

The Aruban Shadow Economy

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Contents

- Summary4
- Introduction5
- Results10
- Policy recommendations14
- Annex19
- References23

Summary

Recent research done by the Department of Economic Affairs, Commerce and Industry (DEACI) (Lejuez & Schneider, 2021) shows that the Aruban Shadow Economy (SE) is growing in 2020, except for this year (2021), where we will have a strong reduction of the SE due to the economic recovery. Although a growth in the SE can entail many negative consequences society-wide, the effects of SE are not as straight-forward as might initially be thought. A growth in the SE can also make a positive contribution to economic conditions by filling the gaps left open by the formal sector. The SE can be welfare enhancing, especially for developing countries (Mughal & Schneider, 2020).

The shadow economy comprises economic activities that circumvent costs and are excluded from the benefits and rights incorporated into laws and administrative rules covering property relationships, commercial licensing, labor contracts, torts, financial credit, and social systems.

This paper will present the main results of DEACI's research on the Aruban Economy, and discuss recommendations for policy measures to reduce the SE given the particulars of the Aruban context.

The recommendations are briefly mentioned below:

Reduce unemployment, reduce overall taxation, reduce dependence on tourism, improve quality of institutions, reduce administrative burden, increase popularity of electronic payments. Some open questions and further recommendations regarding the shadow economy are also discussed.

One concrete proposed first step is to implement a multi departmental commission to be led by DEACI charged with the development of a concrete plan for the reduction of the shadow economy.

Introduction

Recent research done by the Department of Economic Affairs, Commerce and Industry (DEACI) (Lejuez & Schneider, 2021) shows that the Aruban Shadow Economy (SE) is growing in 2020, except for this year (2021), where we will have a strong reduction of the SE due to the economic recovery. Although a growth in the SE can entail many negative consequences society-wide, the effects of SE are not as straight-forward as might initially be thought. A growth in the SE can also make a positive contribution to economic conditions by filling the gaps left open by the formal sector. The SE can be welfare enhancing, especially for developing countries (Mughal & Schneider, 2020).

Negative consequences SE

From the perspective of the Aruban government a growth in the SE entails a lower collection-rate of potential revenues resulting in budgetary constraints that lead to pressure on the quantity and quality of public services and on the servicing of debt payments. To mitigate this suboptimal revenue collection fiscal measures are used in the form of increased taxation. The increase in tax burden leads to less available resources for the Aruban population to consume goods and services. Less consumption leads to a decrease in production and consequently to a decrease in employment. Less employment means a shrinking of tax base. More taxation on the smaller tax base leads to more shadow economic activities in order to avoid taxation and so terminating in a vicious circle. Combatting the growth in the SE is a necessity for the government and the population not only for quality governmental services and for level of consumption, but also because the SE engenders a myriad of other negative consequences like unfair competition with formal sector businesses, money laundering, less labor protection, tax avoidance and evasion and corruption. Therefore, action is needed to prevent those who benefit from the secrecy that is so characteristic for the SE.

Positive consequences SE

It is inevitable that the formal sector, due to its nature and bureaucratic formalities, would result in less dynamism and limited ability to change with economic conditions. It is here that the more dynamic and less bureaucratic nature of the informal sector may boost economic activities by helping people earn extra income due to SE activities. This extra income will for the most part be spent in the economy and thereby help stimulate the local economy by increasing demand, which in turn results in more formal employment and more revenue for the government. The possibility to engage in SE

activities can help a part of the population to overcome the deficiencies in the Aruban system (e.g. the imbalance between level of wages and cost of living and the limited financial assistance provided to unemployed persons). Therefore, any policy intervention must take in to account the necessity to combat the SE while at the same time trying to prevent those active in the shadow economy from falling in an economic abyss and thereby missing out on their potential contribution to the economy.

The literature on the SE provides a broad range of definitions of the term SE and multiple methods for capturing this somewhat elusive phenomenon. In the following this paper will, albeit briefly, discuss the definition of the SE and present the various methodologies. This paper will present the main results of DEACI's research on the Aruban Economy. But most importantly, since this is a policy paper, this paper will present and discuss recommendation for policy measures to reduce the SE given the particulars of the Aruban context.

Shadow economy¹

Defining the Shadow Economy

Definition and measurement of the shadow economy has been a subject of controversy. A number of different names, such as the “hidden” economy, “gray” economy, “black” or “lack” economy, “cash” or “informal” economy, are used. All these synonyms refer to some type of shadow-economy activities and have been used frequently—and quite inconsistently. Williams and Schneider (2016) argue that the informal economy comprises economic activities that circumvent costs and are excluded from the benefits and rights incorporated into laws and administrative rules covering property relationships, commercial licensing, labor contracts, torts, financial credit, and social systems.

Individuals are rational calculators who weigh costs and benefits when considering breaking the law. Their decision to partly or completely participate in the shadow economy is a choice overshadowed by uncertainty, as it involves a trade-off between gains, if their activities are not discovered, and losses, if the activities are discovered and the individuals penalized. Shadow economic activities thus negatively depend on the probability of detection and potential fines and positively on the opportunity costs of remaining formal. The opportunity costs are positively determined by the burden of taxation and high labor costs (individual income generated in the shadow economy is usually categorized as labor income rather than capital income) due to labor market regulations. Hence, the higher the tax burden and labor costs in a given country, the more incentives individuals in that country have to avoid these costs by working in the shadow economy. The probability of detection itself depends on enforcement actions taken by the tax authority and on facilitating activities individuals engage in to reduce the detection of shadow-economic activities.

Hence, shadow-economic activities may be defined as those economic activities (and the income earned by engaging in them) that bypass public regulation, taxation, or

¹ This section is taken largely from Lejuez & Schneider (2021).

observation. More narrowly, the shadow economy includes monetary and nonmonetary transactions of a legal nature, and hence all productive economic activities that would generally be taxable were they reported to state (tax) authorities. Such activities are deliberately concealed from public authorities to avoid payment of income, value-added, or other taxes and making social security contributions or to avoid compliance with certain labor market laws and standards such as minimum wages, maximum working hours, and safety standards and administrative procedures. The shadow economy thus focuses on productive economic activities that would normally be included in national accounts but remain underground because of tax or regulatory burdens. Although such legal activities would contribute to a country's value added, national accounts do not capture them, because they are produced in illicit ways. Informal household economic activities such as do-it-yourself activities and neighborly help are typically excluded from the analysis of the shadow economy.

Methods for Measuring the Shadow Economy

Based on these considerations, a variety of methods have been used in the literature over the years to measure the size of the shadow economy. These methods can be categorized as either direct or indirect (including the model-based ones). Before discussing the different methods, it is important and necessary to mention that all methods, without exception, have advantages and weaknesses and that no method is superior.

The most common direct approaches to measuring the size of the informal economy rely on surveys and samples based on voluntary replies or tax auditing and other compliance methods. While providing great detail about the structure of the informal economy, the results are sensitive to the way the survey questionnaire is formulated and respondents' willingness to cooperate. Consequently, surveys are unlikely to capture all informal activities in an economy (see Isachsen and Strøm 1985; Witte 1987; Mogensen et al. 1995; and Feige 1996).

Indirect approaches are mostly macroeconomic in nature. These are in part based on (i) the discrepancy between national expenditure and income statistics or (ii) the discrepancy between the official and actual labor force in a country, or else they follow one of several approaches that have been formulated: (iii) the "electricity consumption" approach of Kaufmann and Kaliberda (1996), (iv) the "monetary transaction" approach

of Feige (1979), (v) the “currency demand” approach of Cagan (1958) and Tanzi (1980), as well as others, and (vi) the “multiple indicators–multiple causes” approach (see Medina & Schneider 2021).

For DEACI’s research to estimate the size of Aruba’s shadow economy Lejuez & Schneider (2021) used the Currency Demand Approach (CDA). This method assumes that informal transactions take the form of cash payments, in order to avoid leaving observable traces for authorities. The assumption is that the increase in the size of the shadow economy will increase the demand for currency. Using time series data in which currency demand is a function of conventional factors and factors causing people to work in the shadow economy, the “excess” demand for currency is isolated. This excess demand for cash thus represents the shadow economy and to calculate the “excess” demand for currency the natural demand for cash is calculated by holding the factors causing the shadow economy at their minimum values and then subtracting this from the total demand for cash in the Aruban economy. The size of the shadow economy as a percentage of GDP is then calculated by dividing the excess demand for cash by the natural demand for cash. As with every other method the CDA also has several problems that are associated with this method and its assumptions. As mentioned in Medina & Schneider (2021): *“(1) the CDA may underestimate the size of the shadow economy because not all transactions use cash as a means of exchange, (2) currency demand deposits may increase because of a slowdown in demand deposits rather than increase in currency used in informal activities, (3) it seems arbitrary to assume equal velocity of money in both the shadow and formal economies, and (4) the assumption of no shadow economy in a base year is arguable.”*

Results

The research done by DEACI estimates, for the first time to our knowledge, the size of the Aruban shadow economy and explores the inclusion of a tourism-related variable in the calculation of the shadow economy for a tourism-dependent economy. Aruba is one of the most tourism-dependent countries in the world (see figure 2 in Annex) (see Mooney, H. and Zegarra, M.A., 2020) and the performance of the tourism sector results in consequences felt society-wide. With the help of the Currency Demand Approach (CDA) the size of the Aruban shadow economy is estimated using twelve (12) CDA equations². The results show that the average shadow economy size for these equation from 1991 to 2019 is 18.8 percent of GDP and 19.7 percent from 1991 to 2020. The average results including the year 2020 are somewhat higher as they include the unprecedented shock to the tourism sector (and thus the larger part of Aruban economy) from the COVID-19 pandemic. Table 1 presents the results for the average of all twelve equations. Figure 1 shows the average for all twelve equations for 1991 to 2021³. In the annex table 1 and table 2 the results of all twelve CDA equations separately are presented.

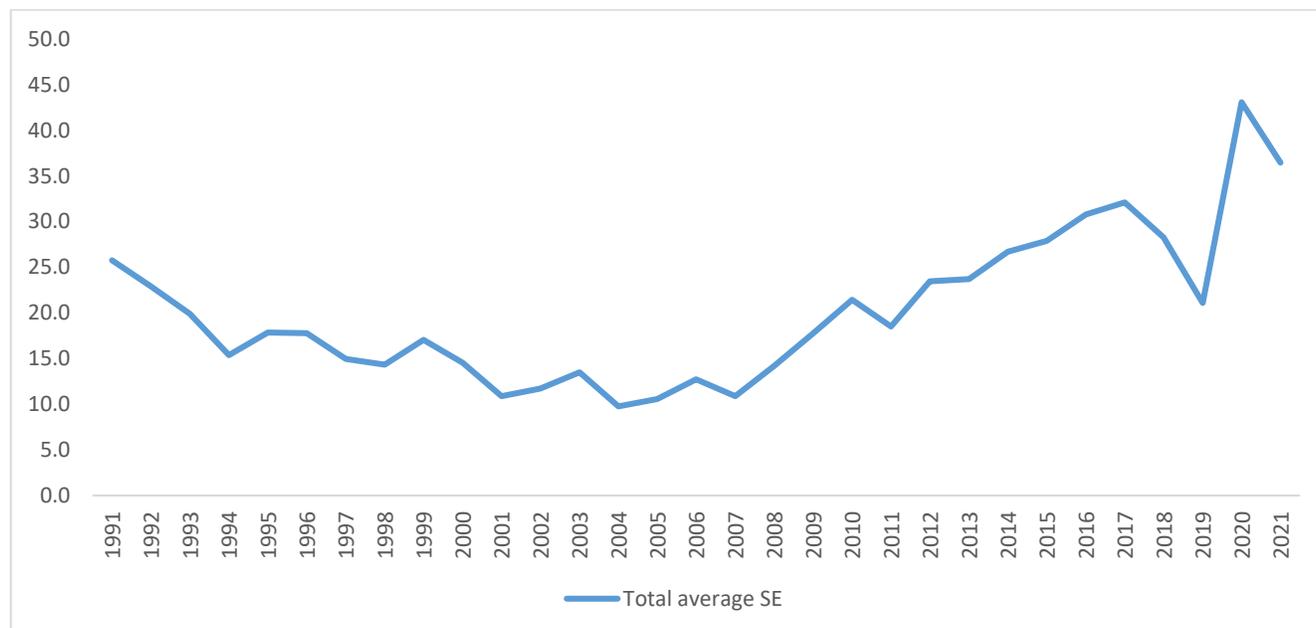


Figure 1 Results calculation of shadow economy as percentage of GDP, from 1990 to 2021.

Source: DEACI's own calculations (Lejuez & Schneider, 2021)

² For a more detailed discussion see Lejuez & Schneider 2021. Tourism and the Aruban Shadow economy.

³ The figure for the year 2021 is based on projections made by DEACI. See DEACI's December 2020 Economic Outlook 2020-2021 report.

The average shadow economy size for Equations 1.1 to 6.1 over 1991 to 2020 is 22.2 percent⁴; for Equations 1.2 to 6.2 (which include a lagged endogenous variable) it is 17.1 percent⁵. Including the tourism variable as part of the shadow economy results in an average size of the shadow economy of 23.8 percent for Equations 1.1, 4.1 to 6.1 for the years 1991 to 2020 and of 18.2 percent for Equations 1.2, 4.2 to 6.2. These results are also presented in table 1. The econometric results for the equations with the lowest and the highest SE calculations are presented in table 6 in the annex.⁶

⁴ The equation with the lowest average size of the shadow economy from 1990 to 2020 16.7 percent and the highest is 27.9 percent). See annex table 1.

⁵ The equation with the lowest average size of the shadow economy from 1991 to 2020 13.4 percent and the highest is 20.2 percent). See annex table 2.

⁶ For all econometric results see Lejuez & Schneider, 2021.

Year	Average Equations 1.1 to 6.1 SE % to GDP	Average Equations 1.2 to 6.2 SE % to GDP	Average Equations 1.1, 4.1 to 6.1 including tourism SE % to GDP	Average Equations 1.2, 4.2 to 6.2 including tourism SE % to GDP	Total Average Equations 1.1 to 6.1 and 1.2 to 6.2 SE % to GDP
1991	29.3	22.2	27.7	20.8	25.8
1992	25.9	19.9	25.6	19.5	22.9
1993	22.5	17.3	22.2	16.9	19.9
1994	17.4	13.4	17.0	13.0	15.4
1995	20.0	15.7	19.2	14.7	17.8
1996	20.0	15.6	19.2	14.7	17.8
1997	16.8	13.2	16.7	12.9	15.0
1998	16.0	12.7	16.4	12.6	14.3
1999	19.1	15.0	19.0	14.4	17.1
2000	16.3	12.8	17.2	13.1	14.5
2001	12.0	9.8	15.3	12.6	10.9
2002	13.0	10.4	17.5	14.2	11.7
2003	15.1	11.9	15.3	11.6	13.5
2004	10.9	8.7	10.3	7.7	9.8
2005	11.8	9.4	13.0	9.9	10.6
2006	14.2	11.3	18.6	14.9	12.7
2007	12.5	9.3	13.4	9.9	10.9
2008	16.0	12.4	16.3	12.2	14.2
2009	19.9	15.7	22.7	18.2	17.8
2010	23.9	19.0	23.4	17.9	21.4
2011	20.7	16.3	21.2	16.1	18.5
2012	26.4	20.6	26.8	20.2	23.5
2013	27.0	20.5	28.9	21.6	23.7
2014	30.5	23.0	31.6	23.4	26.7
2015	31.9	23.9	33.2	24.4	27.9
2016	35.2	26.4	41.9	31.8	30.8
2017	36.6	27.6	41.7	31.8	32.1
2018	32.4	24.2	35.2	26.0	28.3
2019	24.4	17.8	27.4	19.9	21.1
2020	48.6	37.6	61.0	47.7	43.1
2021-Optimistic	41.2	31.7	30.5	21.5	36.5
Average 1991-2019	21.3	16.4	22.5	17.2	18.8
Average 1991-2020	22.2	17.1	23.8	18.2	19.7

Source: DEACI's own calculations (Lejuez & Schneider, 2021)

DEACI's estimations demonstrate that from 2008 until 2017 there was an upward trend in the size of the shadow economy. The steady increase in the tax burden experienced in Aruba during this same period is a contributing factor. Unemployment during this period was also higher than usual at an average of 8.3 percent. The proportion of public employment in total employment also showed a decline in this

period and when seen as an indicator of the quality of institutions and the probability of detection of shadow economy activities (depending on enforcement actions taken by the authorities), it is plausible that this decline also contributed to the increase in the shadow economy. Another possible contributing factor to informality was the large influx of illegal Venezuelan migrants fleeing the serious economic decline in their native country over the same period, although concrete data regarding this is not available.

In 2019 Aruba experienced an exceptional year with strong performance in the tourism sector and the lowest unemployment in the last decade. However, these gains were short lived as the outbreak of the COVID-19 pandemic resulted in a record drop in GDP in 2020 (-25 %) being Aruba's deepest recession in history. Recent data indicates a faster than expected recovery for the year 2021 but given that the pandemic is still ongoing a high degree of uncertainty remains.

Policy recommendations

The Aruban government faces the challenge of reducing the shadow economy and tax evasion. Policy measures to this end need to take into account that SE activities can sometimes have beneficial outcomes. The total GDP of a country always consists of the official GDP and the contribution of shadow economy. Some part of shadow economy activities can be captured by the official GDP but other parts can't because they complement those of the official sector (i.e. those goods and services would not be produced in the official sector). To increase the total welfare of a country through a decline in the shadow economy a policy needs to succeed in transferring the shadow economy activities from the shadow economy to the official economy. In other words, the chosen policies measures must strongly increase the incentives to transfer the production from the shadow (black) to the official sector. Only then will the decline of the shadow economy be a benefit for the whole economy.

Before discussing policy recommendations, it is important to look at the interactions between the shadow economy and the official economy. The shadow economy influences the tax system negatively through tax evasion and positively through additional tax revenues. In the case of tax evasion, the effects on the official economy and overall economic performance is that public policies to finance public goods and services are impaired, thus economic growth may be negatively affected. In the case of additional tax revenues, if the shadow economic activity is complementary to the official economy, extra income is generated which is then (at least partly) spent in the official economy. This seems to be the case in Aruba and should be considered much more strongly⁷. The SE also influences the allocation of resources through stronger (or ruinous) competition or market stimulation. One positive result is that the competitive advantage of firms operating in the SE will require that competing official economy firms make more efficient use of resources. Another positive result from this stronger competition is that it will provide incentives for official economy firms and individuals that will result in stimulation of creativity and innovation to be able to compete with SE firms. Further, consumers can benefit from the production in the SE as it contributes to the

⁷ Data regarding informality in the labor market show that about 7% of the Aruban workforce work in their primary job in the shadow economy (Source: Department of Labor and Research Aruba- see Report SDG- Indicator Working Group, 2018). Therefore, one can assume that for most persons SE activities are mostly complementary to formal sector activities.

enlargement of market supply through additional goods and services and, due to increased competition, may result in lower prices. Some negative results may be that cost advantages of producers acting from the shadow economy may lead to ruinous competition for some firms in the official sector. Another negative consequence is that it could lead to problems in information flows for producers and consumers due to reduction in transparency and lack of structure in unofficial sector. Lastly, the shadow economy also influences policy decisions through bias in officially published data. Because of this negative influence due to the incorrect size of indicators like employment and biased policy measures, redistribution and fiscal policies may fail.

Policy measures against the shadow economy and tax evasion⁸

Reduce unemployment

DEACI's research (Lejuez & Schneider, 2021) found a strong positive relation between unemployment and the SE indicating that unemployment is a major factor influencing the Aruban shadow economy. In other words, the higher the unemployment rate the larger the size of the SE. Therefore, policies aimed at reducing unemployment should be pursued. Unemployment is either controllable by the government through economic policy in a traditional Keynesian sense; or the government can try to improve the country's competitiveness to increase foreign demand. Further, the guaranteeing of quality public employment services and a well-functioning labor market information system can help connect those looking for work and those looking for workers and thereby decrease frictional unemployment.

Unemployment can also be combatted with the stimulation of self-employment. The impact of self-employment on the shadow economy is only partly controllable by the government. The government can deregulate the economy or incentivize "to be your own entrepreneur", which would make self-employment easier, potentially reducing unemployment and positively contributing to efforts in controlling the size of the shadow economy. These policies need to be accompanied with a strengthening of institutions and trust in public institutions to reduce the probability that self-employed shift reasonable proportions of their economic activities into the shadow economy, which, if it happened, made government policies incentivizing self-employment less

⁸ SE and tax evasion are NOT the same. SE creates by definition a value added or additional GDP and tax evasion not.

effective. Other targeted interventions aimed improving labor market outcomes for the most vulnerable groups (e.g. youths, single mothers etc.) should also be pursued.

Reduce overall taxation

Besides these measures, policy makers should focus to reduce overall taxation (especially indirect⁹ taxation and custom duties). As noted in DEACI's research on the SE, the increase in the tax burden is another major contributor to the increase in the SE. However, tax reductions may lead to budget deficits, which can only be overcome by strong economic growth, or extra value added or GDP due to SE activities. As part of a comprehensive reform package¹⁰ agreed upon by the Aruban Government and the government of the Kingdom of the Netherlands to improve Aruba's post pandemic economic resilience, some major changes in the tax system are planned. One change is the introduction of VAT (BTW in Dutch) to replace the current indirect taxation method (BBO, BAZV). This change should not result in an increase of the tax burden for ordinary Aruban citizens otherwise it will lead to increased SE activities. Improvement in tax collection effectiveness will diminish the need to increase the level of taxation as every citizen will contribute their fair share. A well-equipped and well-trained tax authority can perform effective control and act as a powerful deterrent. If resources are lacking, opting for increasing the mere perception that the probability of getting caught is high can help reduce SE activities and tax avoidance. For these behaviorally informed measures can be developed¹¹.

Reduce dependence on tourism

Another main driver of Aruba's shadow economy is the strong dependence on tourism in the Aruban economy. Because of this strong dependence on tourism a growth or decline in tourism will have far reaching consequences for other sectors as well leaving the Aruban economy vulnerable to outside economic forces that influence the level of tourist arrivals, particularly forces in the American economy since about three quarters of visitors are US citizens; hence, taking a medium- and long-term perspective, the

⁹ Indirect taxes disproportionately affect low-income persons as they consume a greater percentage of their disposable income compared to high-income persons. Increased indirect taxation can push these low-income persons to engage in SE activities in order to maintain their level of consumption.

¹⁰Landspakket Aruba (2020). <https://www.rijksoverheid.nl/documenten/brieven/2020/11/13/landspakket-aruba>

¹¹ See World Bank. 2021. Behavioral Insights for Tax Compliance (English). eMBeD document. Washington, D.C. : World Bank Group.

dependency on tourism should be reduced and hopefully other services could be built up, such as health care institutions and other promising sectors¹².

Improve quality of institutions

Equally important is the quality of institutions. Democratic and transparent institutions with lesser regulatory burden, corruption and bureaucracy evokes the trust and confidence of the people in the public institutions. DEACI's research on the SE also finds that diminishing strength of the government institutions is a major contributor to the increase in the SE. Recent research done by the Central Bank of Aruba¹³ finds that a great majority of survey respondents believed that corruption was widespread in Aruba and that the government was doing badly in fighting corruption in government.

Reduce administrative burden

Reducing administrative burden on businesses by simplifying the procedures for obtaining licenses, accelerating the release of documents required for entrepreneurship, reducing bureaucratic barriers for such documents and increasing transparency of the whole process. In this the implementation of e-government should be accelerated¹⁴¹⁵.

Increase popularity of electronic payments

Discouraging the use of cash by increasing popularity of electronic payments. Key measures in this regard should focus on the further development of adequate infrastructure for bank cards and other electronic payments, particularly in the service sector; creating incentives for companies that encourage their customers to use electronic payments, and to pay the salaries of their employees into a bank account; organizing unscheduled inspections in companies to verify that card terminals and other related infrastructure work correctly.

Open questions and recommendations regarding the shadow economy

¹² https://www.deaci.aw/promising-sector/promising_sectors/

¹³ See: Central Bank of Aruba. 2021. Report Corruption Survey 2020. Oranjestad, Aruba: Central Bank of Aruba.

¹⁴ See: Towards a Digital Aruba: Increasing Readiness of Arubans and Aruba's Civil Servants for E-Government (2019). School of International and Public Affairs. University of Columbia. New York.

¹⁵ Building a Better Citizen Experience. e-Government Road Map 2021-2025 (2020). Government of Aruba. Oranjestad.

An internationally accepted definition of the shadow economy and of informal employment is still missing. Such a definition is needed in order to make comparisons easier between Aruba and other countries and between the different methods.

Although the research done by DEACI gives an indication of the main causes and drivers of the shadow economy the link between theory and empirical estimation of the shadow economy and of informal employment is still somewhat unsatisfactory. A deeper exploration is needed to understand in more detailed manner which are the “core” driving forces of both phenomena in the Aruban economy. Therefore, more research regarding the Aruban shadow economy is called for.

Other aspects that need to be further researched are the economic sectors and occupations that are most affected by SE activities in Aruba. For this purpose a large-scale survey could be done. Some drawbacks of such large-scale survey research are that it demands a large amount of resources, financial as well as human, and that due to its self-report aspect it will inevitably give an incomplete picture, as respondent will tend to avoid reporting their SE activities.

The research done by the DEACI (Lejuez & Schneider, 2021) on the SE gives much better knowledge of the size and development of the shadow economy in Aruba. According to the research the main drivers of the Aruban shadow economy (se) are: Tax burden, regulation, unemployment, tourism, strength of government institutions.

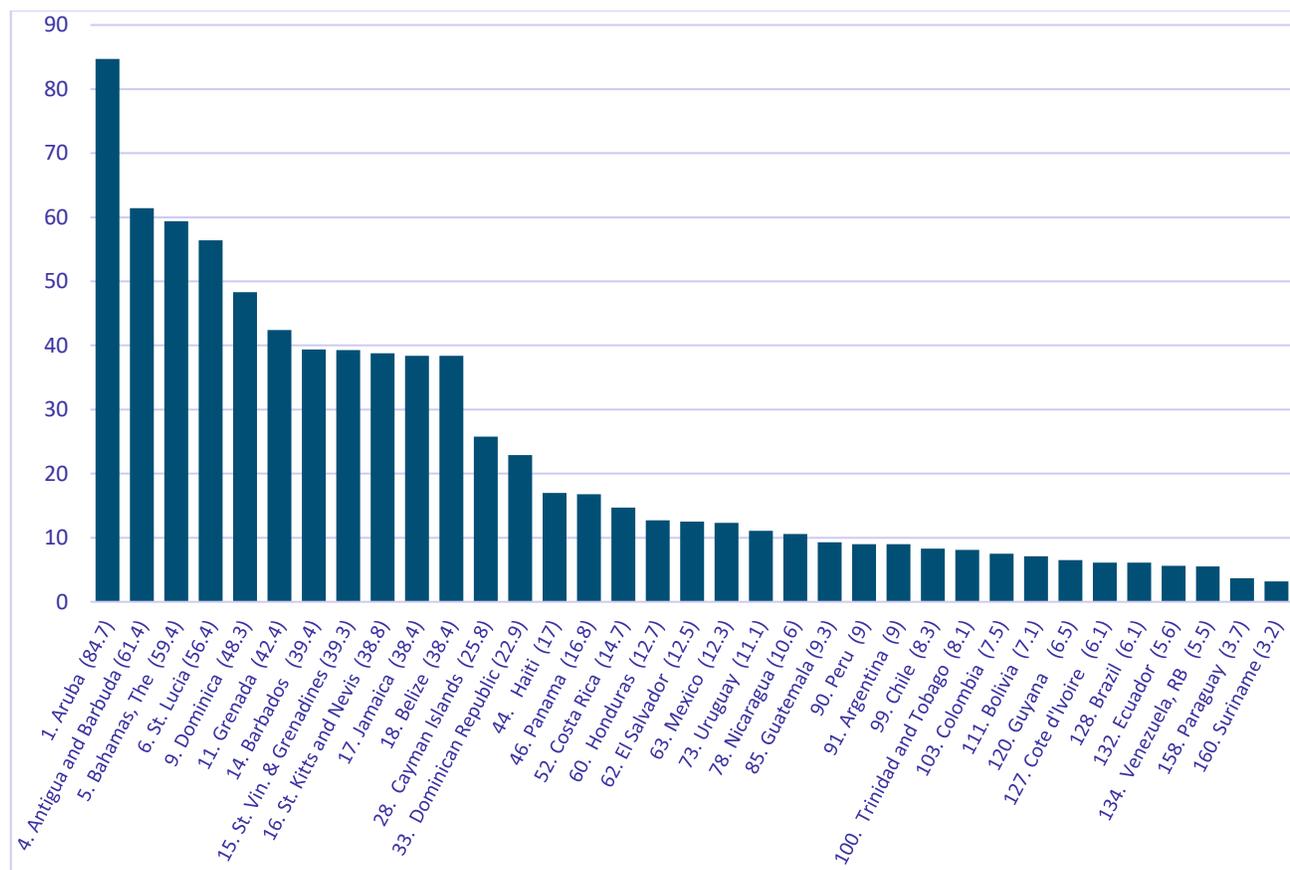
Beside these drivers the scientific literature also finds that self-employment, income, competitiveness, size of the agricultural sector, good governance and corruption also drive the SE. Due to the unavailability of time series data for these drivers their impact on the Aruban SE could not be assessed. Improvement in data collection and production throughout all Aruban government institutions should also be a priority in order to support future research. These results should be updated regularly in the future as more data becomes available and as updates regarding the used data are performed.

First concrete step

One concrete first step is to implement a multi departmental commission to be led by DEACI charged with the development of a concrete plan for the reduction of the shadow economy. This commission will take into account the different available policy options and devise an implementation plan consisting clearly defined ends to be pursued in an orderly, rational and coordinated fashion.

Annex

Annex Figure 1. Tourism Dependency Index (TDI) Latin America and Caribbean countries- from IDB report¹⁶



Source: IDB report 2020. Extreme Outlier: The Pandemic's Unprecedented Shock to Tourism in Latin America and the Caribbean (Mooney, H. and Zegarra, M.A. , 2020).

¹⁶ The Tourism Dependency Index (TDI) is calculated using 5-year averages (2014-2018) for the total contribution of tourism to export receipts, GDP, and employment for each country. The range is from zero to 100, with 100 representing total dependence on the sector. TDI for 35 countries in Latin America and the Caribbean for which data was available displayed. The digit preceding the country name represents its rank out of 166 countries around the world for which data was available.

Annex Table 1. Estimated shadow economy as percentage of GDP for Aruba from 1990 to 2020, with the optimistic scenario for 2021. Equations 1.1 to 6.1.

Year	Equation 1.1 SE % to GDP	Equation 2.1 SE % to GDP	Equation 3.1 SE % to GDP	Equation 4.1 SE % to GDP	Equation 5.1 SE % to GDP	Equation 6.1 SE % to GDP	Average
1990	30.9	35.9	26.0	36.5	25.2	28.8	30.6
1991	30.8	32.9	24.6	33.8	24.5	29.4	29.3
1992	26.6	29.7	22.7	29.7	21.4	25.5	25.9
1993	22.5	24.9	20.8	24.9	19.7	22.1	22.5
1994	18.4	19.3	14.9	19.2	14.1	18.2	17.4
1995	20.7	23.4	17.4	22.3	15.0	21.2	20.0
1996	20.5	22.9	17.9	21.9	15.6	21.0	20.0
1997	17.7	19.7	14.0	18.8	11.9	18.4	16.8
1998	17.6	18.9	12.8	17.7	10.4	18.7	16.0
1999	21.4	21.5	15.1	20.5	12.9	23.2	19.1
2000	19.8	18.1	11.4	17.2	9.5	21.6	16.3
2001	14.3	14.6	8.0	13.1	5.5	16.5	12.0
2002	16.4	15.1	8.3	14.0	6.2	18.2	13.0
2003	18.3	16.4	10.9	15.3	8.7	20.7	15.1
2004	15.0	11.3	6.7	10.3	4.9	17.1	10.9
2005	15.5	11.9	8.2	10.8	6.2	18.1	11.8
2006	18.0	14.0	10.9	12.8	8.7	20.9	14.2
2007	19.3	8.6	9.1	8.8	9.0	20.1	12.5
2008	21.1	13.2	14.5	12.0	12.1	23.1	16.0
2009	21.1	19.1	21.7	16.6	17.2	23.4	19.9
2010	26.8	26.4	21.6	23.2	15.9	29.5	23.9
2011	25.0	21.2	17.9	19.0	13.9	27.3	20.7
2012	30.6	27.5	23.1	24.9	18.4	33.6	26.4
2013	35.6	25.5	20.3	24.9	18.3	37.2	27.0
2014	40.1	28.5	22.9	28.1	21.2	41.9	30.5
2015	42.1	28.9	24.3	28.7	22.8	44.3	31.9
2016	45.2	31.7	28.6	31.4	26.7	47.4	35.2
2017	45.4	33.6	31.9	32.3	28.6	47.7	36.6
2018	42.3	27.3	27.3	27.1	25.8	44.4	32.4
2019	35.3	15.6	20.1	17.2	21.8	36.6	24.4
2020	44.9	51.2	54.8	46.3	45.2	49.0	48.6
2021- Optimistic	39.9	40.7	45.9	37.6	39.5	43.5	41.2
Average 1990-2019	25.8	21.9	17.8	21.1	15.7	27.2	21.6
Average 1990-2020	26.4	22.9	19.0	21.9	16.7	27.9	22.5

Source: DEACI's own calculations (Lejuez & Schneider, 2021)

Annex Table 2. Estimated shadow economy as percentage of GDP for Aruba from 1990 to 2020, with Optimistic scenario for 2021. Equations 1.2 to 6.2. With lagged endogenous variable.

Year	Equation 1.2 SE % to GDP	Equation 2.2 SE % to GDP	Equation 3.2 SE % to GDP	Equation 4.2 SE % to GDP	Equation 5.2 SE % to GDP	Equation 6.2 SE % to GDP	Average
1990							
1991	22.7	24.5	19.4	24.7	20.6	21.3	22.2
1992	20.0	22.1	18.5	21.6	18.1	18.9	19.9
1993	16.9	19.1	16.8	18.4	16.3	16.3	17.3
1994	13.9	14.9	12.2	14.3	11.8	13.5	13.4
1995	15.9	18.4	14.9	16.4	12.6	15.9	15.7
1996	15.8	18.0	15.1	16.1	12.9	15.7	15.6
1997	13.7	15.7	12.1	13.9	10.0	13.8	13.2
1998	13.6	15.3	11.3	13.1	8.7	14.0	12.7
1999	16.3	18.0	12.8	15.6	10.5	16.9	15.0
2000	15.1	15.0	9.9	13.0	7.9	15.8	12.8
2001	11.3	12.8	7.6	10.0	4.5	12.3	9.8
2002	12.7	12.8	7.7	10.6	5.2	13.5	10.4
2003	14.0	14.2	9.6	11.7	7.0	15.1	11.9
2004	11.6	9.7	6.2	7.8	4.1	12.5	8.7
2005	12.0	10.6	7.3	8.4	4.9	13.1	9.4
2006	13.8	12.4	9.6	9.9	6.8	15.1	11.3
2007	14.4	5.7	7.3	6.3	7.7	14.3	9.3
2008	16.2	10.2	12.6	8.6	9.8	16.9	12.4
2009	16.6	15.3	18.9	12.0	13.5	17.7	15.7
2010	21.0	21.1	19.6	16.7	13.1	22.3	19.0
2011	19.4	16.8	16.0	13.7	11.5	20.3	16.3
2012	23.5	22.0	20.3	18.1	14.9	24.7	20.6
2013	26.5	19.1	17.0	18.0	15.5	26.6	20.5
2014	29.6	21.3	18.9	20.4	17.8	29.7	23.0
2015	30.9	21.8	19.8	20.9	18.9	31.1	23.9
2016	33.2	23.8	23.2	22.8	21.9	33.3	26.4
2017	33.6	25.1	26.4	23.2	23.3	34.0	27.6
2018	31.0	20.3	22.0	19.7	21.0	31.2	24.2
2019	25.4	10.8	15.0	12.7	17.6	25.0	17.8
2020	34.4	41.2	45.8	33.4	34.5	36.1	37.6
2021 Optimistic	30.3	32.9	37.8	27.5	30.1	31.7	31.7
Average 1991-2019	19.3	16.8	14.8	15.1	12.7	19.7	16.4
Average 1991-2020	19.8	17.6	15.8	15.7	13.4	20.2	17.1

Source: DEACI's own calculations (Lejuez & Schneider, 2021)

Annex Table 3. Estimation Results of the Currency Demand Function for Aruba over 1990 to 2020; yearly data.

Independent Variables		Equation 5.1	Equation 6.1
Private consumption per capita (<i>prconspc</i>)	Coef.	0.8036***	0.6816***
	Beta	[0.8972]	[0.7640]
	t	30.60	11.51
	p	(0.000)	(0.000)
Unemployment rate (<i>ur</i>)	Coef.	0.145***	0.1379**
	Beta	[0.0949]	[0.0860]
	t	3.07	2.78
	p	(0.005)	(0.010)
Proportion public employment in total employment (<i>ppubemp</i>)	Coef.	-0.1915***	-0.3338***
	Beta	[-0.1201]	[-0.2105]
	t	-3.11	-8.05
	p	(0.005)	(0.000)
Total tax revenue to GDP (<i>tottaxogdp</i>)	Coef.	0.3485***	
	Beta	[0.1279]	
	t	3.11	
	p	(0.005)	
Direct tax revenue per Capita (<i>dirtaxpc</i>)	Coef.		0.2308**
	Beta		[0.1738]
	t		2.58
	p		(0.016)
Annual growth rate tourism (<i>angrtourism</i>)	Coef.		-0.0023***
	Beta		[-0.1139]
	t		-3.17
	p		(0.004)
Dummy variable Tourism (<i>dytour</i>)	Coef.	-0.0406*	
	Beta	[-0.0608]	
	t	-1.99	
	p	(0.057)	
Constant	Coef.	4.0775***	5.5704***
	t	9.55	33.69
	p	(0.000)	(0.000)
D.W-Stat		1.950	1.9774
R-squared		0.983	0.982
F-test		(5, 25) 282.85	(5, 25) 268.74
Prob>F		(0.0000)	(0.0000)
(df)		30	30

p values are in parentheses, **p* < 0.1, ***p* < 0.05, ****p* < 0.01.

Source: DEACI's own calculations (Lejuez & Schneider, 2021)

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