominican labor market remained broadly stable at around 55 percent between 2001 and 2015; suggesting the potential existence of structural reasons for the lack of improvement in the formalization of the economy[58].

[54] The definition of informality in use by this study differs from the one used by a previous WB study from 2006 (La Informalidad en el Mercado Laboral Urbano de la República Dominicana). The present analysis is based on the national official definition in use by the Dominican authorities; this facilitates data appraisal, comparability with internal analysis undertaken by Government, as well as it complements the previous analysis providing a different angle. As far as the 2006 study is concerned, the results found that informal workers were concentrated in "small productive units", or "self-employed workers" with low levels of education, who work in conditions of relative illegality and who lack pensions. This type of worker appears to be extremely close to the definition of informal worker that our analysis - and the Central Bank of the DR - use (i.e., a vast majority of informal workers are found in small enterprises and are not affiliated to the pension system). The bottom line is that the definition of informality in use by the present analysis is closely compatible with the description made in the 2006 study, and there is significant overlapping among the definitions. Finally, the choice of this definition allowed the present study to investigate the relationship between informality and the participation in the social security system; should the model be based on a definition of informality that is related already to social security participation, this would prevent an analysis of social security coverage as the answer would be implicit and the model would be around a circular reference.

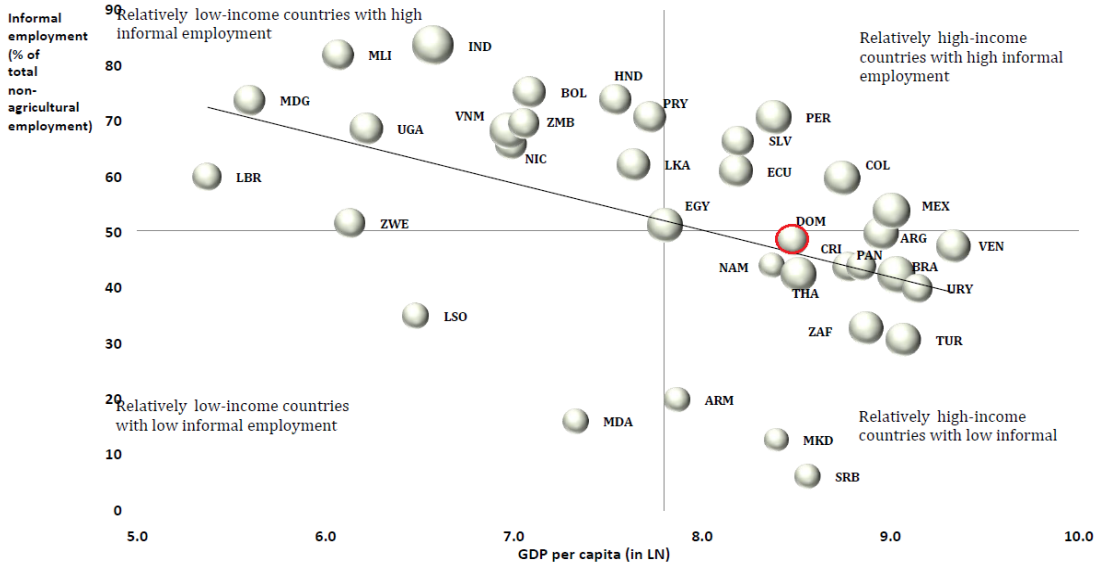
[55] ILO, 2010

[56] Law 87-01 created the Dominican Social Security System in 2001 following a long consultative process. The system became effective in 2003, and supplemental regulations were passed between 2004 and 2005.

[57] More recent data show that in 2012 the effective coverage of the contributory scheme increased to 2,747,735 people, or 68.7 percent of the employed population. Since 2003, over two million workers were incorporated into the system, and its coverage increased by over 350 percent.

[58] See paragraph #99.

Figure 38: Informal Employment and GDP per Capita, Dominican Republic and Comparator Countries



Source: Adapted from ILO (2012)

85. In developing countries, the financial and administrative costs of formalization—both for workers and firms—typically drive informality. By contrast, labor informality in developed economies often takes the form of unreported or underreported income for the purposes of tax evasion, and a relatively small share of workers are exclusively employed in the informal sector. The following analysis examines the causes of labor informality in the DR, including those related to the costs of formalization and to the characteristics of informal workers themselves.

86. This chapter is organized as follows. The first section analyzes the relationship between economic growth, employment creation and informality. The second describes the characteristics of informal workers based on the October 2015 ENFT, and discusses changes in the employment, in earnings (including estimates of the impact of informality on labor income using the Mincer equation, a Blinder-Oaxaca decomposition, and propensity score matching) and in education of informal workers between 2001 and 2015. The third section examines the determinants of labor informality's probability. Finally, the fourth section simulates the impact of increased formalization on personal income tax revenue.

Economic Growth, Employment, and Informality

87. Years of robust economic growth have had only a limited impact on formal employment in the DR. Rates of job creation are highest in sectors that tend to employ temporary and typically low-skilled workers, such as construction and tourism, while more skill-intensive sectors such as finance have produced few new jobs. From 2010 to 2015, sectoral value addition grew by around 5 percent, but employment rose just 2.8 percent, indicating an employment-output elasticity of around 0.56. The government has since prioritized efforts to strengthen the link between growth and employment. The construction (CO) and hospitality (HO) sectors have experienced robust output and employment growth, significantly exceeding the economy-wide average (Figure 39). By contrast, the electricity (EL), manufacturing (MAN), retail, agriculture (AG), and public administration sectors have experienced slow growth and anemic job creation. As these sectors account for a large share of total output—retail represents 21.4 percent of GDP, agriculture 14.2 percent, and manufacturing 10.1 percent—their low rates of growth and job

creation have an especially negative implication for the economy. Meanwhile, the "other services" (OS) sector, which employs 25.7 percent of the employed workforce, and the transportation sector (TRA) have registered high rates job creation despite their below-average output growth. Finally, the financial (FIN) sector has grown rapidly while creating very few jobs, and it represents just 2.4 percent of total employment.

Figure 39: Growth Rates of Value Addition and Employment by Sector, 2010-15 (%)

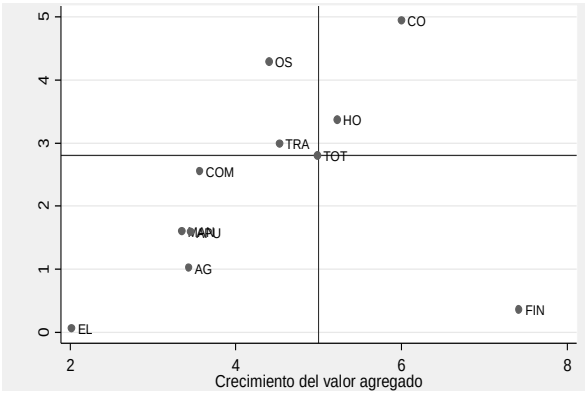
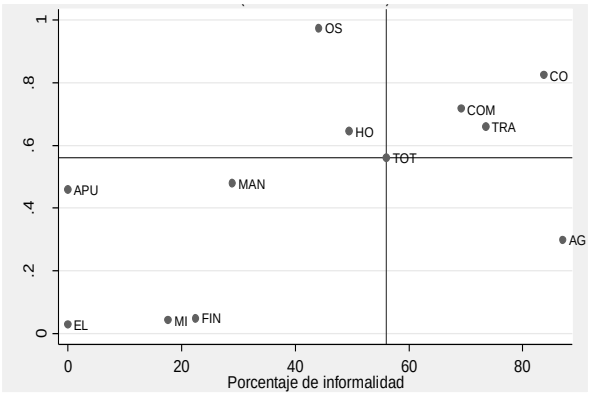


Figure 40: Employment-Productivity Growth Elasticity and Informality by Sector, 2010-15 (%)



Source: Author's calculations based on BCRD data
Note: The sectors shown include agriculture (AG), commerce (COM), construction (CO), electricity (EL), finance (FIN), hospitality (HO), manufacturing (MAN), other services (OS), transportation (TRA)

88. Informality tends to be most common in sectors where growth has a strong impact on employment. For example, informality is especially prevalent in the retail, construction, and transportation sectors, which also have a relatively high employment-growth elasticity (Figure 40). By contrast, the finance, mining, and electricity sectors have both very low levels of informality and weak employment-growth elasticities.

Characteristics of Formal and Informal Workers in the Dominican Republic

Demographics

89. As of October 2015, the DR's working-age population was estimated at 4.37 million out of a total population of 10.47 million.[59] An estimated 58.3 percent of the working-age population was economically active, and 14 percent of the economically active population was unemployed. More than half of the employed workforce (54 percent, representing 2.36 million people) worked in the informal sector.

90. Most informal workers are employed by firms with fewer than four employees. Very small businesses employ over 99 percent of informal workers, and 7 out of 10 informal workers are their firm's sole employee. By contrast, large firms employ 67 percent of formal workers, while the government and public enterprises employ another 30 percent. Small firms employ just 3.2 percent of formal workers.

91. Finding an informal occupation appears to be simpler and more rapid that a formal one. Seventy-five percent of informal workers surveyed by the ENFT stated that their job search

[59] This analysis uses the BCRD's definition of the working-age population, which includes all Dominicans over 10 years old.

had lasted less than one month, compared to 66 percent of formal workers. Longer job-search times in the formal sector may reflect the administrative burden associated with formal employment, greater competition between workers for a limited number of formal jobs, the more extensive vetting processes associated with skilled work, or a combination of factors.

92. Men are more likely to work in the informal sector. Forty-three percent of employed men work in the formal sector, compared to almost fifty-two percent of employed women. This may reflect a cross-correlation with education levels, as the average economically active woman in the DR has almost 2 more years of schooling than the average economically active man.[60] However, despite their higher education level, women are less likely than men to work, and they work fewer hours on average. An important corollary is that the country appears to be underutilizing a factor of production that has higher levels of intangible (human) capital.

93. Educational attainment is highly correlated with informality. The illiteracy rate among informal workers is 9.8 percent, far higher than the 2.9 percent rate observed among formal workers. In other words, the informal sector employs roughly 80 percent of illiterate workers. Informal workers have an average of 7.5 years of schooling, while formal workers have an average of 11.3. Just over half of informal workers have only a primary education, compared to less than a quarter of formal workers. More than 38 percent of formal workers hold an undergraduate or postgraduate degree, while the figure drops to only 8 percent among informal workers.

94. Formal workers tend to work longer hours than informal workers. Formal workers report working an average of 3.8 more hours per week in their primary occupation than informal workers (Figure 41). The gap widens to 6-8 hours per week among the least-educated workers and shrinks to 2 hours among university graduates. However, informal workers with postgraduate degrees work an average of about 2.5 more hours per week than their peers in the formal sector (Figure 42).

Figure 41:Average Number of Hours Worked per Week at Each Worker's Primary Occupation

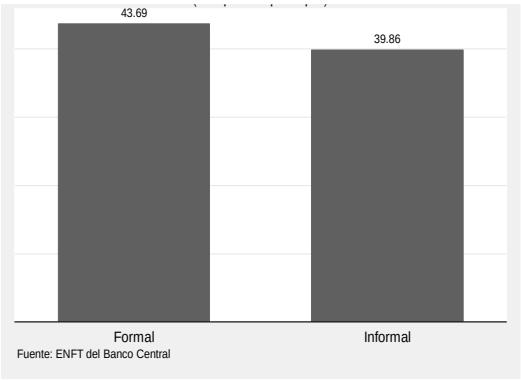
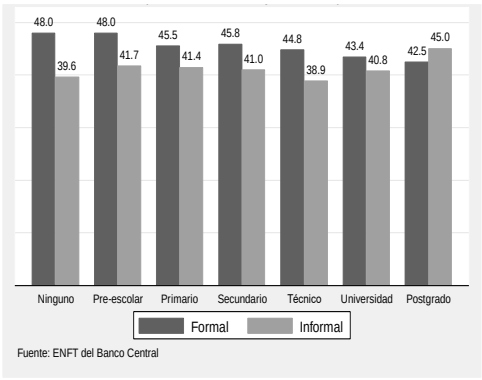


Figure 42: Average Number of Hours Worked per Week by Education Level



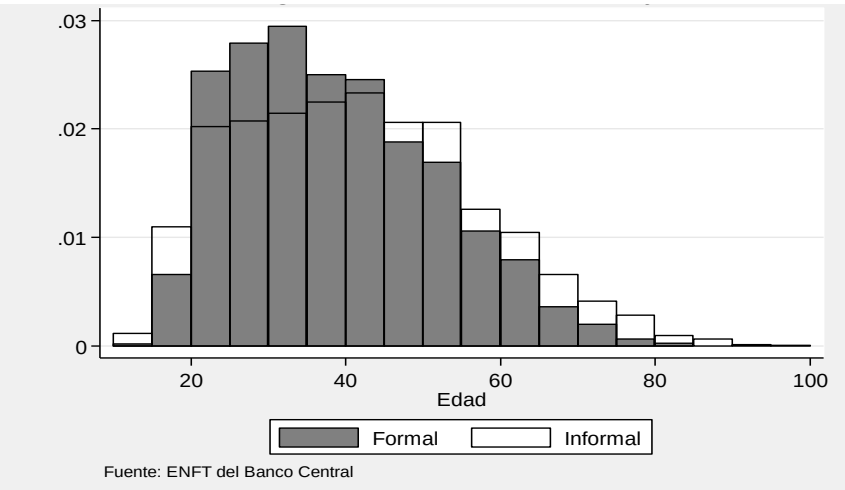
Source: ENFT

95. Informal workers are more likely to be either relatively young or relatively old, while formal workers are more likely to be middle-aged. Overall, informal workers skew slightly older than formal workers, with an average age of 40.4 years for the former versus an average of 37.9 years for the latter.[61] However, the relationship between working age and informality is nonlinear.[62] Charting the distribution of the age of both types of workers shows that informality is

[60] Median testing makes it possible to reject the null hypothesis that the two population groups have the same level of schooling.
[61] This difference is statistically significant according to the equality of medians test.
[62] Specifically a convex relationship.

especially common among workers under the age of 20 and over the age of 45. Formal workers, on the contrary, tend to be between the ages of 20 and 45.

Figure 43: Formality and Informality by Worker Age



96. Finally, formal workers are more likely to be married and more likely to live in an urban area. Twenty-three percent of formal workers are married, compared to just 15 percent of informal workers. This may reflect a cross-correlation with the average ages of formal and informal workers, as well as education level, household income, and other socioeconomic factors associated with formality and informality. Almost 80 percent of formal workers live in cities, versus about 60 percent of informal workers. The capital, Santo Domingo, is home to 33 percent of the country's population, 26.9 percent of the national informal workforce and 40.1 percent of the national formal workforce. In most other regions of the country, the share of informal workers exceeds the population share.

97. Informal workers are much more likely than formal workers to be seeking different employment. The ENFT found that 42 percent of informal workers wished to change their job, versus just 26 percent of formal workers. Sectors with high rates of informality—including construction, agriculture, and domestic services—tend to have higher number of workers who are seeking a new position.[63]

98. Informal workers are less likely to have health insurance, be enrolled in a pension scheme, and be part of a workers' union. While 70 percent of employed workers in the DR report having health insurance, the share among informal workers is roughly 45 percent. Meanwhile, just 13 percent of formal workers report having no insurance. Among informal workers with health insurance, 72 percent are covered by the national health insurance scheme (Senasa).[64] Meanwhile, 71 percent of formal workers are covered by a private healthcare provider. Strikingly, only about 10 percent of informal workers are enrolled in a pension fund, compared to 86 percent of formal workers. The unionization rate in the Dominican Republic is generally low, at 12.5 percent (considering all workers) but particularly so among informal workers: those who indicate to belong to a union is just 2.9 percent.

99. The share of informal workers in the Dominican labor market remained broadly stable at around 55 percent between 2001 and 2015; suggesting the potential existence of

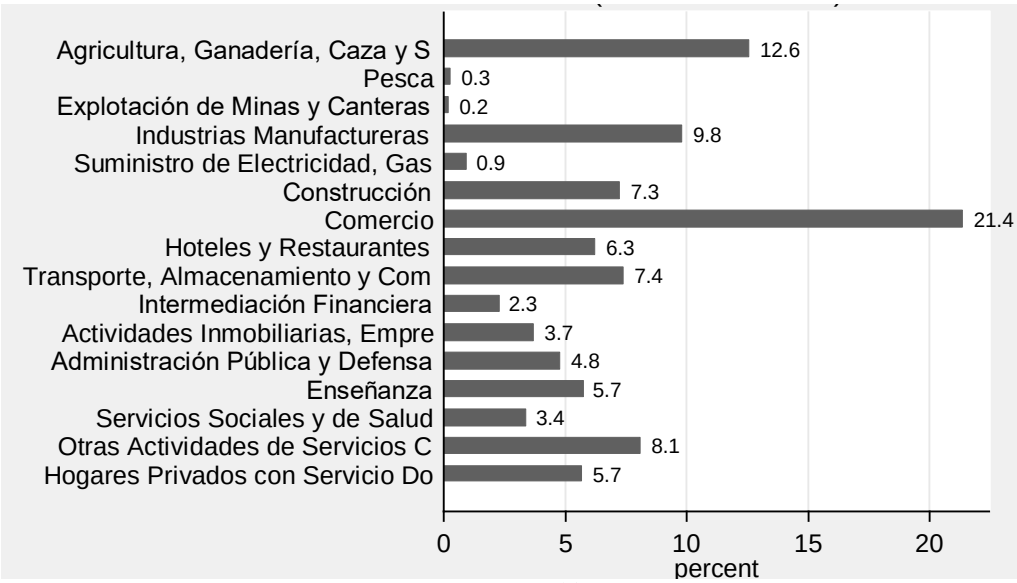
[63] This difference is statistically significant.
[64] In principal, informal workers should be insured by Senasa.

structural reasons for the lack of improvement in the formalization of the economy. The fact that informal labor participation has long fluctuated around 55 percent is a symptom of the existence of conditions that make a large proportion of the population prefer to remain outside the formal labor market governed by the Labor Code, the Social Security System, and the Tax Code. For example, required severance payments (*cesantía laboral*) significantly increase the cost of terminating employees. Mandatory employer contributions to the health insurance and social security systems also discourage formalization, as do the DR's relatively high tax rates, which encourage many businesses to remain outside the reach of the DGII.

Economic Sectors

100. The DR's two largest employers are retail trade and agriculture, and both sectors are characterized by a high degree of informality. Along with manufacturing, these sectors account for almost half of total employment (Figure 44). Informality is especially prevalent in the agricultural sector, where more than 90 percent of workers are informal (Figure 45). Domestic services, construction, and transportation also employ a large share of informal workers.[65] By contrast, only about 30 percent of manufacturing workers are informal. The electricity and financial sectors also have low levels of informality, but they employ a relatively small share of the workforce.

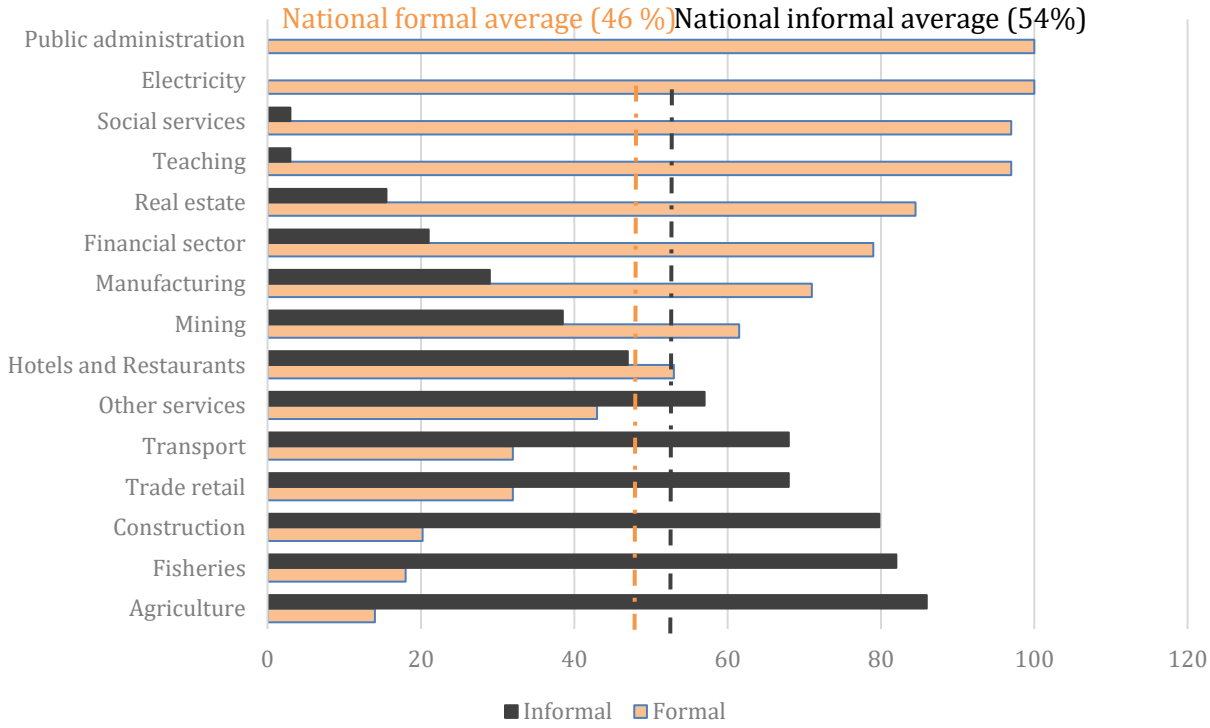
Figure 44: Employment by Sector, 2015 (%)



Source: ENFT

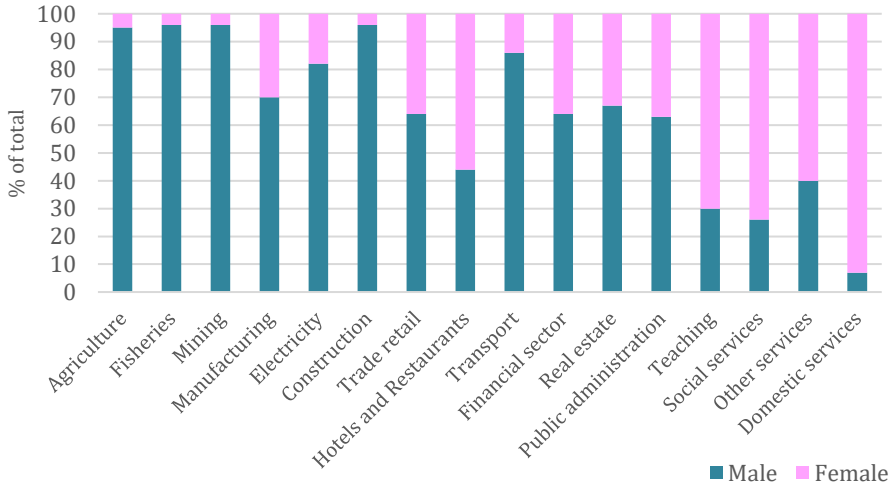
[65] Illegal immigration is also common in these sectors. See Aristy-Escuder (2011 and 2016).

Figure 45: Formal and Informal Employment by Sector, 2015 (%)



101. The sectoral decomposition of informality sheds light on its gender dimension. Women appear to be participating significantly less than men in the labor market; however, if we look at the whole working population, most women have a formal job. Women are severely underrepresented in the agricultural, fishing, and construction sectors, where informal employment is most common. Crossing these pieces of information allows us clarify that, while women appear overall to show greater relative formality, in reality this can be largely explained by the fact that they are not participating in two highly informal sectoral activities (agriculture and construction). When these two sectors are excluded from the analysis, informality is more prevalent among women than it is among men. Women are also much more likely to work in the education and social services sectors, where informal employment is very rare.

Figure 46: Formality and Informality by Gender



Labor Income

102. Overall, formal workers tend to earn significantly more than informal workers. In the DR, the median monthly income from a worker's primary occupation is RD$6,000.[66] However, the average income among informal workers is just RD$3,000, while formal workers report an average of RD$10,000. This difference partially reflects the higher average number of hours worked by formal workers, but the hourly wage differential is also substantial. Informal workers receive an average of RD$76, versus an average of RD$103 among formal workers.

103. Sectors with high levels of formalization also tend to have higher average wage rates than sectors where informality is common. The financial services sector—while generating relatively few jobs—has the highest average hourly wage (RD$150), followed by real estate (RD$143). Informal employment is rare in both sectors. Meanwhile, the sectors with the lowest hourly wages are domestic services (RD$44.5) and agriculture (RD$60), both of which employ a large share of informal workers.

Figure 47: Hourly Wage by Principal Occupation (RD$)

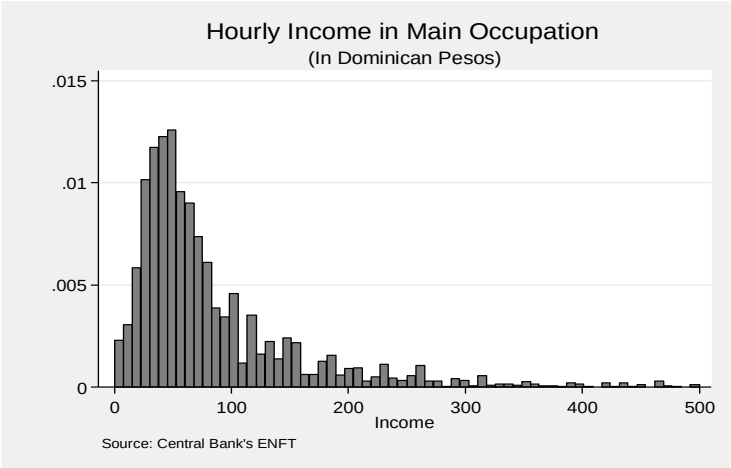
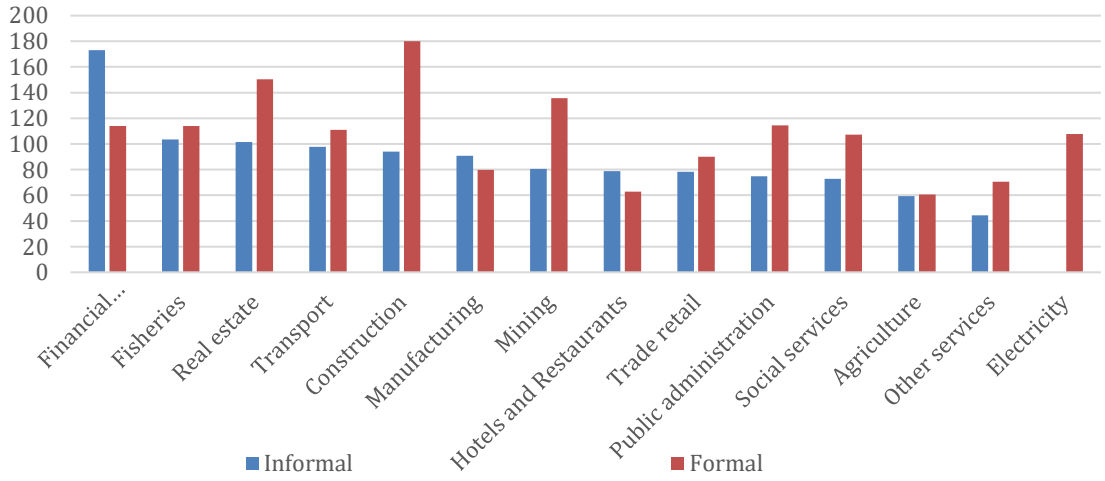


Figure 48: Hourly Wage by Sector (RD$)

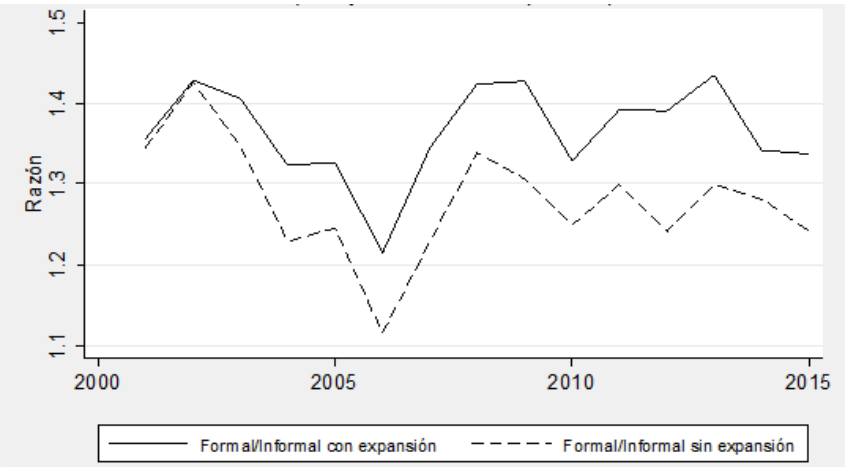


Source: ENFT

[66] These figures are for gross income before taxes or social security contributions.

104. Since 2001, the earnings of formal workers have consistently exceeded those of informal workers. When the sample expansion factor[67] is accounted for, formal workers earned an average of around 36.5 percent more per hour than informal workers. When the sample expansion factor is not taken into account, the hourly wages of formal workers exceed those of informal workers by 28 percent.

Figure 49: Ratio of Hourly Wages for Formal and Informal Workers, 2001-2015



Source: ENFT

Box 5: Social Security Labor Costs and Formalization in the DR

The Dominican social security system includes both health insurance and pension components, and it encompasses three financing regimes: contributory, subsidized, and subsidized-contributory. The contributory system includes all employees in both the public and private sector, as well as employers. Under this scheme, the employer pays 70 percent of the contribution and the employee pays 30 percent. The subsidized regime covers self-employed workers with irregular incomes below the national minimum wage, as well as the unemployed, the disabled, and the indigent. This regime is publicly financed. In principle, self-employed workers with regular incomes above the minimum wage should be covered by the 'subsidized-contributory' system, which is designed to resemble the contributory system, but with the state standing in for the absent employer. At present, however, only the contributory system and the subsidized system are operational, and the latter only for health insurance and not for pensions.

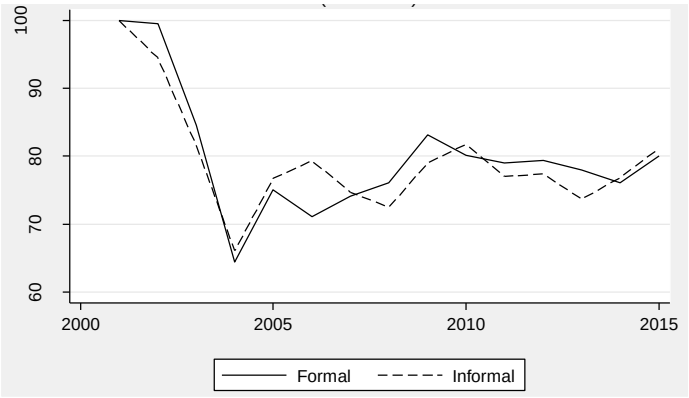
By law, annual employer contributions to the pension system cannot exceed 20 months of the minimum wage, while annual contributions to the health insurance system cannot exceed 10 months. Social security contributions increase costs in the formal labor market by 15.32 percent, of which 7 percent is the cost of health insurance, 7.1 percent is the costs for pension insurance, and the remaining 1.2 percent is the cost for insurance for occupational hazards. In addition, mandatory contributions to the National Institute of Vocational Training (INFOTEP) increase labor costs by roughly 1 percent.

Statutory benefits for formal workers further increase labor costs. Employers are required to grant every worker 14 days of paid annual leave between the first and the fifth year of work. After the fifth consecutive year, the number of paid leave days rises to 18, which would increase labor costs by approximately 6 percent. Workers are also entitled to receive a Christmas bonus, which increases their total salary by roughly 8 percent. Finally, rules for advance notice of termination and severance pay, can increase annual labor costs by another 10 percent. Overall, worker protections and benefits increase labor costs by approximately 25 percent.

In total, formalization costs—including social security contributions and worker protections and benefits—increase labor costs by about 41 percent over the average salary. It is likely that employers will be reluctant to pay these costs unless workers are adequately productive to justify the expense. This may partially explain why formal workers have higher levels of education than informal ones.

[67] The sample expansion factor represents the various weights that are used in the ENFT.

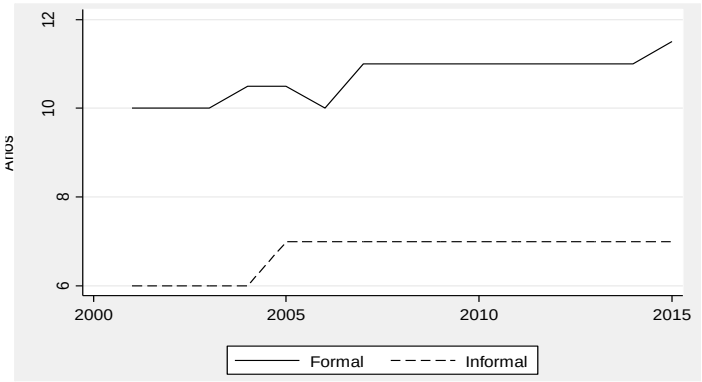
Figure 50: Real Hourly Wage Rates in the Formal and Informal Sectors, 2001-2015 (2001=100)



Source: ENFT

105. Average education levels of both formal and informal workers have remained broadly unchanged since 2006. This is among the factors that can explain why the level of wages has not majorly improved over time. Educational attainment is correlated with productivity and, therefore, with wage rates. If education levels remain constant, wages are unlikely to significantly increase. This is a critical finding that underscores the importance of refining the measurement and the definition of productivity in the DR, when that is compared to the real earning trends.

Figure 51: Average Education Levels among Formal and Informal Workers, 2001-2015 (years of schooling)



Source: ENFT

106. However, when comparing average wage rates for formal and informal workers, different estimation methods yield very different results. A Mincerian earnings function controlling for education, experience, gender, and economic sector finds that the average hourly wage for informal workers is 3.2 percent lower than the hourly wage for formal workers. A Blinder-Oaxaca decomposition finds that the informal labor market does not reward education and experience to the same degree as the formal market. However, once human capital is accounted for, informal workers appear to receive higher wages than their formal counterparts. This counterintuitive finding suggests the presence of unobserved variables: in other words, the informal labor market may possess special features that result in higher wage rates than would otherwise be expected.

107. Of particular interest, a propensity score matching[68] analysis appears to confirm that, ceteris paribus, informal workers actually receive marginally higher wages than formal workers. Propensity score matching eliminates endogeneity bias, i.e. the interactions between the condition of being informal and the error terms of the econometric model studying the effect of informality on income, which makes it possible to obtain consistent estimated coefficients. The results show that the average informal worker will have an income level that is 5.2 percent higher than that of a formal worker with the same characteristics.[69] Similar to the results of the Blinder-Oaxaca decomposition, this finding suggests that unobserved conditions in the informal labor market allow workers to obtain higher wages than they would in the formal sector.

108. The robustness of these outcomes was assessed by using a nearest-neighbor matching (NNM), which gave highly comparable results. The NNM was computed through Stata with the command *teffects nnmatch* using the log of hourly income as an outcome variable, while the covariates were: years of education (and their squared), gender, zone (urban/rural) and whether the worker receives remittances[70]. The results confirm that the hourly income of the informal worker in the DR is 5.1 percent higher than the income of a highly similar worker employed in the formal sector. In other words, taking two workers with highly similar characteristics, where one is employed in the informal market and the other in the formal one, the former would receive a higher income than the latter.

```
Treatment-effects estimation                   Number of obs      =     10,682
Estimator      : nearest-neighbor matching     Matches: requested =         1
Outcome model  : matching                                     min =         1
Distance metric: Mahalanobis                                  max =       439
```

ling_hora	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
informal (Informal vs Formal)	.0496159	.015188	3.27	0.001	.0198479	.0793838

The Probability Function of Informality in the DR

109. This section will analyze the probability function of being an informal worker through a binary logit model. The probability of being an informal worker is estimated on the basis of a set of variables relating to the worker, including: education level (*educ*); age (*age*); gender (*woman*);

[68] Rosenbaum and Rubin (1983)

[69] This result confirms the existence of an endogeneity bias in the coefficient of the impact of informality on income when estimated with a model in which the only explanatory variable for income is the condition of informality. In this case, the coefficient indicates that the formal worker receives an income that is 24.2 percent higher than that received by the informal worker. If the economic sector (i.e., agriculture, construction, and retail) is included as an explanatory variable for the likelihood of being an informal worker, the treatment effect on the treated is reduced to 4.0 percent, but the coefficient is statistically significant at 10 percent only.

[70] More in detail, we included in the command various options, including the exact match option for categorical variables, and a bias-corrected estimator to get consistent estimators of the nearest-neighbor as presented by Abadie and Imbens (2006, 2011). The Mahalanobis distance metric was used to determine the nearest neighbor.

civil status (*union*); area of residence (*urban*); work sector (*agriculture, construction, retail,* and *other*); and receipt of remittances (*remittances*)[71]. The goal is to determine whether the parameters under consideration ($\boldsymbol{\theta}$) are statistically different from zero, and if the likelihood of being an informal worker can be simulated on the basis of the values of the explanatory variables. The education variable takes values of between 0 and 20 years, with a median of 9.3 years; the literacy variable is considered to have a value of one for literate and zero for illiterate; the age variable takes values between 10 and 99 years, with an average of 39 years; the variable representing gender takes a value of one if the worker is a woman and zero if the worker is a man; the union variable is equal to one if the civil status is a non-marital union and zero if the civil status is anything else; for residence in an urban area, the urban variable takes a value equal to one; if remittances are received or the worker works in the agriculture, construction, or retail sectors the value is equal to one[72]. On these bases, the analysis is conducted estimating three models with various combinations of the explanatory variables described above.

110. Educational attainment has a non-linear correlation with the probability of being an informal worker in the DR.[73] Among workers with less than 4.3 years of formal education, higher levels of educational attainment increase the probability of informality. However, among workers who have had more than 4.3 years of formal education, higher levels of educational attainment decrease the probability of informality.

111. While these findings alone do not prove a causal relationship, it is possible that investing in education may help to reduce informality. Raising the education level of the average worker could reduce informality through several mechanisms. Workers with higher levels of education would likely move from sectors where informality is common (e.g., retail) to sectors where it is rare (e.g., finance). Within sectors, greater human capital could enable the development of sophisticated value chains and the formation of larger, more complex companies, both of which would likely encourage formalization. At the individual level, workers with higher levels of education would tend to be more productive and better able to manage the financial and administrative costs of formalization, such as paying taxes and fulfilling regulatory requirements. However, these findings do not imply that a large share of workers remains informal solely due to a lack of education, and complementary measures would likely be necessary to realize the full benefits of investing in a more education workforce.

---

[71] The general form of the logit model used to quantify the probability of being an informal worker is as follows:

$$\Pr(P=1|\mathbf{x}) = \frac{\exp(\boldsymbol{\theta}\mathbf{x})}{1+\exp(\boldsymbol{\theta}\mathbf{x})}$$

Where is the vector of the explanatory variables and is the set of parameters associated with each. This probability function is then used for a logit regression which involves making the logarithm of the odds ratio the linear function of the vector of explanatory variables, estimating the parameters using the maximum likelihood method.

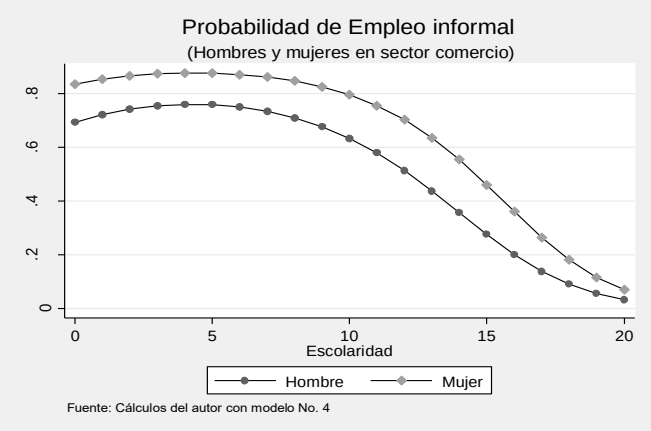
$$\log\left(\frac{p}{1-p}\right) = \boldsymbol{\theta}\mathbf{x}$$

[72] One of the models to be estimated using the maximum likelihood method is:

$$\log\left(\frac{p}{1-p}\right)_i = \theta_0 + \theta_1 educ_i + \theta_2 educ_i^2 + \theta_3 mujer_i + \theta_4 urbano_i + \theta_5 remesa_i + \theta_6 agropecuario_i +$$
$$+\theta_7 construccion_i + \theta_8 comercio_i + u_i$$

[73] The coefficients are shown exponentiated. This means that they are interpreted as the change in the odds ratio of participating or winning the competition.

Figure 52: Probability of Informal Employment by Education Level and Gender



112. When male-dominated sectors such as agriculture and construction are removed from the analysis, women appear to have a greater likelihood of working informally in the DR. If economic activities with a higher incidence of informal work are controlled for, women appear to be between 1.3 and 1.6 times more likely to work informally than men (models 2 and 3 in the following table) with the same level of education, when they both live in urban areas, do not receive remittances, and both work in the retail sector. The policy relevance of this finding is that reforms focusing on increasing the capacity of women to enter the formal labor market could have a favorable impact on formalization of employment as well as on increasing average wages.

113. Working in the agriculture, construction, and retail sectors significantly increases the likelihood of being informal. In the case of those working in retail, the likelihood ratio of being informal is four times higher (table below) than for those working in other sectors, apart from agriculture and construction. The latter sectors also appear to have a significant correlation to the likelihood of informality. Specifically, working in construction raises the likelihood ratio of working in the informal sector almost tenfold and working in the agricultural sector raises it 6.4 times. It should be noted that these three activities are the main sectors receiving immigrant labor entering the country illegally. The formalization process would be facilitated if efforts were concentrated on these three activities.

114. Residing in urban centers reduces the likelihood of informality, while receiving remittances is typically highly correlated with being an informal worker. The likelihood ratio for an individual living in an urban center declines by a factor of 0.86, with the other variables remaining constant. It should be borne in mind that the largest companies, which require a higher level of formality for relations with other companies, with the government, and with companies abroad, are concentrated in urban centers. The likelihood ratio of being an informal worker increases with remittances: an individual receiving remittances has a likelihood ratio of being an informal worker that is 1.43 times higher than that of a person who does not receive remittances.

Modelo de probabilidad de trabajo informal

	Modelo 1	Modelo 2	Modelo 3
Escolaridad	1.15***		1.17***
	(6.036)		(8.720)
Escolaridad al cuadrado	0.98***		0.98***
	(-14.417)		(-17.093)
Edad	0.97***	0.97***	
	(-3.825)	(-3.118)	
Edad al cuadrado	1.00***	1.00***	
	(4.117)	(4.313)	
Urbano	0.67***	0.71***	0.86***
	(-8.534)	(-7.166)	(-3.043)
Remesa	1.44***	1.29***	1.43***
	(3.631)	(2.588)	(3.439)
Alfabetizado	0.72***	0.71***	
	(-2.593)	(-3.608)	
Mujer		1.25***	1.56***
		(4.611)	(8.599)
Unión Libre		1.23***	
		(4.556)	
Agropecuario		7.49***	6.37***
		(26.470)	(23.143)
Construcción		11.97***	9.71***
		(21.022)	(19.406)
Comercio		3.99***	3.95***
		(24.917)	(23.033)
Observations	10853	10853	10853
Pseudo R-squared	0.140	0.152	0.221

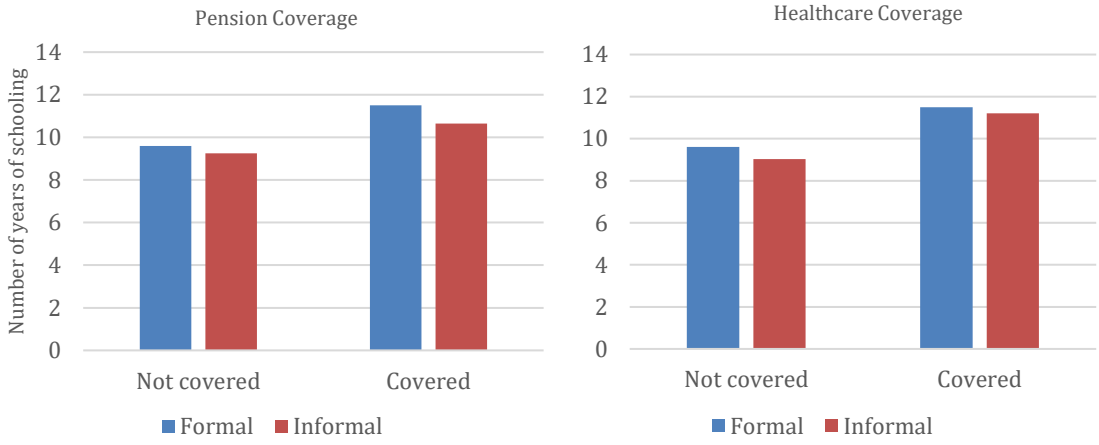
Nota: Los coeficientes están exponenciados. Estadístico t en paréntes
Fuente: Cálculos del autor.
* p<0.10, ** p<0.05, *** p<0.01

115. Data constraints limit attempts to analyze the impact of administrative and regulatory burdens on informality. Informality is much more common outside the country's Special Economic Zones (SEZs) and has significantly lower turnovers. This seems to demonstrate the existence of a pattern: enterprises with fewer than 5 employees make up only about 5 percent of SEZ-based firms, compared to about 40 percent of non-SEZ-based firms, and very small firms are far more likely than larger firms to operate in the informal sector. Informality appears to be connected to structural/behavioral factors that underpin different utility functions, related to whether or not to expand the business (then additionally, nationally or internationally), whether or not to benefit from fiscal incentives, whether or not to comply with administrative and regulatory burdens, insurance contributions, etc. Isolating the impact of these and several other individual factors that contribute to informality would require highly granular data on salary structures, complemented by more detailed behavioral evidence. However, the available information allows for some preliminary conclusions regarding the impact of social security contributions on informality.

116. The Dominican authorities do not use the condition of participating in the social security system as part of their definition of informality. However, this analysis shows that being informal is closely correlated with non-participation in the social security system. The definition of informality used by the ENFT includes the size of the production unit, the occupational group and the occupational category, but not whether a worker is covered by social security. Consequently, the relationship between the condition of labor informality and participation in the social security system can be properly investigated. The result is that roughly 86 percent of formal workers report being enrolled in an employer-sponsored pension system, compared to just only 11 percent of informal workers.

117. Results show the existence of a close correlation between the educational level, the probability of receiving social security coverage (both for pensions and health insurance), and the condition of work formality. Educated workers are more likely to covered by pension systems and health insurance. Social security enrollees have an average of 11.5 years of formal education, while non-enrollees have an average of 9.3 years.[74] Even within the informal sector, workers who are enrolled in the pension system have a higher average education level (10.7 years) than non-members (9.3 years). While both formal and informal workers who are not covered by social security and public health insurance tend to have a similarly low level of education, both formal and informal workers who are covered have a similarly high level of education. This implies that employers may be more willing to bear the administrative and financial burdens of the social security system in exchange for the increased productivity of more educated workers. While exploring this implication would require a more in-depth behavioral analysis than the available data allow, these initial results suggest that if the cost of contributing to the social security system is not offset by higher labor productivity, the probability of informality increases.

Figure 53: Pension and Healthcare Coverage by Education Level and Formal Status



118. These results show that formalization, social security coverage, and PIT compliance all reflect two key factors: labor productivity and educational attainment. Most workers who lack pension or healthcare coverage have below-average levels of educational attainment. This implies that boosting worker productivity by improving educational attainment would increase the likelihood that employers would be willing to bear the costs associated with formalization.

119. Education, gender, and sector of employment are the factors most closely correlated with informality in the DR. A male worker with eight years of formal education, who lives in an urban center, does not receive remittances, and works in retail has a 71 percent probability of being informal, which rises to 79.2 percent for a female worker. However, keeping all other variables constant, a male worker with a university education has only a 20.1 percent chance of informality, which rises to 28.2 percent for a female worker. Among all workers, having less than 4.3 years of formal education greatly increases the probability of informality. Despite their higher average education level, women in the DR are less likely than men to work in the formal sector, and they work fewer hours on average. Thus, efforts to address informality should be informed by an understanding of its gender dimensions. The close correlation between education and informality

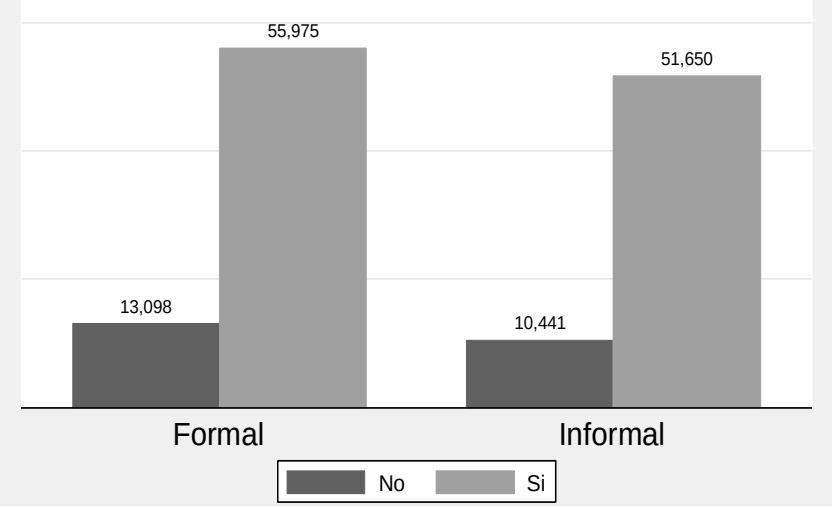
[74] In all applications, the tests of equality of means yield a statistic t that systematically rejects the null hypotheses.

implies that policy measures designed to boost educational attainment of the average worker could therefore promote formalization. Intersectoral mobility would likely play an important role in reducing informality, as more-educated workers move from labor-intensive highly informal sectors to capital-intensive highly formal sectors. Also within sectors, greater human capital could enable the development of more sophisticated value chains and encourage the formation of larger, more complex firms, both of which would likely encourage formalization.

The Potential Impact of Formalization on Personal Income Tax Revenue

120. Informality imposes fiscal costs in terms of foregone income-tax revenue, estimated to be close to a third of a percentage point of GDP. Based on the average worker's monthly income and the structure of the personal income tax (PIT), labor informality cost the government approximately 0.38 percent of GDP in foregone revenue in 2015. Roughly 414,000 workers, or about 9.5 percent of the total employed population, have monthly incomes above the PIT threshold (DR$33,326.92). About 292,000 of these workers are formal, and 122,000 are informal.[75] Assuming that the process of formalization would not affect the income of informal workers, and assuming that the process of formalization maintains unaltered the level of evasion that exists among formal workers, complete formalization would boost PIT revenue by DR$ 11.7 billion a year, which is roughly equivalent to 0.38 percent of GDP. .

Figure 54: Monthly Income, Paid and 'Unpaid', among Formal and Informal Workers (RD$)



121. However, the formalization process would likely affect the amount of income received by informal workers, thus reducing the potential increase in PIT collection; on the other hand, education improvements would have a boosting effect on it. Propensity score matching indicates that an informal worker in the DR receives 5.2 percent more income than a formal worker with the same characteristics (i.e., education, gender, area of residence, and receipt of remittances). On the basis of this evidence, our analysis included some microsimulations to estimate the income of informal workers being transferred to the formal market and, consequently, the potential income

[75] The average income of formal workers (who are taxed) is 56,000 pesos per month, which is 8.4% higher than the income of informal workers who are not taxed but have the potential to be taxed (i.e., those whose income is above the exempt limit). In contrast, the difference between the income of non-taxed (because under the threshold) formal income earners (i.e. 13,000 pesos) exceeds by 25.5% the income of non-taxed informal workers (10,500 pesos).

tax revenues that would result. Adjusting the income of informal workers to the level received by similar workers in the formal sector would reduce the number of formalized workers whose income exceeds the PIT threshold from 122,000 to 106,000. Under this scenario, formalization would increase PIT collection by about RD$10 billion a year, or roughly 0.33 percent of GDP. Finally, with respect to formalization, improved schooling would carry positive effects also on PIT revenue generation, by almost doubling the estimated increase to RD$ 18.8 billion a year, or 0.61 percent of GDP. This scenario assumes that the level of education of informal workers is adjusted upwards before their formalization occurs: the greater number of years of schooling would raise the income level of workers (according to the return of education estimated in our Mincer equation). It is worth noting that the Directorate General of Internal Taxes (DGII) recently produced a study[76] that has shown results in a comparable range, and where the estimated impact of informality on PIT recollection was equal to roughly 0.5% of GDP.

Conclusions and Recommendations

122. Labor informality costs the Dominican government roughly one third of a percentage point of the annual GDP in forgone PIT revenue. Data constraints prevent a similar analysis of the impact of informality on CIT. Depending on how the process of formalization would affect the wages of informal workers, complete formalization would boost PIT revenue by between 0.33 and 0.36 percent of the annual GDP. If education improvements are accounted for, this potential increase may go up to roughly 0.6 percent of GDP, as a consequence of the expected increase in income levels.

123. Informality in the DR is most common in sectors where growth has a strong impact on employment. For example, informality is especially prevalent in the retail, construction, and transportation sectors, which also have relatively high employment-growth elasticities. By contrast, the finance, mining, and electricity sectors have both very low levels of informality and weak employment-growth elasticities.

124. The characteristics of informal workers in the DR differ significantly from those of formal workers. In addition to sector-level effects, individual worker characteristics including age, urban/rural location, gender, and especially education are significant predictors of informality. The finding that women have a higher probability of informality—controlling for sector—dovetails with the challenge of increasing women's participation in the workforce. Despite their higher average education level, women in the DR are less likely than men to work, and they work fewer hours on average. While female workers in the DR have a higher overall formalization rate, this largely reflects their virtual exclusion from the highly informal construction and agriculture sectors. When these two male-dominated sectors are excluded from the analysis, women are between 1.3 and 1.6 times more likely to be informal than men with the same characteristics.

125. Formal workers earn higher wages, on average, than informal workers, but essentially because they are profoundly different. If characteristics such as education level and economic sector are accounted for, informal workers actually appear to earn slightly more than their formal counterparts. Formal workers tend to have higher education levels than informal workers and are more likely to be employed in high-wage sectors. However, when propensity score matching is used to control for differences in characteristics between formal and informal workers, informal workers are found to earn higher wages than formal workers. This suggests the presence of unobserved variables that benefit informal workers. While identifying

[76] Impacto de la Informalidad en la Recaudación del Impuesto sobre la Renta de las Personas Físicas, DGII, October 2013. The study is based on 2011 data.

these variables would require a separate analysis, the wage gap may reflect a premium offered by employers to partially compensate informal workers for foregoing the protections and benefits that formal employment would offer.

126. Informality is a complex phenomenon arising from the combination of many forces and which cannot be adequately explained by a single source; in the DR, however, educational attainment is the factor most strongly and consistently correlated with informality. This correlation is not sufficient to establish that low education levels cause informality, that workers are formal only because their level of education is high, or that education is the only (or even the most important) barrier to formalization. Nevertheless, it is reasonable to infer that education significantly contributes to formalization, and that formalization will be more difficult if educational attainment does not improve. Improving educational attainment could boost worker productivity, making employers more willing to bear the cost of social security contributions, worker protections, and mandatory benefits. The successful implementation of the 2014 "Education Pact" will be critical to this effort.

127. In light of this analysis, some possible policy actions that may benefit the formalization of the economy include:

C1. Due to the close correlation between educational attainment and labor informality, implementing education programs is expected to help expand the tax base. Technical training, vocational education, remedial basic education, on-the-job learning, and entrepreneurship support could facilitate formalization by promoting cross-sector mobility and encouraging the development of more sophisticated value chains. Complementing education programs with measures to reduce the administrative cost of firm formalization and improve the overall quality of the business climate would enhance their effectiveness.

C2. Targeting large non-compliers in the agriculture, construction, and retail sectors – where informality is more prevalent – could accelerate formalization. There sectors include large proportions of informality. Policies should then focus on large non-compliers in these areas and include a mix of (i) *preventive actions* – for example simplifying tax procedures (e.g. flat/simplified regimes) in these sectors would reduce disincentives to declare work; (ii) *sanctions* – which means strengthening oversight and applying appropriate penalties to would discourage tax evasion, and (iii) *adequate public outreach efforts* – highlighting the negative consequences of informality, including its effect on social security, could promote voluntary compliance.

C3. Authorities should consider strengthening data gathering efforts on dimensions related to informality, which could significantly expand the understanding of the phenomenon and facilitate the identification of better targeted policy actions. Among the analytical limits identified by this analysis was the unattainability of specific information on informality, and particularly with regard to the availability of granular data on salary structures (formal vs informal, vis-à-vis social security coverages, etc.), detailed behavioral evidence, as well as on the linkages between investment climate, productivity, human capital and informality. A survey or other data gathering efforts could be undertaken, similar to the efforts conducted in 2006 when an ad-hoc module was added to the ENFT to study the characteristics of informality. Stronger data foundations would prove critical to identify and orient policy changes, given the complexity of this topic.

Annex A: Methodology

List of Contents:

Technical Derivation of Regression Models

The goal is to estimate the impact of changes in taxation on the level of capital invested by the firm. Following Dwenger (2014) and Bond and Xing (2013) we arrive at the specification to estimate this empirically as follows.

The production function for firm '*i*'at time '*t*'using the constant elasticity of substitution (CES) function

$$F(K_{i,t}, L_{i,t}) = S_{i,t} = \gamma_t[\eta_i K_{i,t}^{-\rho} + (1-\eta_i)L_{i,t}^{-\rho}]^{\frac{-\nu}{\rho}}$$

where

$\rho = (1/\sigma - 1)$, σ is the elasticity of substitution between labor and capital

ν is the degree of the function

η_i and $(1-\eta_i)$ are the firm-specific relative factor shares of capital and labor

γ_t is the year-specific production technology

Equating the marginal Productivity of capital and its Marginal Cost, i.e. the User Cost of Capital

$$F_K(K_{i,t}, L_{i,t}) \stackrel{\text{def}}{=} S_{i,t} = \eta_i \nu \gamma_t^{\frac{-\rho}{\nu}} S_{i,t}^{1+\frac{\rho}{\nu}} K_{i,t}^{-(1+\rho)}$$

Hence the Optimal Capital Stock is given by

$$K_{i,t}^* = A_i T_t S_{i,t}^{\beta} UCC_{i,t}^{-\sigma} \text{ where}$$

$$\beta = \sigma + \frac{(1-\sigma)}{\nu}, A_i = (\eta_i \nu)^{\sigma} \text{ and } T_t = \gamma_t^{\frac{\sigma-1}{\nu}} \text{ hence}$$

The optimal level of capital depends on a firm's level of output (or Sales $S_{i,t}$), a firm specific distribution parameter A_i, Technology T_t and the firm's User Cost of Capital UCC

The firm's optimal capital decision is given by:

$$K_{i,t}^* = A_i T_t S_{i,t}^{\beta} UCC_{i,t}^{-\sigma}$$

However, the firm takes some time to reach this optimal level of capital. Hence the dynamic level of capital at time t depends on how far it is from the optimal level of capital. Incorporating this dynamic component and taking logs of the capital decision gives us the following specification,

$$k_{i,t} = c + a_i + \sum_{h=0}^{H} \phi_h k_{i,t-k} + \sum_{h=0}^{H} \beta_h s_{i,t-h} - \sum_{h=0}^{H} \sigma_h ucc_{i,t-h} + \sum_{t=0}^{T-1} \tau d_t + a_i + \varepsilon_{i,t}$$

The challenge is to estimate the long term elasticity of the parameter σ which is the sum of the individual terms σ_h which gives the short term effects. Using one lag of capital and making some readjustment in the terms gives us the following in the Error Correction format.

$$k_{i,t} = c + \phi k_{i,t-1} + \sum_{k=0}^{H-1} \mu_k \Delta s_{i,t-k} - \sum_{k=0}^{H-1} \alpha_k \Delta ucc_{i,t-k} + \sigma' ucc_{i,t-1} + \beta' s_{i,t-1} + \sum_{t=0}^{T-1} \tau d_t + a_i + \varepsilon_{i,t}$$

The goal is to estimate $\frac{\sigma'}{1-\phi}$ which is the long run elasticity of Investment to the User Cost of Capital. The α_k's gives the dynamics of this adjustment of investment to user cost of capital.

Assuming that productivity terms can be dealt with a time trend (α_t), adding a firm-specific fixed effect (α_i) and a stochastic error term (ε_{it}) we can derive an equation that can be estimated with firm-level data:

$$k_{it} = \alpha - \sigma ucc_{it} + \mu s_{it} + \alpha_t + \alpha_i + \varepsilon_{it}$$

The behavior described in this equation is one of equilibrium in which variable have reached a steady state. However, it is common to assume that due to frictions in the capital formation process there are lags for firms to reach the long-run equilibrium and thus some form of short-term dynamics can be introduced. An autoregressive distributed lag representation of this equilibrium relationship thus will be:

$$k_{it} = \alpha + \beta_1 k_{it-1} + \sigma_0 ucc_{it-1} + \sigma_1 \Delta ucc_{it} + \sigma_2 \Delta ucc_{it-1} + \sigma_3 \Delta ucc_{it-2} + \mu_0 s_{it-1} + \mu_1 \Delta s_{it} + \mu_2 \Delta s_{it-1} + \mu_3 \Delta s_{it-2} + \alpha_t + \alpha_i + \varepsilon_{it}$$

We estimate the error correction model to assess the responsiveness of the capital stock to changes in the user cost of capital. The long-term elasticity can be obtained from the regression as the coefficient of the lagged user cost of capital variable σ_0 divided by $(1 - \beta_1)$ where β_1 is the coefficient of the lagged value of capital in the equation above.

The capital stock at the beginning of the period is the reported book value of capital stock and is assumed to be analogous to the replacement cost of capital at the beginning of the period as in Ohrn (2013). Real sales values are obtained by deflating the nominal series by the Producer Price Index (PPI) of the corresponding industry. The user cost of capital is constructed as described in the previous section.

Ordinary Least Squares (OLS) estimation would be biased and inconsistent in dynamic panel data models because the lagged dependent variable is correlated with the firm-specific effect. We would hence use firm level fixed effects to estimate the long run elasticity. We are also concerned that some components of the user cost of capital might be endogenous. Therefore, we will use the generalized method of moments (GMM) with lagged levels of dependent and independent variables as instruments for the difference equation (Difference GMM), and including the lagged differences of dependent and independent variables as instruments for the level equation (system-GMM) as in Blundell and Bond (1998).

Annex B. Construction of the Final Dataset

We proceed through a number of steps to arrive a the final estimation dataset. We explain them here in order to facilitate the replication of the analysis. All the Stata codes used for the analysis are available from the authors of the report.

Basic Data Cleaning

We correct the units of the **turnover** variable, flagging any observations with annual turnover below RD$ 100,000 (approximately US$ 2,000). In some instances, the variable for **total assets** is missing. We replace it with the sum of all fixed assets, when those are available. There are some inconsistencies in the reporting of assets that appear to related to data-entry errors. For example, the same asset seems to be classified under different categories in each year. We fix the obvious inconsistencies, but we cannot guarantee that all the errors are fixed.

Sample Selection

We drop from the dataset all observations with average turnover below RD$ 100,000, or more than 50% of years with turnover below that level. This reduces the total sample by 40%, but has a negligible impact on the total tax revenue reported by firms in the dataset, as all the firms removed are either very small or inactive. We drop any firms without information on which sector they belong to, and those that belong to the Public Administration section (79 and 37 observations, respectively). We drop firms without province information (225). We drop observations for which we do not have any information on fixed assets (1.4% of the remaining sample).

Predicted Variables

128. For some variables, we exploit the existing information in order to recover observations with plausible values and expand the sample size. We predict new sales value for those observations that were tagged as too low (under 100,000$), using a simple regression model of turnover on total fixed assets with firm and year fixed effects for firms above this threshold value.

Calculation of the User Cost of Capital (UCC)

The corporate income tax rate applying to each firm is not directly reported in the data. We use the information on the special tax regime that each firm belongs to in order to construct this variable, combined with the general rate applying each year. For essentially all special tax regimes, the corporate income tax rate is zero.

The calculation of the interest rate faced by each firm is more complicated. We first calculate the firm-level interest rate dividing total financial expenses by the debt stock, which should give a useful proxy for the cost of financing. We find that only 10% of the observations have a plausible value, i.e. an interest rate in an interval of 1% below to 6% above the Central Bank's interbank rate. We use this 10% subsample to study the factors explaining variation in this variable, estimating a fixed-effects regressions of the interest rate on log turnover, sector FE, year FE and province FE. We then apply these coefficients to predict the interest rate for the remaining 90% of the sample.

We calculate the present value of capital allowances per RD$ using depreciation laws. The formula to apply here is $A_s = IA_s + \sum_t \frac{AA_s}{(1+i)^t}$, where i is the firm-level interest rate, t is the year, IA_s is the initial allowance (=0) and AA_s for different assets are summarized in the table below:

Asset Type	Allowance
Buildings	5%
Machinery and Equipment	25%

Other Depreciable Assets 15%

With the exception of the Proindustria special regime, where the allowances are:

Asset Type	Allowance
Buildings	5%
Machinery and Equipment	50%
Other Depreciable Assets	15%

129.

130. For the different price levels required to construct the UCC measure, we use a variety of deflators provided by the Central Bank. In the case of fixed assets, we use the deflators with base 2005 for (i) buildings and (ii) machinery and other assets. For output prices, we use the sector-level deflators also provided by the Central Bank with base 2005.

131.

132. To actually calculated the UCC for each firm, we need to calculate the share of each type of asset (buildings, machinery, other) in total assets. We calculate the real interest rate for each firm using the basic CPI rate. We then apply the UCC formula from the main text to each firm-year observation, applying the following depreciation rates by type of asset:

Asset Type	Depreciation Rate
Buildings	3%
Machinery and Equipment	15%
Other Depreciable Assets	15%

Annex C. User Cost of Capital Elasticity: Regression Analysis and Full Regression Tables

Regression Analysis

The analysis estimated the following regression equation:

$$k_{it} = \alpha + \beta_1 k_{it-1} + \sigma_0 ucc_{it-1} + \sigma_1 \Delta ucc_{it} + \sigma_2 \Delta ucc_{it-1} + \sigma_3 \Delta ucc_{it-2} + \mu_0 s_{it-1} + \mu_1 \Delta s_{it} + \mu_2 \Delta s_{it-1} + \mu_3 \Delta s_{it-2} + \alpha_t + \alpha_i + \varepsilon_{it}$$

where k_{it} denotes the log stock of tangible fixed assets held by firm *i* in year *t*; ucc_{it} is the log user cost of capital; s_{it} is the log turnover (revenue from sales); and $\alpha_t + \alpha_i$ denote time and firm-level fixed effects, respectively.

An error-correction model is estimated to assess the responsiveness of the capital stock to changes in the UCC. The long-term elasticity can be obtained from the regression as the coefficient of the lagged user cost of capital, variable σ_0, divided by $(1 - \beta_1)$, where β_1 is the coefficient of the lagged value of capital in the equation above. The full derivation is provided in Appendix B.

The stock of tangible fixed assets at the beginning of the period is the reported book value of the capital stock. It is assumed to be analogous to the replacement cost of capital at the beginning of the period.[77] Real sales values are obtained by deflating the nominal series by the producer price index for the corresponding industry. The construction of the UCC is described in the previous section.

An ordinary least squares (OLS) estimation will be biased and inconsistent in dynamic panel-data models because the lagged dependent variable is correlated with the firm-specific effect. This issue can be addressed by including firm-level fixed effects to estimate the long-run elasticity. Because some components of the UCC might be endogenous, the generalized method of moments (GMM) with lagged levels of dependent and independent variables are used as instruments for the difference equation (difference-GMM), including lagged differences of dependent and independent variables as instruments for the level equation (system-GMM).[78]

For the GMM estimation results to be valid, the estimation must pass both the Arellano-Bond AR(2) test and the Sargan Test. The Arellano-Bond AR(2) test checks for second-order autocorrelation in the residuals, which would invalidate the use of second lags as instruments for the difference equation. The Sargan test on over-identifying restrictions verifies the validity of using lags as instruments for the difference equation. Both tests require a p-value of more than 0.2 to not reject the null hypotheses that second-order autocorrelation is present and that instruments are correlated to the error term, respectively.

The OLS estimation indicates that the long-term elasticity of investment is -1.33. This is close to the most reliable recent estimates in other contexts. The only sector with a positive estimated elasticity was mining, though the sample size was probably too small (293 observations). It should also be borne in mind that the estimators for other sectors may be biased for the reasons described above.[79]

[77] See: Ohrn, 2013.
[78] See: Blundell and Bond, 1998.
[79] See Table A.1 in the Appendix.

The fixed-effects model estimates the long-run elasticity of investment at -0.95. This point estimate is statistically different from zero, but a long-run elasticity of -1 cannot be ruled out. The estimated elasticities for all sectors are close to the overall value: the smallest (in absolute terms) is transportation and communications at -0.41, and the largest is construction at -1.41. Again, the only outlier is the mining sector, where the estimated elasticity is positive but not statistically significant.[80]

Only the GMM estimation results for the mining sector pass the Arellano-Bond AR(2) and Sargan tests with p-values above 0.2. The investment elasticity of the mining sector is estimated at 0.03. However, a large standard error implies the estimate is not statistically different from zero.[81]

Table 11: Elasticity of Investment with Respect to the User Cost of Capital, by Sector

	Estimated Elasticities by Sector	
By Sector	**Elasticity**	**t-Statistic**
Agriculture	-0,551**	-1,913
Construction	-1,410***	-10,232
Manufacturing	-0,809***	-6,023
Mining	0,038	0,184
Real estate	-1,155***	-8,371
Consumer services	-0,487***	-3,850
Business services	-1,208***	-12,552
Tourism	-0,839***	-3,582
Trade	-1,186***	-17,561
Transport & Communications	-0,406***	-3,668
ALL SECTORS	-0,955***	-25,408
SEZ and Non-SEZ Firms		
SEZ firms	-0.667*	-1.623
Matched control group	-0.802**	-2.200
FULL SUBSAMPLE	-0.748***	-2.788

[80] See Table A.2 in the Appendix.
[81] See Table A.3 in the Appendix.

Table C.1. Ordinary Least Squares (OLS) Regressions

VARIABLES	All sectors	Agriculture	Construction	Manufacturing	Mining	Real Estate	Services for hholds.	Services for priv. sec.	Tourism	Trade	Transport & Comms.
L.k_r	0.939***	0.918***	0.910***	0.920***	0.953***	0.939***	0.926***	0.921***	0.922***	0.931***	0.949***
	(0.001)	(0.012)	(0.006)	(0.007)	(0.023)	(0.005)	(0.007)	(0.003)	(0.007)	(0.002)	(0.004)
L.s_r	0.062***	0.073***	0.089***	0.092***	0.087**	0.059***	0.083***	0.074***	0.084***	0.069***	0.056***
	(0.001)	(0.010)	(0.005)	(0.008)	(0.039)	(0.005)	(0.007)	(0.003)	(0.007)	(0.002)	(0.004)
L.ucc	-0.081***	-0.078**	-0.216***	-0.085***	0.063	-0.160***	-0.067***	-0.154***	-0.186***	-0.130***	-0.003
	(0.004)	(0.033)	(0.022)	(0.018)	(0.156)	(0.016)	(0.017)	(0.012)	(0.026)	(0.008)	(0.012)
LD.k_r	-0.037***	-0.113***	-0.054***	-0.094**	0.016	-0.053***	-0.019	-0.014	-0.002	-0.032***	-0.018
	(0.006)	(0.040)	(0.016)	(0.042)	(0.036)	(0.019)	(0.029)	(0.010)	(0.016)	(0.009)	(0.014)
D.s_r	0.067***	0.084***	0.063***	0.094***	0.033	0.025***	0.092***	0.065***	0.082***	0.077***	0.069***
	(0.002)	(0.023)	(0.006)	(0.009)	(0.048)	(0.007)	(0.011)	(0.004)	(0.016)	(0.004)	(0.006)
LD.s_r	0.018***	0.006	-0.005	0.017***	-0.032	-0.009	0.005	0.010***	0.014	0.023***	0.028***
	(0.002)	(0.027)	(0.005)	(0.006)	(0.038)	(0.006)	(0.009)	(0.004)	(0.010)	(0.003)	(0.006)
D.ucc	-0.600***	-0.429***	-1.026***	-0.506***	-0.094	-0.750***	-0.503***	-0.651***	-0.743***	-0.714***	-0.246***
	(0.015)	(0.132)	(0.063)	(0.057)	(0.445)	(0.055)	(0.058)	(0.039)	(0.086)	(0.027)	(0.051)
LD.ucc	-0.141***	-0.221***	-0.191***	-0.167***	0.093	-0.219***	-0.090**	-0.129***	-0.135***	-0.162***	-0.092***
	(0.009)	(0.075)	(0.037)	(0.043)	(0.249)	(0.030)	(0.042)	(0.022)	(0.050)	(0.015)	(0.031)

Constant	-0.037***	0.091	-0.751***	-0.288***	-0.770*	-0.736***	-0.134**	-0.369***	-0.238***	-0.481***	-0.047
	(0.013)	(0.103)	(0.068)	(0.046)	(0.444)	(0.062)	(0.057)	(0.033)	(0.068)	(0.021)	(0.044)
Observations	188,869	2,887	13,987	18,432	293	15,876	9,234	39,840	6,012	68,640	13,668
R-squared	0.941	0.927	0.914	0.962	0.961	0.930	0.960	0.930	0.970	0.935	0.945
Long Term Elasticity	-1.330	-0.948	-2.399	-1.064	1.352	-2.632	-0.901	-1.950	-2.395	-1.886	-0.0667
Long Term Elasticity t_stat	-25.26	-2.490	-13.58	-5.617	0.403	-19.02	-4.419	-18.57	-11.22	-20.04	-0.280

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table C.2. Fixed-Effects (FE) Regressions

VARIABLES	All sectors	Agriculture	Construction	Manufacturing	Mining	Real Estate	Services for hholds.	Services for priv. sec.	Tourism	Trade	Transport & Comms.
L.k_r	0.472***	0.379***	0.447***	0.463***	0.592***	0.472***	0.449***	0.457***	0.451***	0.471***	0.524***
	(0.007)	(0.079)	(0.019)	(0.026)	(0.080)	(0.023)	(0.030)	(0.014)	(0.033)	(0.011)	(0.020)
L.s_r	0.109***	0.094***	0.086***	0.141***	0.075	0.048***	0.168***	0.092***	0.101***	0.133***	0.101***
	(0.004)	(0.030)	(0.010)	(0.014)	(0.053)	(0.012)	(0.021)	(0.008)	(0.021)	(0.007)	(0.013)
L.ucc	-0.504***	-0.342*	-0.780***	-0.434***	0.718	-0.610***	-0.268***	-0.656***	-0.461***	-0.627***	-0.193***
	(0.021)	(0.184)	(0.082)	(0.082)	(0.647)	(0.081)	(0.072)	(0.053)	(0.140)	(0.039)	(0.053)
LD.k_r	-0.008*	-0.004	0.005	-0.041**	0.040	0.014	0.002	-0.004	0.007	-0.008	-0.013

	(0.004)	(0.029)	(0.014)	(0.019)	(0.027)	(0.014)	(0.020)	(0.007)	(0.019)	(0.007)	(0.012)
D.s_r	0.048***	0.045***	0.038***	0.071***	0.019	0.007	0.076***	0.039***	0.055**	0.061***	0.047***
	(0.002)	(0.015)	(0.006)	(0.009)	(0.059)	(0.007)	(0.012)	(0.004)	(0.022)	(0.004)	(0.008)
LD.s_r	-0.029***	-0.039	-0.026***	-0.034***	-0.047	-0.020***	-0.058***	-0.022***	-0.022*	-0.032***	-0.019**
	(0.002)	(0.034)	(0.005)	(0.007)	(0.045)	(0.006)	(0.009)	(0.004)	(0.013)	(0.003)	(0.008)
D.ucc	-0.636***	-0.373**	-1.008***	-0.528***	0.140	-0.705***	-0.461***	-0.714***	-0.721***	-0.729***	-0.297***
	(0.019)	(0.160)	(0.072)	(0.067)	(0.487)	(0.064)	(0.068)	(0.047)	(0.101)	(0.032)	(0.065)
LD.ucc	-0.039***	-0.072	-0.038	-0.042	-0.214	-0.024	-0.052	-0.003	-0.096	-0.010	-0.071***
	(0.008)	(0.080)	(0.030)	(0.028)	(0.245)	(0.027)	(0.034)	(0.019)	(0.061)	(0.013)	(0.027)
Constant	4.930***	7.379***	5.381***	5.049***	6.076***	5.679***	4.900***	5.161***	5.796***	4.066***	4.926***
	(0.092)	(1.164)	(0.287)	(0.301)	(1.511)	(0.313)	(0.453)	(0.197)	(0.500)	(0.149)	(0.316)
Observations	188,869	2,887	13,987	18,432	293	15,876	9,234	39,840	6,012	68,640	13,668
R-squared	0.343	0.220	0.360	0.334	0.386	0.335	0.338	0.352	0.341	0.364	0.339
Number of id	38,245	542	2,763	3,539	59	2,845	1,830	8,292	1,325	14,369	2,681
Long Term Elasticity	-0.955	-0.551	-1.410	-0.809	1.761	-1.155	-0.487	-1.208	-0.839	-1.186	-0.406
Long Term Elasticity t_stat	-25.41	-1.913	-10.23	-6.023	1.130	-8.371	-3.850	-12.55	-3.582	-17.56	-3.668

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table C.3. Generalized Method of Moments (GMM) Regressions

VARIABLES	All sectors	Agriculture	Construction	Manufacturing	Mining	Real Estate	Services for hholds.	Services for priv. sec.	Tourism	Trade	Transport & Comms.
L.k_r	0.511***	0.235***	0.468***	0.520***	0.563***	0.404***	0.662***	0.468***	0.487***	0.578***	0.481***
	(0.007)	(0.027)	(0.017)	(0.020)	(0.033)	(0.022)	(0.022)	(0.012)	(0.027)	(0.011)	(0.020)
L.s_r	0.066***	0.064**	-0.002	0.022	0.029	0.016	0.198***	0.065***	0.059**	0.051***	0.086***
	(0.006)	(0.028)	(0.017)	(0.022)	(0.031)	(0.021)	(0.022)	(0.012)	(0.027)	(0.010)	(0.020)
L.ucc	-0.010	0.013	0.250***	0.288***	0.017	0.301***	-0.116*	0.040	0.323***	0.039	0.069*
	(0.021)	(0.067)	(0.069)	(0.060)	(0.089)	(0.051)	(0.067)	(0.039)	(0.057)	(0.037)	(0.042)
LD.k_r	-0.050***	-0.020**	-0.057***	-0.078***	0.051***	-0.017*	-0.085***	-0.040***	-0.064***	-0.050***	-0.039***
	(0.003)	(0.008)	(0.008)	(0.008)	(0.015)	(0.010)	(0.012)	(0.006)	(0.011)	(0.005)	(0.009)
D.s_r	0.036***	0.021	0.006	0.010	-0.008	-0.004	0.100***	0.027***	0.035**	0.034***	0.044***
	(0.003)	(0.015)	(0.009)	(0.011)	(0.011)	(0.010)	(0.013)	(0.006)	(0.014)	(0.005)	(0.011)
LD.s_r	-0.009***	-0.019**	0.001	-0.001	-0.043***	-0.012**	-0.031***	-0.012***	-0.014**	-0.004	-0.012*
	(0.002)	(0.008)	(0.005)	(0.006)	(0.011)	(0.005)	(0.007)	(0.004)	(0.007)	(0.004)	(0.006)
D.ucc	-0.194***	-0.117***	-0.120***	-0.048*	-0.263***	0.032	-0.198***	-0.145***	-0.062**	-0.125***	-0.064*
	(0.014)	(0.043)	(0.034)	(0.028)	(0.072)	(0.021)	(0.041)	(0.027)	(0.027)	(0.018)	(0.038)
LD.ucc	-0.048***	-0.067**	-0.084***	-0.105***	0.018	-0.099***	0.051**	-0.061***	-0.140***	-0.023*	-0.081***
	(0.008)	(0.028)	(0.026)	(0.025)	(0.048)	(0.022)	(0.023)	(0.016)	(0.024)	(0.013)	(0.021)

Constant	5.788***	10.556***	7.904***	7.186***	6.212***	8.949***	1.613***	6.359***	7.139***	4.933***	6.096***
	(0.133)	(0.620)	(0.371)	(0.451)	(0.290)	(0.418)	(0.330)	(0.241)	(0.517)	(0.198)	(0.405)
Observations	188,869	2,887	13,987	18,432	293	15,876	9,234	39,840	6,012	68,640	13,668
Number of id	38,245	542	2,763	3,539	59	2,845	1,830	8,292	1,325	14,369	2,681
Long Term Elasticity	-0.0205	0.0167	0.470	0.599	0.038	0.505	-0.343	0.0744	0.629	0.0919	0.132
Long Term Elasticity t_stat	-0.480	0.190	3.505	4.602	0.184	5.423	-1.760	1.026	4.856	1.028	1.656
Arellano Bond Test AR1	0.000	0.000	0.000	0.000	0.029	0.000	0.000	0.000	0.000	0.000	0.000
Arellano Bond Test AR2	0.036	**0.890**	0.057	**0.428**	**0.548**	**0.292**	**0.443**	**0.399**	**0.267**	**0.978**	**0.696**
Sargan Test	0.000	0.036	0.000	0.000	**0.999**	0.000	0.000	0.000	0.000	0.000	0.007

Standard errors in parentheses. For the Arellano-Bond and Sargan tests, p-values are reported. The GMM estimates are only considered valid if both p-values are greater than 0.2.

*** p<0.01, ** p<0.05, * p<0.1

Annex D. Additional Tables

Table D.1. Fixed-Effects Regression for Employment (see next page)

VARIABLES	All sectors	Agriculture	Construction	Manufacturing	Mining	Real Estate	Services for hholds.	Services for priv. sec.	Tourism	Trade	Transport & Comms.
K_R_M	0.143***	0.791***	0.314*	0.192*	0.102***	0.001	0.061*	0.080**	0.184***	0.531***	0.011
	(0.041)	(0.208)	(0.166)	(0.112)	(0.005)	(0.029)	(0.035)	(0.032)	(0.042)	(0.021)	(0.032)
2007.year	2.837***	6.403***	0.479	4.170**	-3.254	1.360**	5.123***	2.718***	5.790	1.664***	3.394***
	(0.383)	(1.684)	(2.761)	(2.067)	(10.508)	(0.532)	(1.246)	(0.553)	(3.683)	(0.192)	(0.918)
2008.year	4.535***	9.000***	1.155	8.971***	-29.784	1.922***	8.208***	4.663***	7.294*	2.769***	4.769***
	(0.478)	(1.946)	(3.362)	(2.333)	(36.122)	(0.663)	(1.400)	(0.806)	(4.335)	(0.282)	(1.585)
2009.year	3.907***	7.237***	-0.488	3.308	-44.853	1.625**	10.418***	5.410***	1.322	2.674***	5.124***
	(0.607)	(2.414)	(4.163)	(3.309)	(51.361)	(0.658)	(1.514)	(0.982)	(4.754)	(0.349)	(1.671)
2010.year	5.265***	9.317***	0.860	4.427	-63.044	2.142***	13.842***	6.817***	4.486	3.391***	6.581***
	(0.667)	(2.998)	(4.388)	(3.605)	(55.341)	(0.797)	(1.810)	(1.193)	(4.930)	(0.356)	(1.759)
2011.year	6.671***	11.169***	2.872	7.094**	-32.251	2.371***	15.722***	8.183***	6.090	4.031***	8.933***
	(0.678)	(3.282)	(4.652)	(3.614)	(47.280)	(0.853)	(2.076)	(1.259)	(5.222)	(0.381)	(1.749)

2012.year	7.383***	9.951***	2.652	6.655	-22.156	2.714***	17.908***	9.273***	6.543	4.409***	11.193***
	(0.738)	(3.357)	(4.902)	(4.223)	(49.229)	(0.912)	(2.204)	(1.283)	(5.475)	(0.429)	(2.008)
2013.year	8.040***	10.618***	1.955	8.085*	-31.127	2.819***	18.669***	10.373***	9.994*	4.604***	11.068***
	(0.763)	(3.895)	(5.049)	(4.345)	(51.908)	(0.982)	(2.180)	(1.356)	(5.655)	(0.401)	(2.202)
2014.year	8.976***	10.668***	1.066	9.344*	-46.405	3.051***	20.553***	10.883***	13.300**	5.235***	14.158***
	(0.818)	(3.436)	(5.269)	(4.891)	(68.043)	(1.056)	(2.228)	(1.379)	(5.956)	(0.412)	(2.266)
2015.year	10.641***	7.877**	3.819	10.954*	-26.890	3.523***	22.645***	12.222***	19.186***	5.803***	16.602***
	(0.900)	(3.632)	(5.595)	(5.848)	(48.448)	(1.199)	(2.374)	(1.469)	(6.046)	(0.447)	(2.619)
Constant	20.614***	15.343***	12.616***	75.839***	87.300*	8.509***	15.653***	11.128***	53.982***	10.806***	23.160***
	(0.971)	(4.564)	(2.851)	(5.281)	(44.189)	(0.954)	(2.859)	(1.089)	(6.785)	(0.382)	(2.251)
Observations	232,351	3,478	16,999	24,007	359	14,213	11,810	47,034	8,417	89,746	16,288
R-squared	0.080	0.164	0.060	0.059	0.163	0.004	0.170	0.018	0.228	0.644	0.016
Number of id	40,599	546	2,957	3,867	61	2,325	1,938	8,588	1,658	15,900	2,759

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

Table D.2: Additional Long-Run Investment Due to Changes in UCC (RD$ millions)

	Fiscal Year									
Sector	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Agriculture	219.5	228.5	244.8	259.5	246.7	321.3	349.7	362.3	428.1	403.7
Construction	1,622.5	1,606.0	1,592.9	1,773.4	1,785.5	2,419.7	2,844.3	2,857.1	3,118.5	2,985.9
Manufacturing	6,771.1	5,605.2	6,633.1	6,074.1	5,786.6	8,132.4	8,426.2	8,475.2	8,907.2	7,890.1
Mining	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Real State	3,790.9	3,358.3	3,187.7	3,463.4	3,613.3	4,130.2	4,315.8	4,565.3	4,624.5	4,892.7
Services for hholds.	2,027.3	1,377.0	1,484.6	1,387.1	1,272.0	1,835.2	1,786.2	1,826.8	2,120.1	1,446.8
Services for priv. sec.	4,540.4	2,058.0	2,574.8	2,937.3	2,416.9	3,265.9	3,418.2	3,555.0	4,077.7	3,029.6
Tourism	4,350.8	4,216.6	5,305.5	5,667.0	6,177.4	7,624.6	8,583.8	7,713.3	7,289.3	7,768.0
Trade	3,580.5	3,315.1	3,615.8	3,745.9	3,803.2	5,297.5	5,704.2	6,089.5	6,420.5	6,270.9
Transport & Comms.	3,029.5	2,337.9	2,983.7	2,614.3	2,192.1	3,246.8	3,432.1	3,406.4	3,500.1	2,690.2
TOTAL	29,901.2	24,076.9	27,564.1	27,897.1	27,273.7	36,244.5	38,832.0	38,826.6	40,461.7	37,374.1

Table D.3: Tax Revenue Foregone Due to Capital Allowances (RD$ millions)

	Fiscal Year									
Sector	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Agriculture	N/A	55.9	31.6	40.8	43.2	35.6	48.1	67.1	131.6	115.7
Construction	N/A	220.1	139.3	186.1	159.6	245.6	199.9	154.9	126.4	221.3
Manufacturing	N/A	308.2	484.6	416.1	348.5	436.8	429.6	602.2	909.0	894.7
Mining	N/A	3.5	5.6	3.7	9.8	20.1	34.6	8.9	10.2	6.7
Real Estate	N/A	200.9	138.6	165.0	272.7	109.5	171.8	369.8	197.2	402.7
Services for hholds.	N/A	148.9	264.3	219.9	171.5	290.5	468.6	527.7	240.9	283.7
Services for priv. sec.	N/A	260.0	253.0	285.0	243.0	348.1	266.0	367.7	268.6	473.0
Tourism	N/A	245.3	799.9	699.4	190.6	590.6	282.6	162.5	255.2	761.5
Trade	N/A	490.0	328.8	424.7	469.7	563.5	551.4	717.3	472.1	994.4
Transport & Comms.	N/A	281.6	637.2	536.1	261.0	381.9	250.0	252.9	320.4	302.2
TOTAL	N/A	2,214.3	3,083.0	2,976.7	2,169.6	3,022.2	2,702.6	3,231.0	2,931.5	4,455.8

N/A no data for the first year since base don increase in capital stock

Table D.4: Tax Revenue Foregone Due to Corporate Tax Rate Exemptions (RD$ millions)

	Fiscal Year									
Sector	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Agriculture	7.1	15.4	11.8	8.5	17.1	20.5	20.2	15.5	17.2	14.6
Construction	2.6	1.9	3.0	5.6	15.4	1.2	0.8	1.0	1.8	0.6
Manufacturing	905.8	608.2	354.4	481.8	699.5	961.5	855.5	805.5	787.4	775.3
Mining	2,366.7	2,406.4	338.9	104.3	119.6	409.8	301.6	172.6	1.8	2.6
Real Estate	0.3	0.3	0.7	0.1	1.4	0.2	0.2	3.5	0.1	0.7
Services for hholds.	149.7	1.1	1.4	2.4	24.1	94.9	69.1	131.7	75.9	0.6
Services for priv. sec.	4.2	11.1	8.2	8.6	5.0	10.2	43.6	53.0	22.5	16.9
Tourism	129.2	60.8	0.0	0.2	2.1	0.0	0.0	14.4	13.1	23.8
Trade	526.4	516.4	384.5	340.5	337.2	319.9	338.3	346.8	375.8	473.7
Transport & Comms.	2,977.5	2,729.6	2,670.5	2,423.6	2,647.7	3,486.6	3,861.0	3,731.6	3,987.9	4,247.7
TOTAL	7,069.4	6,351.2	3,773.4	3,375.6	3,869.1	5,305.0	5,490.3	5,275.7	5,283.4	5,556.5

Table D.5: Total Foregone Tax Revenue

	Fiscal Year									
Sector	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Agriculture	7.1	71.3	43.4	49.3	60.3	56.2	68.3	82.6	148.8	130.4
Construction	2.6	222.0	142.3	191.7	174.9	246.8	200.7	155.8	128.2	221.9
Manufacturing	905.8	916.4	839.1	897.8	1,048.0	1,398.3	1,285.1	1,407.7	1,696.4	1,670.0
Mining	2,366.7	2,409.9	344.5	108.0	129.4	429.9	336.2	181.5	12.1	9.3
Real Estate	0.3	201.2	139.3	165.1	274.1	109.7	172.0	373.2	197.2	403.3
Services for hholds.	149.7	150.1	265.7	222.3	195.6	385.4	537.7	659.5	316.8	284.3
Services for priv. sec.	4.2	271.0	261.3	293.6	248.0	358.3	309.6	420.8	291.0	489.8
Tourism	129.2	306.1	799.9	699.6	192.8	590.6	282.6	176.9	268.3	785.3
Trade	526.4	1,006.3	713.2	765.3	806.9	883.5	889.6	1,064.1	847.9	1,468.1
Transport & Comms.	2,977.5	3,011.2	3,307.7	2,959.7	2,908.7	3,868.5	4,111.0	3,984.5	4,308.2	4,549.9
TOTAL	7,069.4	8,565.5	6,856.4	6,352.3	6,038.7	8,327.3	8,192.8	8,506.7	8,214.9	10,012.4

Annex E: Assessing Firm-level Performance of Enterprises Receiving and Non-receiving Tax Benefits through a Propensity Score Matching

Let T_i be a binary variable which takes the value $T_i = 1$ for firms *i* having access to the treatment (Income Tax equal to zero) and $T_i = 0$ for nontreated firms. Let Y_i be the potential outcomes of the treatment: Liquidity, ROA, Financial expenses-to-sale, and ETA. For example, considering that Y_i is the amount of Liquidity of a firm *i* who has access to the treatment (i.e. tax incentives) and Y_{i0} is the amount of Liquidity for an firm *i* who has no access to the treatment (i.e. that does not benefit from tax incentives). The average treatment effect on the treated (ΔATT) is:

$$\Delta ATT = E(Y_{i1} \mid T_i = 1) - E(Y_{i0} \mid T_i = 1) \qquad (1)$$

Because a given firm cannot simultaneously receive and not receive the treatment, $E(Y_{i0} \mid T_i = 1)$ is not observable. $E(Y_{i0} \mid T_i = 0)$ can be substitute to $E(Y_{i0} \mid T_i = 1)$ because the rest is an observable quantity. Yet doing this assumes that a Treated behavior is identical to that of a non-treated one, which holds true only if treated units have the same characteristics as the untreated ones. To do so, we need the conditional independence assumption. This assumes that there is a vector of firm characteristics (area, economic activity, cost of employee, value of building) that describe the firm irrespective having access to the treatment or not.

Let X be the vector of firm characteristics, the conditional independence assumption is:

$$Y_{i1}, Y_{i0} \perp\!\!\!\perp T_i \mid X, \forall X \qquad (2)$$

$$\text{Or} \quad E(Y_{i0} \mid T_i = 1) = E(Y_{i0} \mid T_i = 0) \qquad (3)$$

We use then the available information on untreated units to build a counterfactual for each treated unit. The counterfactual measures how beneficiary of exemption would have been otherwise without the given intervention (Bonnard, 2011). Thus conditionally to the vector X of firm characteristics, the non-observable counterfactual $E(Y_{i0} \mid T_i = 1)$ is estimated by $E(Y_{i0} \mid T_i = 0)$. The counterfactual analysis enables evaluators to attribute cause and effect between interventions and outcomes. This estimation calls for the careful choice of the covariates belonging to vector X. On the one hand, the more accurate the vector X (i.e. the larger the vector X), the better the matching process. Yet the larger vector X, the harder it is to find an identical untreated unit (i.e. with exactly the same set of characteristics) for each treated unit. Rosenbaum and Rubin (1983) suggest matching units using a propensity score built on the basis of vector X to overcome the problem of the dimension of vector X.

The propension score *P(X)* is the probability of a firm belonging to the treatment group (i.e. having access to the program) given the vector X of firm characteristics. As Rosenbaum and Rubin (1983) put it, $P(X) = P(T_i = 1 \mid X)$. Thus the property of independence conditional on vector X is also true for *P(X)*. This probability is estimated for the whole sample (treated and untreated units) using a multivariate estimation such as a logit or probit model. In this estimation, the dependent variable is access or no access to the program (i.e.incentives) and vector X is used as explanatory variable. Estimated coefficients calculate the propensity score for each firm. In line with the common support assumption, the matching process requires that each treated unit is matched with a untreated unit whose propensity score is not too far removed from the users score.

Given the above, the average effect of the treatment on the treated units is:

$$\Delta ATT = E[E(Y_i \mid T_i = 1; P(X)) - E(Y_i \mid T_i = 0; P(X))] \qquad (4)$$

Annex F: List of all existing legal instruments establishing tax expenditures in the DR

Tax Expenditures defined by the general tax legislation:
Law No. 11-92 and its amendments, which institute the Tax Code.
Law No. 14-93 and its amendments, which establishes the Dominican Tariff.
Law No. 3489 and its amendments, General Customs Law.
Law No. 18-88 and its amendments, on Property Tax.
Law No. 112-00 and its modifications on Hydrocarbons.
Law No. 173-07 of Collection Efficiency: taxes on the transfer of real estate and vehicles.
Law No. 25-69 and amendments, on inheritance and donation tax.
Law No. 139-11 and its amendments that contains the tax regime of gambling, casinos and betting agencies.

Tax Expenses related to Special Regimes and Miscellaneous Legislation:
Law No. 8-90 on Promotion of Free Export Zones.
Law No. 28-01 creating a Special Border Development Zone
Law No. 158-01 and its amendments, on Tourism Incentives.
Law No. 122-05 on Regulation and Promotion of Non-Profit Associations.
Law No. 56-07 on Textile Chain and Footwear.
Law No. 57-07 on Incentives for the Development of Renewable Energy Sources.
Law No. 392-07 and its amendment, on Industrial Competitiveness and Innovation.
Law No. 171-07 on Special Incentives for Pensioners and Rentiers of foreign origin.
Law No. 480-08 and its amendment, on International Financial Zones in the Dominican Republic (not in application).
Law No. 502-08 on Book and Libraries.
Law No. 108-10 and its modifications, of Promotion of the Cinematographic Activity.
Law No. 5852-62 that establishes the National Institute of Hydraulic Resources.
Law No. 96-88 Authorizing the Operation of Slot Machines in Gambling Casinos.
Law No. 9-96, which frees from all types of import taxes all the merchandise/gifts that enter the country with foreign residents during the Christmas and New Year periods.
Law No. 57-96, its amendments, which exempts from taxes the vehicles of Legislators.
Law No. 204-97, which provides for exemption from salary No. 13 (Christmas salary).
Law No. 125-01, Electricity Law.
Law No. 183-02, Monetary and Financial Code.
Law No. 78-03 on the Statute of the Public Prosecutor's Office.
Tax Reform Law No. 557-05.
Law No. 179-09 and its modification, on deduction of Educational Expenses from the Physical Income Tax Base.
Law No. 146-71, General Law on Mines and Quarries.
Law No. 92-04 on Systemic Risk.
Law No. 189-11 on Trust and the Dominican Mortgage Market.
Law No. 103-13 on Incentives for the Import of Non-Conventional Energy Vehicles.
Law No. 126-15 for the transformation of the National Bank for Housing and Production (BNV) into the National Bank of Exports (BANDEX).
Mining Concessions.
Special Contract that regulates the "Fideicomiso RD Vial".
Concordat between the Holy See and the Dominican Republic, dated June 16, 1954.
Agreement between the Dominican State and the Social Service of Churches, dated January 19, 1964, as amended.

Annex G: Methodological Approaches

Mincer Equations

The first methodological approach we will use is based on estimating the effect of informality on labor income using a Mincer equation, with a dummy explanatory variable for informality and a set of control explanatory variables. The Mincer equation[82] quantifies the relationship between education and income. The resulting model makes income dependent on the number of years of education, or schooling, and the number of years of work experience. It also includes other control variables that help to reduce the omitted-variable bias (OVB) of models that include only education and years of experience. Please see Annex XX for more details about the methodological approach.

We utilized the Mincerian earnings function under three different specifications, to increase the explanatory power of the model as well as the robustness of the findings. The upper portion of the next table (Table xxx[83]) presents the results of the three specifications of the Mincer equations. The conceptual reasoning behind our approach is to move from a more 'unspecified' model (the first) and then gradually adding more specifications (in the second this is done by adding 'gender' and 'sectoral' variables, and in the third iteration by considering the interactions among variables):

- The first model presented includes only 'being informal' or 'being formal' as an explanatory variable, and the results indicate that the hourly wage of an informal worker is 18.9 percent lower than that of a formal one.[84] However, it could be argued that this coefficient is biased since the only explanatory variable used is related to the error term, owing to the existence of some potentially not observable characteristics of the workers that are not included in the model. As a result, the comparison of the average income (of both informal and formal workers) would overestimate or underestimate the effects of informality on labor income. To eliminate this bias, a set of explanatory variables that significantly influence informality and worker incomes is introduced in models 2 and 3.

- On such basis, the second model includes, in addition to the condition of informality, the typical variables of the Mincer equation (i.e., schooling and experience) and is expanded by adding gender and work sector. The coefficient that accompanies the informality variable is reduced to -0.032, but it continues to be statistically different from zero. More concretely, this means that an informal worker with the same level of education, experience, and gender working in the same productive sector as a formal worker will receive an hourly wage that is 3.2 percent lower than that received by his formal counterpart. Under model 2, the return on education or rate of growth of income for each additional year of schooling is equal to 6.1 percent. This confirms the positive, but marginally declining, effect of experience on worker incomes. The results make it possible to quantify labor discrimination against women, and the results are quite astounding: it is estimated that a person who is exactly equal to another receives an hourly wage that is almost 21 percent lower simply owing to the fact of being a woman.

- The third model substitutes the variable 'informality' with a compound variable indicating the interaction between being an informal worker and the level of schooling. The result shows that there is a difference between the return on education in the formal and informal sectors. A formal worker's income rises 6.5 percent for each additional year of schooling, while that of an informal worker increases 5.1 percent. This difference in the return on

[82] See Mincer (1974) and Heckman et al. (2003).

[83] It should be noted that the coefficient accompanying the lambda variable is statistically different from zero and it is therefore necessary to use the two-step Heckman method to avoid selection bias.

[84] This variation rate is obtained from the estimated coefficient, using: $e^{-0.209} - 1 = -.189.$ This value reveals that the coefficient estimating using MICO is slightly biased upward.

education of 1.4 percent suggests that a person employed in the formal sector with 10 years of schooling would receive around 14 percent higher earnings than an informal worker with the same level of schooling.

All in all, the Mincerian approach confirms the existence of a negative impact of informality on the level of incomes in the DR, but – most importantly – the income back decreases significantly from the first to the second iteration, as we introduce more controls and increase the explanatory power. Depending on the model specification, the impact of informality on the income levels remains consistently negative but – importantly – its magnitude varies and, more specifically, it decreases as we improve the explanatory capacity of the model by controlling for more variables. According to our least biased specification, if we have two workers with the same characteristics (education, experience, gender, sector of employment) the formal one will earn only about 3% more (per hour) than the informal one. On the other hand, being a man or a woman appears to affect significantly the level of incomes, at a two-digit level gap. Finally, the returns of education on income levels appear to be significantly higher in the formal sector than in the informal sector.

Mincer Equations corrected for Selection Bias

	Model 1	Model 2	Model 3	Model 4
Informal	-0.209***	-0.032**	-0.032**	
	(-14.066)	(-2.041)	(-2.037)	
Escolaridad		0.059***	0.057***	0.063***
		(35.655)	(34.274)	(38.804)
Experiencia		0.017***	0.018***	0.018***
		(6.404)	(6.786)	(6.463)
Experiencia al cuadrado		-0.000***	-0.000***	-0.000***
		(-3.171)	(-3.647)	(-3.281)
Mujer		-0.229***	-0.236***	-0.231***
		(-14.250)	(-14.681)	(-14.431)
Construcción		0.359***	0.359***	0.389***
		(12.583)	(12.614)	(13.829)
Agropecuario		-0.152***	-0.114***	-0.133***
		(-7.170)	(-5.199)	(-6.418)
Comercio		-0.063***	-0.063***	-0.035*
		(-3.420)	(-3.402)	(-1.924)
Urbano			0.093***	
			(6.209)	
Remesa			0.165***	
			(5.329)	
Educación x Informal				-0.013***
				(-8.757)
Constant	4.401***	3.516***	3.444***	3.502***
	(277.557)	(74.416)	(71.814)	(75.936)
mills				
lambda	-0.380***	-0.203***	-0.183***	-0.200***
	(-19.887)	(-6.241)	(-5.647)	(-6.188)
Observations	21620	21620	21620	21620

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Methodological details: Mincer equations

The basic Mincer model (1974) makes the monthly or hourly wage logarithm a function of years of education (*educ*) and years of work experience (*exp*) both linearly and quadratically.[85] This specification can be expanded to take into account the effect of formality or informality, as well as

[85] A concave relationship is expected between experience and the worker income logarithm.

an element of the interaction with the level of schooling to determine the influence of informality on the return on education.

$$\log w_i = \beta_0 + \beta_1 educ_i + \beta_2 \exp_i + \beta_3 \exp_i^2 + \beta_4 \text{informal} + \varepsilon_i$$

$$\varepsilon_i \sim NIID\left(0, \sigma_\varepsilon^2\right)$$

The interpretation of the coefficient accompanying education is relatively simple. Given that the dependent variable is the wage logarithm, the coefficient is interpreted as the return on education in relative terms. More specifically, β_1 is an approximation of the relative distance between the earnings of two persons whose only difference is that one of them has an additional year of education. For two individuals (i, j) who are exactly equal, with the exception of one year of schooling, the income difference is equal to:[86]

$$\log w_i - \log w_j = \log\left(\frac{w_i}{w_i}\right) = \frac{w_i - w_j}{w_j} = e^{\beta_1} - 1$$

Where β_1 is small, less than 0.1, $\beta_1 \approx e^{\beta_1} - 1$, interpreting β_1 as the return on education.

The estimated Mincer equation corrects for the selection bias using the two-step Heckman methodology.[87] This model assumes that there is an underlying relationship between the dependent variable (i.e., income) and a vector of explanatory variables (e.g., education, experience, gender, informality). If the individuals reporting income make the decision to work randomly, there would be no problem with including only the observations of individuals with incomes higher than zero in the model. However, if the population participating in the labor market—and having the possibility of working and receiving income—is statistically different from the population not participating, then estimating the regression equation taking into consideration only the information on those that earn income could result in biased estimates. For this reason, the analysis must include the likelihood of belonging to the labor force

The regression equation (e.g., of the income model) is:

$$y_j = \mathbf{x}_j \beta + u_{1j}$$
$$u_1 \sim N\left(0, \sigma^2\right)$$

This dependent variable is observed only when the following selection equation, defining participation in the EAP, is fulfilled:

$$\mathbf{z}_j \gamma + u_{2j} > 0$$
$$u_2 \sim N(0,1)$$

When $\text{corr}\left(u_1, u_2\right) = \rho \neq 0$, the regression applied to the dependent variable results in biased estimates.

The first step in the Heckman method involves estimating the selection equation using a probit model:

$$\Pr\left(y_j > 0 \middle| \mathbf{z}_j\right) = \Phi\left(\mathbf{z}_j \gamma\right)$$

[86] See Bazen (2011), p. 20.
[87] See Heckman (1979) for a presentation of his methodology.

Based on this estimate, the inverse Mills ratio can be calculated: $\lambda_j = \frac{\phi\left(\mathbf{z}_j\hat{\gamma}\right)}{\Phi\left(\mathbf{z}_j\hat{\gamma}\right)}$, where ϕ, Φ are the functions of normal and cumulative normal density, respectively. The second step involves estimating the regression equation augmented by the inverse Mills ratio, applying observations with values for income greater than zero.

$$y_j = \mathbf{x}_j\beta + \theta\lambda_i + \nu_j$$

Heckman shows that by including the inverse Mills ratio as an explanatory variable the bias of the estimated coefficients is eliminated. If the coefficient θ is statistically different from zero, the estimated coefficients of the regression model without including the Mills ratio would be biased and inconsistent.

The Mincer equations, adjusted for the selection bias, are estimated for the employed population over the age of 10.[88] The dependent variable is the hourly wage logarithm. The variable that will reflect the level of education quantifies the number of years completed in the education system starting from the first year of primary school. The dependent variable of the selection equation is the economically active population.

Blinder-Oaxaca Decomposition

At this point of the analysis, we try to continue to further specify our model by bringing in the differences in the factor endowments of workers (e.g. education, experience, and return of education), by using a Blinder-Oaxaca[89] (B-O) decomposition. This technique makes it possible to single out the difference in the incomes of two population groups (such as, in our case, formal and informal workers) based on the endowment factors (explanatory variables). The B-O methodology allows to determine the extent to which the income difference between informal and formal workers results from differences in these explanatory variables and the extent to which it results from other "non-observable" factors that could be associated with labor discrimination. More specifically, the approach follows three steps:

- Firstly, it considers the difference between the observable explanatory variables for the two groups (e.g., the difference in level of education and experience)

- The second step looks at the difference between the parameters for each of the explanatory variables (e.g., return on education). This second component is considered to be a measure of the degree of discrimination against one of the population groups.

- The third component looks at the interaction effect among variables, owing to the differences that simultaneously exist between the explanatory variables and the coefficients.

In this case, the reference group comprises the formal workers and the comparator group consists of the informal workers. The variable that we picked to identify the two groups is *"informal"*, which will have a value of 0 for formal workers and a value of 1 for informal ones. The dependent variable is the hourly wage logarithm[90].

[88] Models with a population older than 18 were also estimated and the results were similar.

[89] This section is based on Jann (2008) and Bazen (2011). A similar application was used in Aristy-Escuder (2016).

[90] The decomposition of the income difference between informal workers and formal workers into three parts, formulated based on the group of informal workers, takes the following form:

$$R = \left[E(X_F) - E(X_I)\right]'\beta_I + E(X_I)'(\beta_F - \beta_I) + \left[E(X_F) - E(X_I)\right]'(\beta_F - \beta_I)$$

Also the B-O decomposition shows that the average income of formal workers exceeds the average income of informal workers (by roughly 24 percent) and that 92.5 percent of the difference in income is explained by the difference in factor endowments (particularly education).[91] If we move more in-depth into the 'weight' that the various explanatory variables have on this result, we see that the difference in the level of education and experience in favor of formal workers explains roughly 60 percent of this wage difference.[92] The analysis also permits to estimate what would happen if an informal worker was to have the same endowment characteristics (e.g., education and experience) as the average formal worker; if we apply the endowment of a formal worker to an informal one, the wages of the informal worker would increase 13.7 percent. Similarly for the coefficients (i.e., the difference in coefficients such as the return on education; this is the second step of the B-O decomposition[93]), we find that if the informal worker had the education coefficient that formal workers have, their income (informal) would increase. In other words, the DR labor market appears to remunerate each additional year of schooling of formal workers better than it remunerates the same condition for informal workers. In fact, by estimating the income equations[94] separately based on labor status (i.e., formal or informal), the return on education of formal workers is significantly higher than the return on education of informal workers.

If we therefore controlling for these factors endowment (education, experience, and returns) we obtain one of the most interesting findings of the analysis: the informal worker actually appears to earn more than the formal one. While this may look at a first glance contradictory with previous findings, it is rather a natural consequence of the process of adopting gradual, further specifications. In the Mincer equations we found (using only 'formal' and 'informal' as variables) a large gap between formal and informal workers, which however was significantly reduced when we controlled for schooling, gender, and working sector. In the B-O approach we refine the model further and – while we do continue to find that formal workers earn significantly more than informal one – the model (in its second specification) clarifies that informal workers appears to actually be rewarded more than formal ones, if we control for the endowment factors. The coefficient that accompanies the constant in the income model for informal workers (3.43) is in fact higher than that for formal workers (2.85): this, despite the fact that – as we know – the rate of return on the education of informal workers is lower than that of formal workers and that informal workers have lower levels of schooling. The bottom line is that the suggestion that some unexplained factors exist in the informal labor market and do not exist in the formal market, which allow the hourly wage level for informal workers to be higher than what it would normally be expected to be.

The first component of the above equation is identified as the endowment effect, $\left[E(X_F)-E(X_I)\right]'\beta_I$, which quantifies the hoped-for change in the average income of informal workers if this population group had the explanatory characteristics of formal workers (i.e., education, experience). The second component is identified as the coefficients effect, $E(X_I)'(\beta_F-\beta_I)$,which quantifies the hoped-for changes in the average income of informal workers if this population group were to have the coefficients of formal workers. This component is interpreted as labor market discrimination against informal workers. The third summand reflects the fact that the differences in endowments and coefficients can exist simultaneously in both groups, which creates an interaction effect on the difference in incomes.

[91] In formula: $\left(e^{0.216842}-1=0.2421\right)$. This is equivalent to saying that informal workers have an average hourly wage that is 19.5 percent lower than that of former workers.

[92] This wage difference is obtained using the Mincer equations without controlling for gender or for work sector.

[93] Another Blinder-Oaxaca decomposition option uses a coefficient vector β^* that is not discriminatory. In this case the income difference can be written as follows:

$$R=\left[E(X_F)-E(X_I)\right]'\beta^*+\left[E(X_I)'(\beta^*-\beta_I)+E(X_F)'(\beta_F-\beta^*)\right]$$

The first component is the part explained by the difference in endowments (e.g., level of education) for each group. The second part is the unexplained component, which is interpreted as the degree of discrimination. This component captures all the potential effects of differences in non-observable variables. To estimate β^* some authors (See Reimers (1983) recommend using the average of the coefficients for both groups as the vector of nondiscriminatory parameters: $\beta^*=0.5\beta_F+0.5\beta_I$.

[94] Using a specification without gender or work sector and without correcting for the selection bias.

Blinder-Oaxaca Decomposition Tables

```
Blinder-Oaxaca decomposition                    Number of obs     =     10,682
                                                  Model           =     linear
Group 1: informal = 0                             N of obs 1      =       4388
Group 2: informal = 1                             N of obs 2      =       6294
```

ling_hora	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
overall						
group_1	4.189971	.010971	381.91	0.000	4.168468	4.211474
group_2	3.973129	.0100165	396.66	0.000	3.953497	3.992761
difference	.216842	.0148557	14.60	0.000	.1877254	.2459587
endowments	.1283559	.0094103	13.64	0.000	.1099121	.1467997
coefficients	-.0557285	.0151746	-3.67	0.000	-.0854703	-.0259868
interaction	.1442147	.0120991	11.92	0.000	.1205009	.1679284
endowments						
educ	.1350507	.0096485	14.00	0.000	.11614	.1539614
exper	-.0817398	.009584	-8.53	0.000	-.1005241	-.0629555
exper2	.075045	.0092817	8.09	0.000	.0568532	.0932367
coefficients						
educ	.3017291	.0220188	13.70	0.000	.2585731	.3448851
exper	.3082992	.0740625	4.16	0.000	.1631394	.4534591
exper2	-.0830179	.0494948	-1.68	0.093	-.180026	.0139901
_cons	-.5827389	.0453355	-12.85	0.000	-.6715948	-.4938831
interaction						
educ	.165683	.0126318	13.12	0.000	.1409251	.1904409
exper	-.0428136	.0108892	-3.93	0.000	-.0641561	-.0214711
exper2	.0213453	.0128175	1.67	0.096	-.0037766	.0464671

Blinder-Oaxaca with coefficient vector

```
Blinder-Oaxaca decomposition                    Number of obs     =     10,682
                                                  Model           =     linear
Group 1: informal = 0                             N of obs 1      =       4388
Group 2: informal = 1                             N of obs 2      =       6294
```

ling_hora	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
overall						
group_1	4.189971	.010971	381.91	0.000	4.168468	4.211474
group_2	3.973129	.0100165	396.66	0.000	3.953497	3.992761
difference	.216842	.0148557	14.60	0.000	.1877254	.2459587
explained	.2004632	.0080573	24.88	0.000	.1846712	.2162553
unexplained	.0163788	.0145592	1.12	0.261	-.0121566	.0449142
explained						
educ	.2178922	.0078891	27.62	0.000	.20243	.2333545
exper	-.1031466	.0100679	-10.25	0.000	-.1228794	-.0834139
exper2	.0857176	.0089216	9.61	0.000	.0682316	.1032036
unexplained						
educ	.3845706	.0279654	13.75	0.000	.3297594	.4393818
exper	.2868924	.0689042	4.16	0.000	.1518426	.4219422
exper2	-.0723453	.0431272	-1.68	0.093	-.1568731	.0121825
_cons	-.5827389	.0453355	-12.85	0.000	-.6715948	-.4938831

Propensity Score Method

This method is appropriate to higher degrees of randomness in the determination of who receives the treatment and who does not (in this case, who is informal and who is not). The propensity score method does not operate well if everyone with a high degree of propensity is informal and everyone with a low propensity score is not informal, since it requires being able to compare persons with similar scores, some of whom are informal and others not. This method also does

not take into consideration non-observable variables that can explain why a particular worker is informal.

The steps are as follows. The first step involves estimating the propensity score using a logit regression model in which the dependent variable is binary, with a value of one if the individual is informal and a value of zero if the worker is formal. The prediction of the likelihood of informality is the propensity score. The second step is the determination of the effect of the informality on labor income, assigning the income levels of formal workers with the same likelihood of being informal to informal workers, using the propensity score.

Stata's *teffects psmatch* command[95] makes it possible to directly apply the propensity score matching method to calculate the average treatment effect on the treated (ATET[96]). After calculating the likelihood of being informal using the probit (or logit) model, this information is used to match each observation for the informal worker (treatment) with one (or various) for the formal worker (control), using similar propensity scores. Two income variables are created for each observation (y_0, y_1). The variable y_0 shows the level of income observed for formal workers and the variable y_1 the level of income observed for informal workers. The matching estimator based on the propensity score assigns a level of income y_0 equal to that of the formal worker with the closest propensity score to each informal worker. The difference between the two rates of income for the informal worker indicates the average treatment effect on the treated (ATET).

$$\text{ATET} = E\left(y_1 - y_0 \,|\, \text{Informal} = 1\right)$$

The results obtained by applying the propensity score matching method to the October 2015 ENFT data are provided below. The probit model uses schooling (in quadratic terms), gender, area of residence (urban, rural), and receipt of remittances as explanatory variables for informality. Subsequently the difference between the income observed and the income assigned on the basis of the formal workers with the closest propensity score is estimated for informal workers (i.e., the treated).

```
Treatment-effects estimation                   Number of obs      =     10,682
Estimator      : propensity-score matching     Matches: requested =         1
Outcome model  : matching                                      min =         1
Treatment model: probit                                        max =       439
```

ling_hora	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
informal (Informal vs Formal)	.0504099	.0153143	3.29	0.001	.0203944	.0804254

[95] See a presentation on this Stata command at https://www.stata.com/manuals13/te.pdf.
[96] Average treatment effect on the treated.