PARAGUAY

SELECTED ISSUES

July 2024

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PARAGUAY

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June 10, 2024

Approved By **Western Hemisphere Department**	Prepared By J. Nauerz and D. Gutierrez

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ANALYZING TRADE BARRIERS IN PARAGUAY: A COMPREHENSIVE FRAMEWORK FOR UNDERSTANDING GLOBAL INTEGRATION[1]

1.   **According to specific analyses in the 2015 and 2023 IMF Regional Economic Outlook reports, Latin America and the Caribbean (LAC) have weaker ties with global markets than other regions.** This has, in turn, negatively impacted their development. Despite some progress in reducing trade barriers, LAC's level of trade integration remains low, especially within the region. The region's exports are also undiversified, mainly focused on low-value commodities, with minimal involvement in global value chains. Mowatt's (2017) and Bhattacharya and Pienknagura (2024) further reveal that the primary barriers to increasing LAC's export volume, diversification, and sophistication are internal issues such as inadequate infrastructure, skill gaps, and high production costs, which outweigh the challenges posed by international factors.

2.   **Considering these results, this study aims to conduct a more comprehensive analysis of Paraguay's trade performance compared to other Latin American nations and countries outside the region that share similar traits with Paraguay.** Specifically, we investigate whether Paraguay's trade volumes are lower or higher than expected considering its economic and geographical characteristics. We explore other factors, besides trade policies and gravity, that may hinder Paraguay's ability to integrate into global trade by expanding the gravity model. Specifically, we evaluate the impact of trade policies, such as tariffs and non-tariff barriers, and consider factors like transport infrastructure, customs efficiency, production factor quality, access, and quality of governance to assess their impact on trade performance.

A.   Putting Paraguay's Trade Performance on the Map

3.   **Figure 1 presents a comparative analysis of trade dynamics over time, focusing on exports of goods and services and trade openness as a percentage of GDP.** For Paraguay, a downward trend is observed, illustrating a persistent decline in both its export values and the degree of trade openness relative to its GDP. This contrasts with the trajectory seen in other landlocked countries with similar economic profiles, where there has been a sustained increase in these metrics.[2] Additionally, the data highlights a positive trend for both the LAC region and the subgroup comprising the LAC 7, indicating an improvement in their trade performance. Despite this upward movement, it's important to note that their levels of exports and trade openness remain close to the 25th percentile of the global distribution and thus below those recorded for Paraguay, suggesting that while Paraguay's trade metrics have declined, it still maintains a higher baseline compared to its regional counterparts.

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[1] Prepared by D. Gutierrez and J. Nauerz (both WHD)

[2] This group comprises of Armenia, Belarus, Botswana, Mongolia, North Macedonia, and Serbia.

4.   The figure also illustrates the evolving landscape of Paraguay's goods export market concentration over two decades, revealing an interesting pattern of change. Initially, there is a decline in market concentration from the average observed during 2006-2009 to the subsequent decade of 2010-2019, suggesting that Paraguay diversified its export destinations during this period. However, a turning point is shown in the data from 2020, which shows a resurgence in market concentration and a subsequent decline in 2021 and 2022, indicating a recent shift back towards fewer export destinations compared to the decade of 2010-2019 (admittedly in the context of reduced exports due to the drought). The reliance on fewer markets would make Paraguay vulnerable to external shocks while reducing its adaptability to global trade changes, potentially stifling economic growth. However, it is also important to note that, despite these fluctuations, Paraguay's level of goods export concentration remains below that of other landlocked countries with similar economic attributes and the broader group of LAC countries. This comparison underscores Paraguay's relatively more diversified export strategy in comparison to its peers, even as recent data would imply some reversal in this diversification.
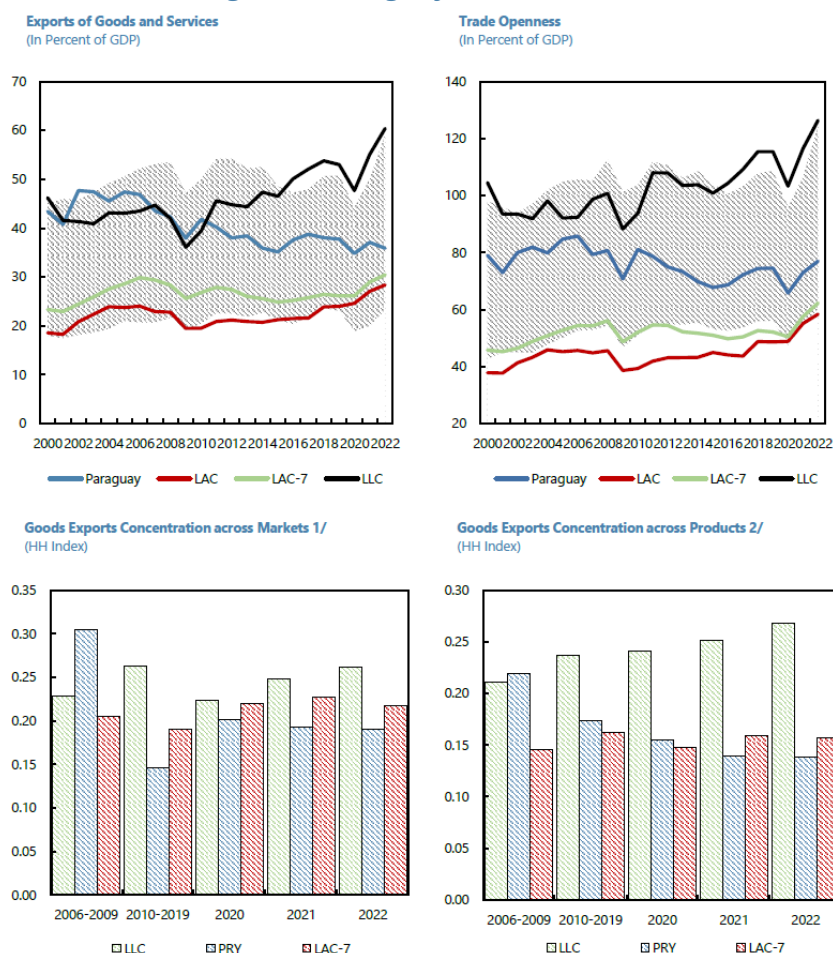
5.   Finally, between the initial period and the subsequent decade, there was a clear downward trend in the concentration across products, signaling a diversification in the types of goods Paraguay exports and making the economy less susceptible to sector-specific downturns and global price fluctuations. Notably, Paraguay's product concentration is lower than that of similar landlocked countries, and since 2021, it remains lower than that observed across the group of LAC countries for the first time in the sample.

B.   Potential Obstacles to Paraguay's Trade Levels

6.   Kahn, Estevadeordal, and Moreira (2015) document a significant reduction in traditional trade costs across Latin American and Caribbean (LAC) countries over approximately fifteen years. However, by the early 2000s, novel barriers began to surface, predominantly concerning transportation, customs clearance, logistics, and the availability of information. These barriers, such as subpar road networks, sluggish customs operations, and a lack of market intelligence, have notably impaired the exporting capabilities of businesses in these regions. Mowatt (2017) further underscores the shortage of human capital as a major obstacle to enlarging exports, with the difficulty in securing financing emerging as a formidable barrier for aspiring exporters in LAC. Additionally, Bhattacharya and Pienknagura (2024) identify production factors and governance issues as further constraints, though they note these are more pertinent in certain LAC sub-regions than others.

7.   Our objective is to dissect how these varied factors collectively affect Paraguay's engagement in global trade, aiming to discern interventions that could elevate its trade performance and foster economic integration.

Figure 1. Paraguay: Trade Pattern

Exports of Goods and Services
(In Percent of GDP)

Trade Openness
(In Percent of GDP)

Goods Exports Concentration across Markets 1/
(HH Index)

Goods Exports Concentration across Products 2/
(HH Index)

Source: IMF World Economic Outlook, UN Comtrade, BCP and IMF Staff
1/ Accounts only registered exports.
2/ Accounts for registered exports and re-exports.

Data

8.   Our empirical study utilizes goods trade flow data sourced from the BACI: International Trade Database at the Product-Level, created by Zignago and Gaulier (2010). The data is structured by exporter-importer country pairs and by year, with reconciliation at the aggregate export value level for each country pair from 2000 to 2021. By employing the UN's Comtrade database as its foundational data source, this database extends the scope of coverage beyond that of Comtrade through the use of mirrored data.

9.   We further use the gravity database crafted by Conte, Cotterlaz, and Mayer (2022), encompassing both bilateral and country-specific variables pertinent to our research. This includes various measurements of bilateral distance (such as between capitals and major cities), details on shared language or borders between country pairs, and the presence of active preferential trade agreements. Additionally, we introduce a binary indicator to denote landlocked countries, guided by the United Nations' list of such nations. With a particular emphasis on Paraguay's trade

activities, we also develop a secondary binary indicator for countries that, like Paraguay, are landlocked and share comparable economic indicators, such as per capita GDP. We complement these variables with additional trade policy variables in the spirit of Bhattacharya and Pienknagura (2024), such as the importer's trade MFN tariff, obtained from the World Integrated Trade Solution (WITS) databases.

10.   Our analysis also draws on data pertaining to infrastructure, logistics, and customs primarily from the World Bank's Logistics Performance Index (LPI), which provides insights into the efficiency of customs and border management as well as the quality of trade and transport infrastructure. Additionally, we consider the number of mobile broadband subscribers per 100 people as a measure of digital infrastructure. For economic indicators like GDP and population, we rely on data from the IMF World Economic Outlook database. Our study also integrates the Human Capital Index from the Penn World Tables (PWT) and governance metrics from the World Governance Indicators (WGI), focusing on areas such as control of corruption, rule of law, and the presence or absence of violence.

Econometric Strategy

11.   To assess Paraguay's trade performance, we employ an enhanced gravity model. Considering the common occurrence of zero trade flows, we use the Poisson pseudo-maximum likelihood (PPML) methodology, as suggested by Santos Silva and Tenreyro (2006), for our estimation. Standard errors are clustered at the country-pair level.

$$T_{i,j} = \exp\big[\alpha + \beta_1 ln(GDP_i) + \beta_2 ln(GDP_j) + \beta_3 ln(POP_i) + \beta_4 ln(POP_j) + \beta_5 ln(d_{i,j}) + \beta_6 w_{i,j} + \gamma TP_{i,j} + \delta Z_i + \zeta Z_j + \eta PRY\big] + \varepsilon_{i,j} \tag{1}$$

12. $T_{i,j}$ denotes the mean trade flow between country i and j during 2015-2019[3]. We account for each country's average GDP and population, POP, and the bilateral distance, d. The set of variables w includes dummies for common language, shared land border, and whether the trade partner is landlocked. TP represents trade policy factors. Vectors Z_i and Z_j serve as indicators for logistics and customs efficiency, quality and access to production factors, or governance standards. Lastly, PRY is used to denote a dummy variable indicating whether one of the trading partners is Paraguay. Thus, η is the main coefficient of interest. To benchmark Paraguay's results against its peers, we also include dummies if one of the trading partners is a country in LAC, South America, or a land-locked country similar to Paraguay.

13.   Following Bhattacharya and Pienknagura (2024), we employ a step-by-step estimation beginning with setting γ, δ, and ζ to zero for a basic gravity model estimation. Subsequently,

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[3] This is a period which roughly coincides with the decline in commodity prices that affected many LAC countries and with the slowdown in global trade. It also avoids the disruptions arising from the COVID-19 pandemic. However, our results for Paraguay are robust to extending the sample.

we incorporate the policy variables into the model by only setting δ and ζ to zero. Finally, we include the remaining groups of variables to estimate the comprehensive augmented model.[4]

C. Results

14.   Our findings indicate that enhancing both physical and customs infrastructure, alongside improvements in quality and accessibility to essential production factors like education, reducing the costs for business entry, and elevating governance standards, can lead to significant trade benefits. This supports the empirical significance of these trade constraints, as corroborated by findings in other studies and observed within our own data.

15.   Focusing on Paraguay's trade performance, we find that trade integration is high, given its economic and geographic characteristics–in contrast to other countries in LAC. Figure 2 presents the estimation results from equation (1), concentrating on the main coefficient of interest, η, for presentational purposes. The analysis is aimed at assessing and benchmarking Paraguay's trade performance. After accounting for key macroeconomic characteristics in a gravity trade model, the country's trade is estimated to be about 10 percent higher than comparable trade flows outside of Paraguay. Conversely, when looking at the LAC region as a whole, trade integration appears to be limited, aligning with conclusions from prior studies. The LA-7 group of countries, like Paraguay, shows over-trading, albeit to a slightly lesser extent. This phenomenon is primarily attributed to Mexico, as highlighted by Bhattacharya and Pienknagura (2024), who identified significant overtrading linked to Mexico's advantageous trade relations with the US market. Additionally, when comparing other landlocked countries with economic profiles akin to Paraguay's, there's evidence of over-trading, though on a less pronounced scale.

Figure 2. Paraguay: Benchmarking Paraguay's Trade Performance

Note: *p<0.1, **p<0.05, ***p<0.001

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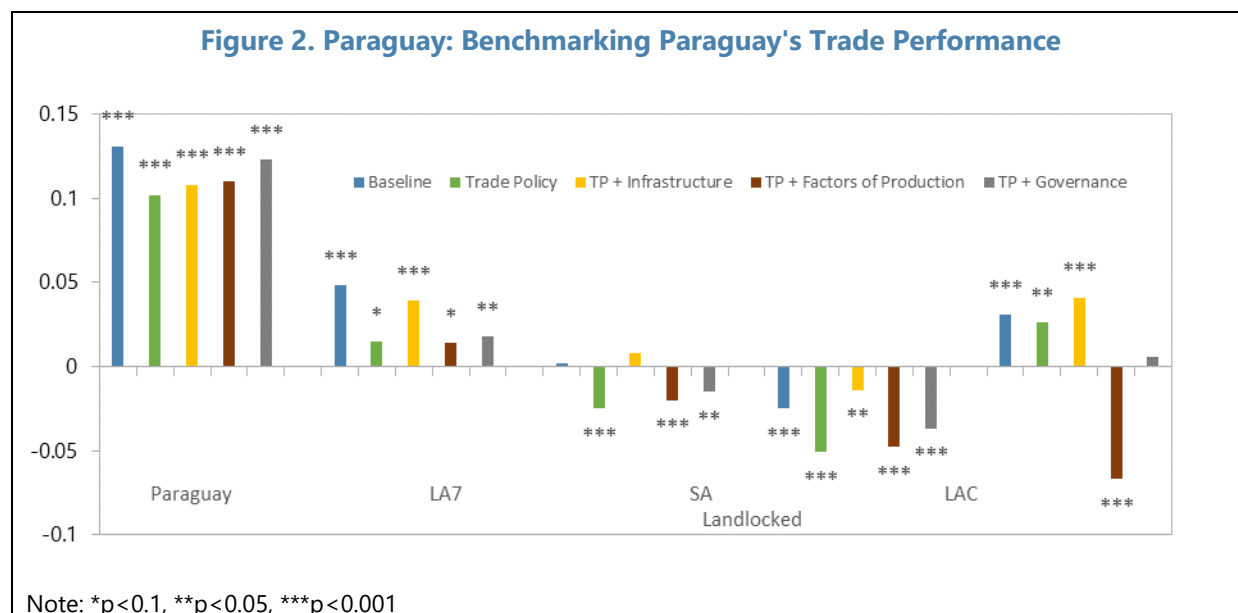
[4] Given the focus of this study, we do not estimate a fully saturated gravity model, i.e., including country-pair fixed effects; thus, our results cannot be framed in a structural gravity framework.

16.   We enhance the traditional gravity model to investigate the policy variables that might account for over- and under-trading behaviors. Consistent with prior research, we examine aspects such as trade policy, infrastructure, the quality of production factors, and governance quality. A significant observation for Paraguay arises: The extent of over-trading cannot be attributed to infrastructure, production factor quality, or governance, as the coefficient for the indicator remains largely unchanged across different model specifications. Interestingly, the magnitude of over-trading seems to escalate upon adjusting for these policy variables. This suggests that the elevated trade flows associated with Paraguay occur not because of, but despite, the country's specific attributes.

17.   Examining all LAC countries, it becomes evident that deficiencies in infrastructure significantly contribute to the region's lackluster trade performance. While the inadequacies in production factors hold relevance, they represent a less significant factor in the overall trade dynamics. Conversely, the low quality of governance emerges as a major barrier to trade within the LAC region. Accounting for infrastructure markedly mitigates, and essentially resolves, the issue of under-trading in South America, underscoring the critical role that infrastructure deficiencies play in the region's disappointing trade outcomes. Similarly, governance quality deficits are key in elucidating the pattern of under-trading observed in South America. When focusing on other landlocked nations, findings are consistent with those of Paraguay, albeit to a lesser quantitative extent.[5]

18.   These findings highlight that transversal policies like infrastructure, governance, and human capital are important for enhancing trade in all countries, including Paraguay, and present the main barriers to LAC's and South America's trade integration.

D.   Conclusions and Policy Implications

19.   Despite Paraguay's trade integration exceeding expectations based on its economic and geographical attributes, our analysis highlights the crucial role of comprehensive policies in infrastructure development, governance enhancement, and human capital improvement for promoting trade in all countries, including Paraguay. These sectors are pinpointed as the main barriers to trade integration within Latin America and the Caribbean, as well as in South America.

20.   Reducing trade barriers, overcoming infrastructure shortfalls, and enacting policies to enhance Paraguay's attractiveness for investment are key strategies for fostering trade and economic development. Furthermore, collaborative trade policy efforts and multilateral cooperation, especially within the Latin American and Caribbean region, are imperative to leverage the benefits of greater trade openness fully. These collaborative actions are also vital for mitigating

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[5] An exception arises with the consideration of production factors. For landlocked nations akin to Paraguay, the phenomenon of over-trading vanishes and turns negative when accounting for variables such as the HCI or our metric for the costs of initiating a business. This suggests that, based on their average human capital levels, one would anticipate a higher trade volume from these countries.

cross-border challenges and uncertainties, and for the effective prevention and management of any unintended consequences arising from trade policies.

21.   Finally, given Paraguay's levels of export concentration across products, alongside an increasing concentration across markets, and the vulnerability of its primary agricultural exports to droughts, diversification strategies should be intensified, both in terms of products and export markets. Investing in agricultural technology and practices that enhance drought resilience is crucial to safeguard primary exports. Additionally, exploring and developing non-agricultural sectors for export can reduce reliance on volatile agricultural commodities. Expanding trade partnerships through new or enhanced free trade agreements can reduce market concentration risk. These strategies combined with policies aimed at improving infrastructure, particularly in transport and logistics, can enhance competitiveness and help mitigate the risks associated with export concentration and environmental vulnerabilities, paving the way for sustainable economic growth.

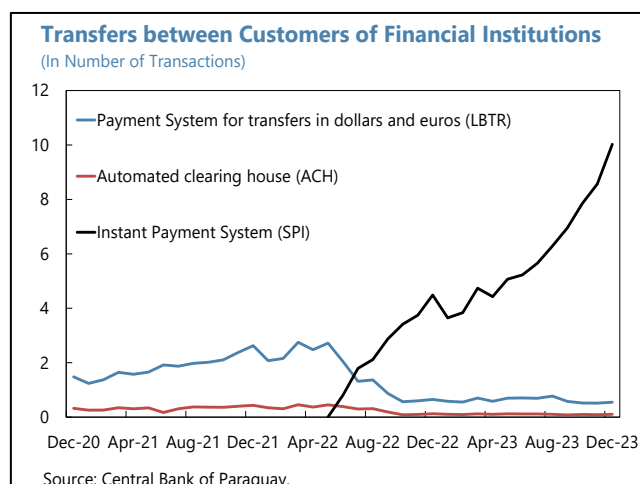# Annex I. Financial Inclusion: Marking 10 Years of Progress[1]

Expanding financial access and financial inclusion (FI) of the population has proven to be effective in reducing poverty and accelerating economic growth and they became prominent objectives in the Sustainable Development Goals. Paraguay has made considerable progress in promoting financial inclusion in recent years, with an increasing percentage of adults having access to formal financial services. However, challenges, such as limited financial literacy, high costs of financial services, and geographical barriers, still need to be addressed. The government is actively working towards further improving financial inclusion through initiatives such as financial education programs, better payment systems, and regulatory reforms.[2]

1.　　**Reform efforts.** In 2013, the government incorporated FI at the core of Paraguay's poverty reduction strategy. FI, later in the form of a National Financial Inclusion Strategy (NFIS), also became one of the pillars of its National Development Plan, and pursues broader goals that include financial education and wider access to financial services other than loans. Several regulatory initiatives were introduced by the BCP, including the regulation of non-banking correspondents in 2011, i.e., agents providing basic financial services; the creation of a basic savings account in 2013 with reduced requirements and lower fees, in line with FSAP and staff recommendations; and the regulation on e-money accounts in 2014, establishing requirements that must be met by entities providing non-bank transfers and electronic money using telecommunication services.[3] In 2017, the BCP started a project with the publication of gender-disaggregated information of accounts and credits provided by banks and financial companies to better understand the gap. In 2022, an NFIS working group for the promotion of women's financial inclusion was created with the coordination between the Ministry for Women and the Finance Ministry (IMF, 2022). The BCP also launched the "Financial Education for All" initiative. This program focuses on providing financial education to vulnerable populations, including low-income individuals, women, and rural communities. It offers workshops, training sessions, and educational materials to improve financial literacy and promote responsible financial behavior. Formalization of business and financial practices is also one of the principal next steps identified in the recently approved Law on Financial Inclusion and Transparency. The BCP also expanded the network of banking agents in rural areas, making it easier for people to access financial services closer to their homes. In 2022, an instant 24/7 interbank payment system (SPI) was launched, which also should help reduce intermediation costs, as per staff recommendations (IMF, 2015). The number of transactions exceeded expectations and dwarfed the transactions through other payments venues (BCP, 2023).

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[1] Prepared by S. Vtyurina (WHD).

[2] This analysis only covers individuals' access to financial services.

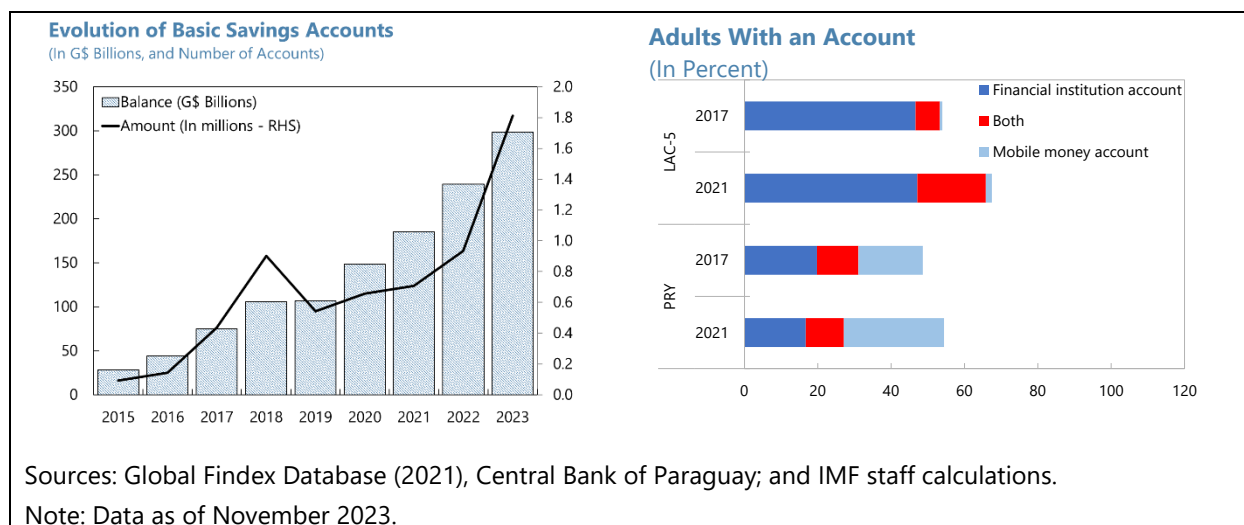[3] Refer to BCP, 2023 on the progress in establishing basic savings accounts.

Transfers between Customers of Financial Institutions
(In Number of Transactions)

Source: Central Bank of Paraguay.

Usage of Electronic Service Channels
(2017 and 2021 (in italics), in percent)

Usage of Electronic Service Channels	Women	Men	Gender Gap
Mobile Money Account	26.8	30.9	-4.1
	37.9	*37.5*	*0.4*
Used mobile phone or internet to acess an account	25.1	31.6	-6.5
Using the internet to pay bills	4.5	4.3	0.2
	10.8	*10.6*	*0.2*
Debit card ownership	12.2	18.7	-6.5
	15.6	*15.4*	*0.2*

Source: Global Findex 2021.

2.   Progress through numbers. A decade ago, about 30 percent of adults had an account at a formal financial institution (Afi, 2023). By 2021, this number increased to 55 percent against the NFIS's 2018 objective of 50 percent. According to latest BCP data, of every 100 adults, almost 28 access credit in the formal financial system. Women hold about 47 percent of individual deposit accounts, most of which are savings accounts (BCP, 2023). A digital gender divide also has been narrowed (Table). Paraguay's experience with digital financial inclusion started in 2008, when digital financial services were launched through domestic remittances and electronic payments performed via mobile phones. This made the country a pioneer in South America. Paraguay's successful growth of mobile wallets had been shaped by an initial phase of exploration and learning (2008-2014) as *Tigo* and *Personal* were allowed to operate without dedicated regulation but in close exchange with authorities. Interestingly, a positive side-effect of COVID-19 was a large growth of digital accounts (bank deposit and mobile money accounts), and state temporary support (programs such as Pytyvõ, Ñangareko, Border Subsidy) was also largely done in an electronic format.[4] While pre-pandemic many low-income Paraguayans still relied on cash and the increase in payment services points has reduced the hassle associated with opening a formal bank account, between March and September 2020, 1.3 million new mobile wallets were opened—a growth of 78 percent, not least due to the already established infrastructure. Paraguay is the only country in the LAC region where the share of fintech users (measured by the proportion of adults making/receiving digital payments) exceeds the proportion of traditional account holders (IMF, 2021). Microfinance institutions also play a crucial role in promoting financial inclusion as providers of financial services, such as microloans and savings accounts, to low-income individuals (Findevgetaway).

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[4] The payment from the Food Pension Program for Seniors is now exclusively via debit card. At the end of 2021, 66 percent of the Tekoporã Program payments were made through debit cards, 14 percent via counter, 8 percent through the National Post Office of Paraguay (DINACOPA), 6 percent via electronic wallet, and the remaining 6 percent through BNF mobile ATMs.

Evolution of Basic Savings Accounts
(In G$ Billions, and Number of Accounts)

Adults With an Account
(In Percent)

Sources: Global Findex Database (2021), Central Bank of Paraguay; and IMF staff calculations.
Note: Data as of November 2023.

3.   Remaining challenges. It is vital to build on these encouraging trends. Expanding access to finance, reducing the cost of digital transactions, and further promoting wage and social transfer payments through accounts and digital means is critically important. Two access barriers are particularly relevant for Paraguay: cost of bank services and internet access.

- **Costs: Worldwide,** 36 percent of unbanked adults consider that financial services to be too expensive (World Bank, 2021). In Paraguay, more than 60 percent of unbanked adults cited cost as an impediment. Besides the creation of basic savings accounts, the BCP is now looking to establish standard guidelines for obligatory payroll accounts free of charges for opening, maintenance, and debit card use, and without having to have a minimum account balance to expedite the uptake of fuller financial services. Increasing competition among banks, upgrading the regulatory framework, expanding more cost-effective mobile services, and encouraging partnerships between banks and micro-finance institutions would all help reduce the cost of holding a bank account.

- **Internet access:** Progress in access to finance now depends on the mobile phone much more than the banking system. Ubiquitous and affordable internet access is therefore a prerequisite to further progress. In recent years, Paraguay has experienced significant growth in internet access, driven by the increasing demand for connectivity and the rapid expansion of mobile networks. Despite these positive developments, Paraguay still faces several challenges in ensuring that all its citizens can enjoy the benefits of internet access. One of the main obstacles is the digital divide between urban and rural areas. At the start of 2022, roughly 37 percent of Paraguay's population lived in rural areas. While internet penetration in the capital city of Asunción and other major urban centers is relatively high, many rural communities still lack access to basic telecommunications services. To address this issue, the government has launched several initiatives aimed at expanding rural connectivity, such as the Rural Telecommunications Project, which seeks to provide internet access to more than 1,000 rural schools and health centers. Another challenge facing Paraguay is the relatively high cost of internet access, where Paraguay ranks among the most expensive countries in the region in

terms of fixed broadband prices (TEDIC; ECLAC, 2017). To tackle this issue, the government has introduced measures to promote competition in the telecommunications market, such as the auction of 4G spectrum, which is expected to result in lower prices and better quality of service for consumers. There is a need for increased investment in the country's internet infrastructure and greater competition among internet service providers (ISPs). This could be achieved through a combination of government initiatives, such as the expansion of public Wi-Fi networks and the promotion of public-private partnerships to develop broadband infrastructure, as well as regulatory reforms aimed at encouraging new market entrants and fostering competition among existing ISPs.

ESTIMATING THE ELASTICITY OF FORMALITY WITH RESPECT TO TAXES AND SOCIAL SECURITY CONTRIBUTIONS[1]

1.   **The informal economy poses significant challenges to workers, businesses, and governments worldwide.** Paraguay has made progress in promoting economic growth and reducing poverty recently. However, a significant portion of the population remains in the informal economy, lacking access to formal labor and social protection. Therefore, an enabling environment for formalization can promote inclusive and sustainable economic growth, job creation, poverty reduction, social protection, and decent work conditions.

2.   **The issue of informality has garnered significant attention in academic research and policy debates.** In comprehensive reviews, Ulyssea (2020) and Cetrangolo and Calligaro (2023) conclude that the available literature suggests that increasing enforcement is a more effective policy tool to reduce informality than lowering the costs of formality. Furthermore, global evidence suggests that tax reductions can induce formalization, although with low elasticity, implying potential net losses in tax revenues.

3.   **For Latin America, the evidence from empirical studies is mixed, and evidence for Paraguay is scant.** Additionally, many studies examine the effects of payroll and corporate income taxes, thus targeting firm behavior rather than individual behavior. For instance, Rocha et al. (2018) found that reducing payroll taxes after eliminating registration costs helped reduce firm informality. However, the formalization elasticity implied by these findings is low, and a cost-benefit analysis indicates that tax revenues may suffer a net loss. De Andrade et al. (2013) found no evidence that reducing costs incentivizes formalization, but inspections had a positive effect. In contrast, Kugler and Kugler (2009) found that a 10 percent increase in payroll taxes led to a 4-5 percent decrease in formal employment in Colombia. Similarly, Morales and Medina (2017) demonstrated a significant increase in formal employment following a 13.5 percent reduction in payroll taxes.

4.   **Studies using calibration models, including Vargas (2015), show that improving government effectiveness helps informal businesses to transition to the formal sector.** Conversely, imposing higher penalties and reducing inefficient regulatory and tax burdens can discourage informality. Other models, such as those by Bosch and Esteban-Pretel (2015) and Alonso-Ortiz and Leal (2013), show that increasing benefits, such as the introduction of an unemployment benefit system for the formal sector, can lead to an increase in formality in the economy.

5.   **In practice, many policy proposals for formalization rely on a strong link between informality and taxes and social security contributions.** For example, a proposed law in Paraguay

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seeks to promote access to the social security system for micro, small, and medium-sized businesses, and independent workers by offering incentives such as simplifying tax and social security obligations or reducing or eliminating them. However, based on the economic literature, it is unclear how much informality is affected by these changes, particularly in Paraguay, where there are currently no estimates of the impact of taxes and social security contributions on formal-sector employment based on a modern, credible estimation strategy. This study aims to fill this gap by providing new evidence of the elasticity of formal work using representative household survey data.

A. Defining Informality

6.   Given their considerable diversity, various ways exist to define informal employment situations. This study will use the Seventeenth International Conference of Labour Statisticians guidelines,[2] which provide a statistical definition of informal employment. The guidelines differentiate between the informal sector, which refers to production units as observation units, and informal employment, which refers to jobs.

7.   We identify businesses that are not registered in the Single Taxpayer Registry (RUC) as part of the informal sector by using the household survey called "Encuesta Permanente de Hogares" (EPH). Businesses that employ five or fewer people and use auxiliary family workers are also considered informal.[3] To determine whether someone is informally employed, we look at their workplace and whether they contribute to the retirement system. Furthermore, self-employed workers not registered in RUC,[4] and all family workers are informally employed.

Informality in Latin America

8.   Informality is a widespread issue in Latin America; however, there are noticeable differences in the levels of informality across countries in the region. Figure 1 indicates the proportion of informal employment in total employment for several Latin American countries, using data from the ILO SDG Labour Market Indicators.

9.   While some countries, such as Chile and Uruguay, have significantly lower levels of informality and have made notable progress in reducing it over time, most other countries, including Paraguay, which has the third-largest share of informal employment in the region, have struggled to reduce it substantially.

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[2] The 21st International Conference of Labour Statisticians recently agreed on a revised definition of informality. This update aims to deepen the understanding of informality within the agricultural, subsistence, and unpaid domestic sectors. The implementation of these changes will be gradual over the next few years.

[3] In cases where respondents are unsure whether their employer is RUC-compliant, we use additional information such as establishment size and legal status to determine informality.

[4] Self-employed individuals can obtain a RUC through three options: sole proprietorship, professional license, or as independent workers, and may voluntarily contribute to social security. However, very few register for RUC or contribute to social security, with the voluntary scheme attracting less than 1,000 contributors.

Figure 1. Paraguay: Informality Across Latin America
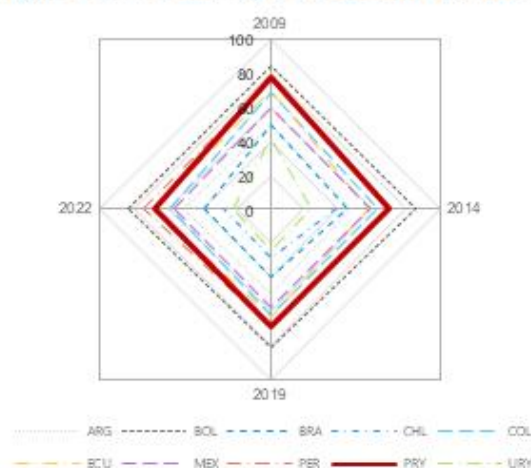
Source: ILO and author calculations

Informality Over Time in Paraguay

10. Delving deeper into the microdata and how informality in Paraguay has developed over time, Figure 2 plots the share of individuals in the informal sector and informal jobs by gender. Informality has decreased slowly over time. In 2009, roughly 72 percent of working aged individuals in the sample[5] had informal jobs, compared to 67 percent in 2022. Interestingly, the data shows a gender gap in the informal sector but not for informal jobs. This suggests that many men work in the formal sector but do not contribute to a pension fund.

11. Figure 2 also shows data on the percentage of individuals working informally, also broken down by education level. The data reveals a strong negative correlation between education level and informality. However, even highly educated workers have relatively stagnant rates of informality.

B. Conceptual Framework for Estimating the Elasticity

12. The framework and discussion presented in this section are based on earlier studies by McKay et al. (2019) and Jäntti et al. (2015), which extend from seminal work by Blundell et al. (1998). The underlying assumption is that individuals may opt for informal sector employment based on the availability of formal sector job opportunities. In the model, those engaged in the formal sector receive earnings and are subject to taxes while benefiting from, e.g., healthcare, or future pension entitlements. Conversely, participants in the informal sector receive income and potential benefits but do not pay taxes. McKay et al. (2019) demonstrate that the likelihood of

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[5] Our analysis focuses on individuals aged 15-65 with positive income, while omitting those in the agricultural sector. It's important to note that the EPH's data collection does not fully encompass the Boquerón, Alto Paraguay, and Presidente Hayes departments within the Chaco Region.

formal sector employment is positively associated with the net pay difference between formal and informal sectors and inversely related to labor taxes.

Figure 2. Paraguay: Share of Informal Sector and Jobs

Source: EPH and author calculations
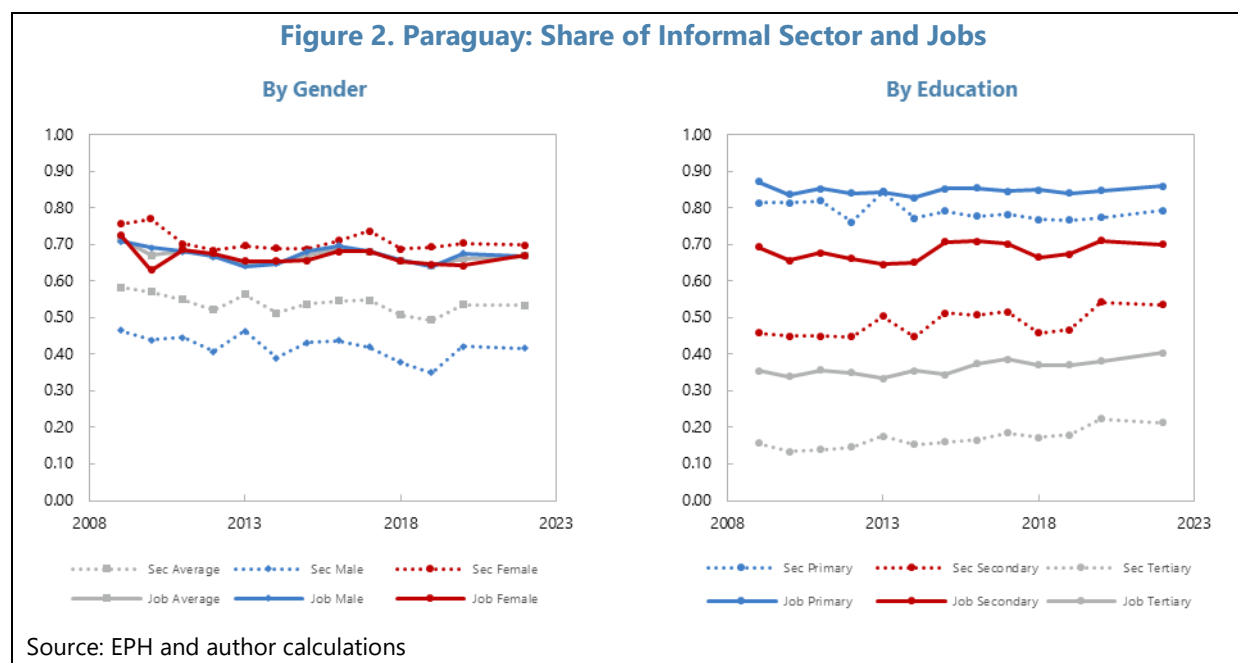
13.   **Thus, the empirical likelihood of observing positive informal labor income for an individual at a specific time can be expressed as:**

$$P(y_n > 0)_{it} = \alpha + \beta(x_f - x_n)_{it} + \epsilon_{it} \tag{1}$$

where $(x_f - x_n)_{it}$ denotes the net wage differential between the formal and informal sectors. Given the above, we anticipate a negative sign for the coefficient β. Variation essential for identifying coefficients arises from tax and social security reforms altering tax parameters and the fact that tax schedules may not always adjust for nominal wage growth, also known as bracket creep.

14.   **To address endogeneity concerns, we construct instruments[6] and divide the data based on gender, age, and education level, aligning with the approach of Blundell et al. (1998).** The rationale is that tax reforms and bracket creep impact individuals who are otherwise similar but engaged in the formal versus informal sector differently. Additionally, we incorporate group and time-fixed effects to capture the connection between unobservable individual traits and education/occupational choices, as well as time effects consistent across groups.

15.   **Jäntti et al. (2015) highlighted that the second stage variation occurs entirely at the group level.** Consequently, regressing the group's probability of informality (i.e., the proportion of
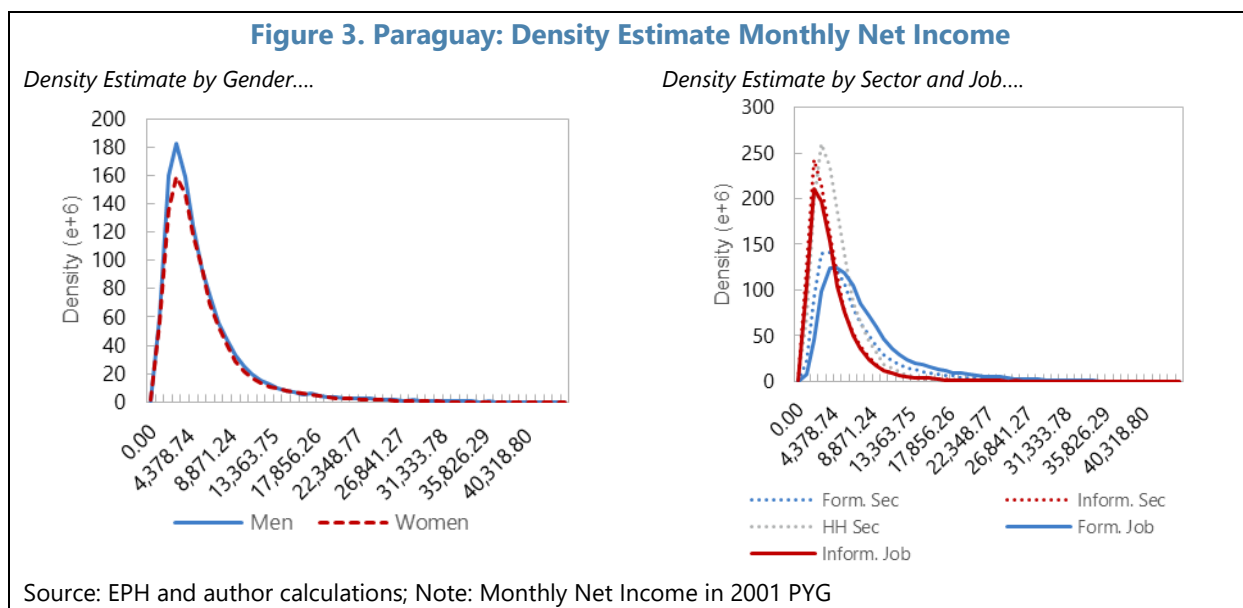
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[6] Specifically, we use a vector containing a full set of interactions between group dummies and time as the excluded instrument for $(x_f - x_n)_{it}$, as they are, by assumption, uncorrelated with the error term η_{it} when fixed effects are included: $P(y_n > 0)_{it} = \alpha + \beta(x_f - x_n)_{it} + \alpha_g + \mu_t + \eta_{it}$. For more details, see McKay et al. (2019).

informal workers) on time-specific group means of the net wage differential, using cell sizes as weights, is equivalent to the two-stage least square approach outlined earlier:

$$\overline{P(y_n > 0)_{gt}} = \alpha + \beta \overline{(x_f - x_n)}_{gt} + \alpha_g + \mu_t + \eta_{gt}. \qquad (2)$$

16.   Based on this regression, the elasticity of informality, i.e., the percentage change in the likelihood of having positive informal income with respect to a percentage change in the net earnings difference due to, e.g., tax or social security contribution changes, is then expressed as:

$$\beta \times \left[\overline{(x_f - x_n)} \middle/ \overline{P(y_f > 0)} \right]^7$$

Figure 3. Paraguay: Density Estimate Monthly Net Income

Density Estimate by Gender….

Density Estimate by Sector and Job….

Source: EPH and author calculations; Note: Monthly Net Income in 2001 PYG


C. Data and Descriptive Information

17.   The study uses EPH data from 2009 to 2022 and includes employed individuals between the ages of 15 and 65 who reported a strictly positive income from their primary activity. The sample was grouped by gender, education, and age, with consideration for primary, secondary, and tertiary education, as well as five ten-year age groups. This resulted in 30 groups. Income data was reported in real terms (i.e., in 2001 Guaranís) and truncated at the 99th percentile to eliminate any outliers.

18.   Figure 3 shows the Epanechnikov Kernel density estimates of monthly income based on gender, sector, and job type. The estimates also include the income differences between formal and informal jobs. Without considering education, occupation, sector, or experience, women

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[7] We cluster at the group level and calculate standard errors using the delta method. Note that, since income differences may be negative, we cannot simply estimate equation (2) in logarithms to obtain the elasticity.

have a higher average income than men, indicating a negative gender wage gap.[8] On average, income from formal jobs and the formal sector is higher and more dispersed.[9] On the other hand, the income distribution between the informal and household sectors (mainly consisting of domestic workers) is relatively similar.

19.   The graph in Figure 4 displays the estimated density of income differences between formal and informal jobs. These estimates were calculated for 30 different groups or types of individuals. Although most of the distribution mass is above zero, some groups have net pay that is higher in the informal sector than in the formal sector.[10]

Figure 4. Paraguay: Density Estimate Income Differences

Source: EPH and author calculations
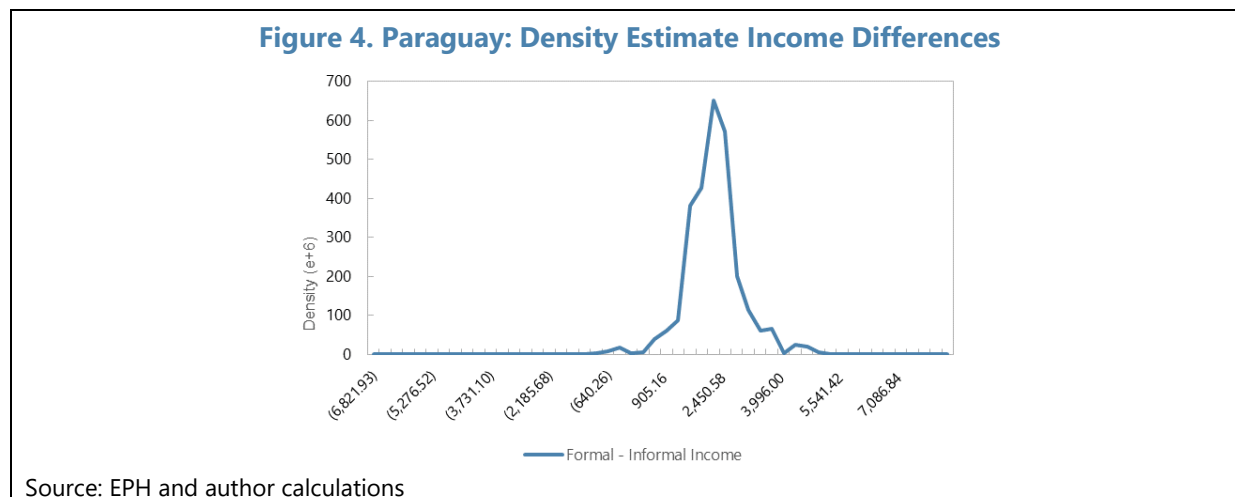
D.   Results

20.   Table 1 displays the elasticity of informal work for Paraguay, based on EPH data, using the grouped estimator from equation (2). The first column presents our preferred specification, which we label as the baseline. The second model uses the same specification, but standard errors are computed using a heteroscedasticity robust estimator instead of clustering at the cell level. Columns (3)-(7) present the elasticity estimates based on our preferred specification for several sub-samples. Finally, in column (8), all observations below the minimum wage are removed since the incentive structure may differ for these individuals.[11]

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[8] As the ILO Global Wage Report 2022-23 shows, however, taking these factors into account results in a positive conditional gender wage gap (which compares otherwise similar workers). The reason is that many women in Paraguay work in jobs requiring a high level of education.

[9] The most recent ILO report on informality found that globally, the earnings of workers in informal wage employment are 56 per cent of the earnings of wage workers in the formal economy.

[10] This finding is not new and is in line with previous evidence in the literature from other countries. For details, see El Badaoui et al. (2008).

[11] A binding minimum wage could prevent workers from requesting a higher wage in response to tax changes. Refer to McKay et al. (2019) for a more detailed discussion.

21.   All estimates, except those in the model (4) that are statistically insignificant, show the expected sign. This indicates that, all else being equal, a larger difference in net pay between formal and informal jobs reduces the proportion of informal workers. Our estimates are reasonably precise, as most are statistically different from zero. This includes our baseline estimate of -1.32e-16. Unsurprisingly, the estimates for some subgroups are less precise due to the smaller sample size. However, in terms of magnitude, they are quite similar.

22.   Across the board, the estimated elasticity is minimal, indicating a weak relationship between income differences and responses in formal activity. Specifically, there does not appear to be a clear and economically significant link between the net pay differences between sectors and the share of informal work based on our estimates. This implies that any changes in taxes or social security contributions directly impacting the income difference are unlikely to induce economically significant changes in the proportion of individuals with an informal job. This conclusion holds for different types of individuals, such as genders and education levels, and is robust to various specifications.

Table 1. Paraguay: Regression Results							
	Baseline	Robust	Men	Women	Tertiary Educ.	Secund. Educ.	Primary Educ	Above Min wage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Elasticity	-1.3e-16*	-1.3e-16**	-3.6e-17	1.7e-16	-1.7e-16	-1.6e-16*	-4.4e-16*	-2.1e-17
t-statistic	(-2.57)	(-2.96)	(-1.60)	(-1.05)	(-1.29)	(-2.13)	(-1.98)	(-1.59)
Group N	418	418	209	209	138	140	140	412

Note: The dependent variable is the share of informal workers in a cell. The elasticity is of informal work with respect to changes in the difference of formal versus informal wage. We report the t-statistic, the standard errors are clustered at the cell level (except for model 2, where we use robust standard errors), and calculated by the delta method. * $p<0.05$, ** $p<0.01$

23.   Informality may not be sensitive to changes in income differences due to the lack of benefits or awareness regarding the advantages of having a formal job.[12] This is supported by the findings of Bargain and Kwenda (2011), who discovered that the wage premium of the formal sector is higher in South Africa than in Mexico and Brazil, primarily because of the legal benefits of having a formal job. Additionally, the expected quality of benefits linked to formalizing and the existence of non-contributory systems are likely to play a significant role, as pointed out by Ulyssea (2020), Montt et al. (2021), and Nauerz and Torres (2020). This notion is supported by evidence from other countries in the region. In Uruguay, Bergolo and Cruces (2014) found that extending healthcare coverage significantly increased registered employment.[13] Garganta and Gasparini (2015) analyzed Argentina's Universal Child Allowance program, indicating that it discourages informal

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[12] Although awareness may be a factor, our results show no significant difference for the highly educated subgroup. Therefore, it is unlikely to be the only driver behind our findings, in line with the findings of McKenzie and Sakho (2010) in Bolivia. There, formalizing does not benefit firm profits across all sizes and among large firms, primarily high-ability entrepreneurs remain informal.

[13] A recent study on Uruguay's monotax system highlights market access as the key reason for participation, overshadowing retirement pension benefits, which exclude healthcare.

workers from transitioning to the formal sector. Bosch and Campos-Vazquez (2014) estimated that Mexico's Popular Health Insurance program reduced registered employers by 3.8 percent and employees by 2.4 percent.

24.   Individuals may choose to work in the informal sector for reasons beyond price considerations, i.e., the level of contributions. A poorly designed regulatory framework, high transaction costs such as procedural or implementation difficulties, and a low probability of eligibility for certain benefits may also contribute to this choice, as indicated by a 2021 ILO study conducted by Montt et al. For instance, older individuals may not be able to meet the minimum contribution threshold for pensions, which reduces their incentives to contribute. Additionally, the low quality and availability of services in rural areas can affect the decision to work in the formal sector.

E. Policy Implications

25.   Previous discussions have emphasized the significant size of Paraguay's informal economy. However, reducing or eliminating taxes and social security contributions alone may not reduce informality, and reducing the tax base or the financing directed to social security may harm fiscal balances and/or the provision of social services. While this presents an opportunity, insofar as there is no tradeoff between labor protections, social security funding, and fiscal revenue, the results raise an important question: What other policy measures can promote and sustain employment in the formal economy?

26.   The success of labor informality, social protection, and productivity outcomes depends not on a single policy but a comprehensive combination of policies (Levy & Cruces, 2021).** Thus, to mitigate informal employment, policies should focus on multiple fronts.

27.   First, reducing transaction costs by simplifying paperwork can make formal employment more accessible. Enhancing the visibility, quality, and perceived value of benefits, particularly for healthcare, accident insurance, and sickness benefits, is crucial since old-age and invalidity pensions do not provide immediate incentives. Furthermore, establishing an unemployment insurance scheme, introducing family allowances, and broadening maternity benefits to include self-employed individuals encourage formal employment and enhance income security. Lowering the eligibility criteria for old-age benefits based on actuarial recommendations ensures that workers contributing to a retirement fund can qualify for retirement.

28.   Furthermore, labor regulations should not penalize highly productive businesses and individuals, creating barriers to inclusion. Thus, at the enterprise level, promoting compliance through measures such as linking public procurement to formalizing employees and exports or requiring subcontractors and suppliers to formalize and maintain proper paperwork for tax clearance has shown effectiveness in countries like Chile and Uruguay. These strategies collectively aim to make formal employment more attractive and feasible for individuals and enterprises.

29.   Therefore, an essential strategy for promoting and sustaining formal employment should include improving business productivity growth by eliminating inefficient, complicated, and distorting rules, as Vargas (2015) points out. This could involve simplifying licensing and registration procedures and making targeted adjustments to tax schedules and regulations that penalize growth in size, imposing an indirect tax on larger and formal entities. Additionally, enhancing governmental efficiency and the ability to enforce regulations will increase the chances of identifying informal entities, thereby raising the costs associated with operating informally.

30.   To address informal employment by enhancing productivity, policies should provide targeted support to enterprises at the margin, leveraging the capabilities of national training institutes to offer specialized assistance. Such support can enhance the skills and competencies of the workforce, making formal employment more attractive and viable for businesses. By focusing on those enterprises that stand to benefit the most from additional support, policies can effectively stimulate productivity and encourage a shift away from informal employment practices.

31.   Moreover, given the strong negative correlation between education and informality observed in the data, promoting access to high-quality education, and supporting policies that encourage individuals to invest in their human capital could significantly reduce informality. Such policies could also include establishing a comprehensive support system that provides care solutions to households, thus mitigating underemployment and the pullout from the labor force. Recognizing the value of unpaid care work is another critical step towards facilitating the shift of numerous informal workers in this sector to formal employment.

32.   Finally, although non-contributory schemes and special regimes offer partial remedies for exclusion, they might also encourage lower productivity and greater informality. Thus, evaluating non-contributory social security systems to assess how they might incentivize workers to stay in the informal sector is crucial for mitigating unintended distortions. These efforts must be accompanied by strategies that guarantee the financial viability of pension funds, offering members confidence that their contributions will translate into substantial and high-quality benefits.

F.   Final Remarks

33.   Our findings indicate that merely reducing taxes and social security contributions may not substantially affect informality. As previously mentioned, relying on a single policy instrument will be unlikely to solve the issue entirely. However, it is crucial to highlight that in our analysis, variations in taxation primarily stem from adjustments in the income levels that determine tax bracket thresholds. Consequently, the observed disparities between formal and informal incomes result primarily from bracket creep, a phenomenon that workers might not always recognize. Therefore, significant, clearly communicated alterations to tax parameters could elicit more pronounced, non-linear reactions. Furthermore, the analysis presupposes, to some degree, that the incentives are designed for individual workers, assuming these individuals choose between formal and informal engagement. However, informality occurs also at the enterprise level. This represents a constraint of our analysis, as our findings are not derived from a survey of enterprises.

34.   Nevertheless, our research has not provided conclusive evidence that tax incentives or reduced social security contributions significantly impact the levels of informality in the economy. Considering the necessity of domestic revenue mobilization to fund social programs and invest in human capital and productivity, it is essential to adopt a holistic, efficient, growth-friendly, and fiscally sustainable set of policies, including those previously mentioned. Such a policy framework is vital for fostering conditions conducive to formalization, thereby supporting inclusive and lasting economic development.

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