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# Definitions and Estimation Models of Shadow Economy: A Systematic Literature Review

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ABSTRACT

This study is an attempt to understand the divergence between different definitional approaches and measuring methods to estimate the shadow economy through extensive review of literature. The misunderstandings in the definition of shadow economy are underpinned in the contradictory views of researchers belonging to different academic backgrounds. Although reconciliation attempts were made to mitigate the difference between these conflicting definitional approaches but there is still non-availability of common ground. This variation in definitional approaches has resulted in researchers taking different routes for estimating the size of shadow economy. Literature identifies three approaches taken by researchers to measure the informal sector i.e. direct, indirect and model approach. After an extensive evaluation, the current study identifies many advantages and disadvantages for each of the methods. The direct approach is highly useful when a specific sector and specific time-period is into play but fails to deliver when estimating the size of an aggregated shadow economy. The indirect approach is often criticized for taking only one factor into account while calculating the black economy but also praised for its simplicity. The model approach considers multiple cause and indicating variable for the estimation of shadow economy, but these models tend to be unstable and overly complicated. The current study suggests there are broken links between the theory and estimation techniques of informal economy which needs to be addressed for true estimation of shadow economy.

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## INTRODUCTION

Measuring the size of the black economy has intrigued many researchers throughout the globe. Many researchers claimed to have built a robust model that has contributed towards true functioning and estimation of the informal sector, but only a few were able to get close to its actual value. This makes its estimation attempt highly interesting and difficult to realize. The ambiguity in the estimation of the black market lies in the difficulty of defining it. The authors of the first ILO mission labelled the shadow economy as a "*giraffe*"; hard to define as per the standard measures but straightforward to identify. Lautier (1990) however took a much harder stance by terming it as a "*unicorn*"; its abundant definitions are available in literature but none of the definitions comprehend its dynamic estimation. As per the author, the true definition of the informal sector is hard to manufacture. These technical disagreements on the metaphors used by different authors provide an insight into how complicated the argument on defining the various shades of informality is. The main objective of the study is to conduct a thorough review of literature to find the gap between the different definitional approaches and methods to measure the black economy. The first section concentrates on the various definitional approaches of shadow economy taken up by researchers. The second section delves deep into estimation methods of informal sector.

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## Different Definitional Approaches

The misunderstandings in the definition of shadow economy are underpinned in the divergent views of researchers belonging to different academic backgrounds. The economists term informality as "shadow, underground, unofficial, black or hidden economy" whereas statisticians name the concept as "*non-observed economy*" or "*underground production*". When it comes to labor economics, informality diversifies and takes the shape of "*informal sector*" or "*informal productive activities*".

Although reconciliation attempts were made to mitigate the difference between these conflicting definitional approaches but there is still non-availability of common ground (e.g., Dell'Anno, 2016). The segment of literature that considers the economic perspective of informality; Feige (2016) encourages informality to be submerged with non-compliance. He suggests that both "*non-compliant behavior*" and "*unobservability*" are underlying characteristics of "*unobserved economies*". In accordance with the non-compliance, the difference between the "*unobserved economies*" root from a specific set of rules being violated. On the other hand, "*unreported economy*" takes a major shape through tax evasion when non complaint behavior occurs due to major shift in the fiscal policy. Furthermore, "*unrecorded economy*" is boosted from the violation of national income accounting rules. "*Illegal economy*" takes hold when there are violations of laws governing the consumption and production of banned goods and services, for example non licensed weapons and prostitution. In terms of labor economics, informal economy is explained through regulations on the labor market such as disability benefits, minimum wages, unemployment and working conditions.

While there is extensive literature available on the black economy, this study is concerned at highlighting the misunderstandings rooting from different definitional approaches of informality.One of the sources of misinterpretation stems from different meanings of informal economy. Some studies estimate shadow economy as "informal value added", while others measure its size in terms of "involved production units". According to the 15th International Conference of Labor Statistics, the informal sector is defined as "units engaged in the production of goods and services with the primary objective of generating employment and incomes for the persons concerned. These units typically operate at a low level of organization, with a little or no division between labor and capital as factors of production and on a small scale" (ILO, 1993). This definition is in contradiction to the concept of informal sector employment which accounts for at least 70 percent of employment in the developing countries of the world (ILO, 2015). Practically informal sector and informal employment pose two different concepts. The first relies merely on the production units and the latter is dependent upon job characteristics. This makes the design of informality much more complex; for instance, informal employment can be generated in the formal economy and formal employment in the informal sector.

**Table 1**

Segregation of the employment in informal economy, informal employment and informal sector in the Systems of National Accounts

| | Institutional sectors | Sub sectors | Jobs | |
|---|---|---|---|---|
| | | | Formal | Informal |
| Enterprise/Economic units/institutional sectors | General Government/Non- Financial Corprations/Financial corporations/Non-Profit institutions serving households | | 1 | 2 |
| | Household: Unincorporated enterprise | Formal | 3 | 4 |
| | | Informal sector | 5 | 6 |
| | Household: Others | Paid domestic workers | - | 7 |
| | | Production of goods for own final use | 8 | 9 |
| Employment in the informal sector = 5+6=11 | | | | |
| Informal employment= 2+4+6+7+9=28 | | | | |
| Employment in the informal economy = (5+6)+(2+4+7+9)=33 | | | | |

Source: (Charmes, 2016)

Table 1 shows that according to Charmes (2016), sectors associated with informality and informal employment are not mutually exclusive parts of the labor force. Furthermore, Systems of National Accounts identifies that informal economic activities and employment are scattered in multiple institutional sectors. Lastly, both the informal employment and informal sector have their share of contribution in the shadow economy.

The second source that elevates concern is the difference in the definition provided by the ILO and national account standards. The main cause of misunderstanding is the treatment related to the illegal activities. The definition provided by the ILO does not demand the coverage of illegal activities for estimating the informal sector, whereas European System of Accounts, ESA (2010) and OECD (2002) includes some of illegal economic activities to define the informal economy. The former explains the shadow economy as all the legal and illegal economic activities that are not included in the official estimates of the GDP. Illegal economic activities are explained as such activities that are under the production realm of national accounts i.e. where the parties associated with the illegal activity are

of reasonably sound mind and are willing partners. Illegal activities include gambling, smuggling, drug dealing and trading in stolen goods etc.

The third point of concern is how scholars treat tax evasion for the purpose of estimating informal economy. Literature related to economics studies often includes tax evasion when explaining the phenomenon related to shadow economy. According to Shneider (2005), black economy relates to every legal market-based activity that is concealed from public authorities with deliberation. This concealment relates to avoidance of income payments, various forms of taxes, meeting certain standards of labor market and compliance with different administrative procedures. This "economic" definition may conflict with both the definitions provided by the ILO and the one provided by the National Systems Accounts.

## Estimation Methods to Measure the Size of the Shadow Economy

Different definitional approaches of the informal sector result in choosing different methods to measure and estimate its size. The estimation of the black economy is complicated. Economic and transactional activities taken up by individuals and hidden from the public authorities is the main cause of this complication. However, policy makers and researchers have devised different mechanisms to measure the informal sector. This section of the study provides a critique of different techniques employed to estimate informality in the economic activity alongside its estimation methods.

### Direct Methods

Direct methods are largely thought of as microeconomic side approach to measure informality. Surveys and tax auditing are the two main distinguishing methods used. The researchers are hesitant in using such methods as these methods have proven costly and time consuming. Moreover, estimated results are often subject to biasness because of an inherited flaw associated with the sample surveys. The sample surveys are often dented by the respondent's noncooperation and non-seriousness. The micro level data obtained from the tax audits as well as surveys are subject to exploitation at the hands of the respondents. Furthermore, tax audits are non- random in nature, resulting in biasness of the results.

The studies associated with direct methods are limited and are often shaped as intensive but small surveys. Their studies cover a specific vicinity (Collin C. William, 2006; Lemieux et al.,1994 and Williams and Windebank, 2001). Collin C. William (2006) was the first study conducted in the United Kingdom at the national level. The study investigated the enterprise perception on informality. The results suggested eight percent activities associated with shadow economy as perceived by different businesses. There was also an emphasis laid on high variations in the size of the informality in different areas, sectors, and types of economic activities.

As far as the method associated with tax audit is concerned, the United States Internal Revenue Service conducted elaborated audits from 1965 to 1988 in the country. For this purpose, a stratified random sample on a cyclical basis of 3 years was considered. The sample size of the study was 50000 personal tax returns. These audits paved the way for the estimation of taxpayer's true income leading the Internal Revenue Service to find the original tax gap prevailing in the United States Economy. According to OECD (2022), there are few countries in the world that have such a systematic and sophisticated audit.

Delivering results for a specialized sector or a specific region is a disadvantage of using direct methods. Potential bias in selecting the sample size from an entire population also creates misleading results. Furthermore, the taxpayer selection for audit purposes is not random and cannot be termed as a true representation of the total population. Additionally, estimates of tax audit reflect those informal economic activities that are successfully intercepted by public authorities. This reflects just a meagre portion of the actual shadow economy. Both direct methods have an inbuilt flaw as they do not estimate all of activities associated with the black economy. Microdata methods may underreport the size of the informal sector. Achim and Borlea (2020) highlighted that this happens because most individuals do not declare those revenue streams and assets that they want to hide from public authorities. The expensive nature of long-term estimation of black economy makes it difficult for researchers to evaluate the magnitude of informal sector in the long run.

### Indirect Methods

Indirect methods are associated with macroeconomic approaches to measure the size of the shadow economy. Literature on informal sector includes fiscal, energy consumption, labor market and monetary approaches as indirect methods to estimate the informal sector.

#### *Fiscal Approach*

Fiscal approach is built on the fact that if individuals conceal their revenue streams but cannot conceal their expenditure; then the discrepancy between their income and expenditure is the size of the informal economy (Yoo & Hyun, 1998; Smith 1994; Dell Boca & Forte, 1982). According to OECD (2002), for most of the national accounts, data is available for estimates of income and expenditure. This is beneficial for finding this discrepancy. The researchers using this approach propagate that if an individual has concealed part of his income and revenue streams from the authorities for the sole purpose of tax evasion; then the expenditure side will be including that part of hidden income as well. Hence, the gap between income of tax evaders and their expenditure might lead to a close estimate of informal sector.

There can be many causes of this discrepancy other than tax evasion. This can include statistical mistakes. Furthermore, illegal, or immoral estimates such as gambling, prostitution or even the use of narcotics are mostly cash based economic activities and might be omitted from the estimates of national accounts expenditure. Hence, a major limitation of the fiscal approach is that it can only estimate that part of the informal sector which is interacting with official and legal records. The other part of shadow economy is ignored by this approach (Bashlakova & Bashlakov, 2020).

#### *Labor Market approach*

Three types of labor market approaches were identified in the literature to estimate the size of the shadow economy.

First, the gap between the official labor force and the actual one; second, the labor demand vs labor supply and the third; the rate of employment approach.

*The Gap Between the Official Labor Force and the Actual One*

This type of approach runs on the assumption that decreasing labor force participation in the official sector is assumed fixed and a declining formal rate of labor force participation is an indication that there is a rise in informality. Notable studies include, Contini (1981) for Italy and Del Boca (1981) for the US. According to Schneider and Buehn (2018), the variations in the labor force participation might have other reasons, for example recession. Further, a possibility may arise when individuals can be working in both the official and unofficial sectors. For instance, sectors associated with informality and informal employment are not mutually exclusive parts of the labor force.

*Labor Demand vs Labor Supply*

According to OECD (2002), this approach is referred to as estimation of non-observed economy. The basis of this approach is that the wages calculated from the employer's perspective are compared with the employee's perspective. There is some allowance given to the theoretical differences. According to OECD (2002), a thorough analysis of gaps between measurement of wages from the employers and employee's end is indicative of economic activities that are missing from organizational data. The labor input surplus for employees ends as compared to the organizational side shows contribution towards informality. OECD (2002) termed this approach to be effective to such an extent that it is adopted by the European commission to analyze labor input mechanisms.

*The Rate of Employment Approach*

It is a survey-based method adopted by Italian Statistical service. ISTAT conducted surveys related to the cost of labor. The focus of these organized sample surveys were the Italian households. The objective of such surveys was to collect information related to the hours worked by individuals in a particular field or sector. The information obtained was then expanded to the entire Italian population through extrapolation. Thereafter, extrapolated data was converted to average hours worked by an individual (Bashlakova & Bashlakov, 2020).

The approach has been subjected to major criticism. Firstly, many respondents have knowledge of the official working hours and informal working hours. This leads to high distortion in answers. Secondly, for different regions, the intensity of labor in black economy and structure of informal and formal activities is different, leading to biased conclusions for highlighting the quantitative as well as qualitative parameters of informality.

***Monetary Methods***

Cash transactions play a major part in the size of the shadow economy as it leaves few traces for public authorities. Consequently, an increase in the demand for cash over a desired threshold is indicative of a greater informal sector. For monetary methods, literature shows two approaches: first, the transaction method and second, the currency demand method.

*The Transaction Method*

This approach was developed by Feige (1979). It derives its basis from the fisher equation with an assumption that linkage between the transaction volume and recorded GNP is fixed. This means that the total amount of money multiplied by money velocity is equal to the number of transactions multiplied by the transaction price.

The equation is given by as follows:

$M^*V=p^*T$

Where M is the stock of money, V is the money velocity, P is the transaction price and T is the total number of transactions. This approach also assumes that aggregated flow of money and summated value added have a constant relationship i.e. $P^*T=k^*Y_{summed}$, where $Y_{summed}$= Official and informal economic activity for consequent years. As per the equation, valued-added approximates are known, the amount of money is a measurable entity and velocity of money can easily be estimated. Hence, if the informal sector size is identified with respect to official sector in the base year; the black economy as a percentage of GDP can be estimated for all consequent years (Fiege 1996). Fiege (1979) employed this approach to calculate the size of the informal sector in the United States of America. He estimated that the country's black economy is 27 percent of the GDP in 1979 by taking the base year of 1939.

This approach is subject to manifold assumptions. The assumption of black economy to be zero in the base year and the assumption of fixed transactions with respect to Gross Domestic product seems a stretch. Transactions not associated with revenue generation might be included in estimation of shadow economy while using the transaction approach (Blades, 1982). These money transactions include dollar deposits and repurchase agreements etc.

Moreover, the rise in facilities associated with credit and debit cards and cheques might pose a challenge for such a method. Furthermore, people store their wealth in large denomination bills which do not circulate in the economy and are hidden. The measurement of the size of shadow economy through this research requires rigorous empirical analysis and data, resulting in dubious results. Boeschoten and Fase (1984) came up with another criticism on transaction approach. He argued that US dollar bills are considered a dominant currency throughout the world and are circulated either as an official currency or as an alternative to local currency. Hence, there is no point in linking dollars that are in circulation to domestic economic activity in the United States.

When applied to the data for Netherlands, this approach gave spurious results. For addressing this problem, Boeschoten and Fase (1984) worked on modifying this method, by formulating a new base approach and created its multiple variants. There was a certain problem with these variants, as according to OECD (2002) each variant produced variable results.

*Currency Demand Approach*

Cagan (1958) was the first to come up with the empirically tested notion that linkage between demand for currency and tax pressure expands black economy. He tested this hypothesis on United States from 1919 to 1955. Then it

was adopted by Gutman (1977) to examine the relationship between the currency in circulation and demand deposits for the period starting from 1937 to 1976. Tanzi (1983) adopted Cagan's approach and further developed it into an econometric estimate for currency demand function, ending up in calculating US 's informal sector size. He assumed that informal transactions are settled through cash payments for the sole purpose of leaving few or no trace for public authorities. He suggested that a rise in the black economy is the result of higher demand for currency. The equation for regression analysis as suggested by Tanzi (1983) is as follows:

$$\text{Ln}\, C/M2_t = \beta_0 + \beta_1 \ln(1+Tw)_t + \beta_2 \ln\left(\frac{WS}{Y}\right)_t + \beta_3 \ln R_t + \beta_4 \ln\left(\frac{y}{n}\right)_t + u_t$$

Where as $\beta_1, \beta_2, \beta_3, \beta_4 > 0$

The equation is taken in logarithmic form. $C/M2$ is the ratio of cash held with respect to the demand deposits. TW is the average rate of tax. WS/Y is the ratio of wages with respect to national income. R is the interest that is paid on saving accounts. Y/N is the income per population. Any rise in the demand for currency is attributed towards higher tax regulations causing people to end up working in the informal sector. The magnitude of the shadow economy can be measured by taking the tax regulation at its highest and actual value. Assuming that velocity of money is the same for informal and formal sectors, the size of the black economy can be estimated.

The critics of this approach propagate that not every cash transaction that takes place is part of the informal sector (Takala et al, 2010). Tax burden cannot be termed as the only factor assessing the magnitude of the informal sector. There are other factors as well such as government regulations, efficiency of law enforcement, tax morale and attitude of the taxpayers. These factors have not been considered because of the non-availability of data for many countries (Schneider and Buehn, 2018). Furthermore, the money velocity is the same for both the informal and formal sectors only when there is similar income elasticity (Ahumada et al, 2009).

The monetary approach might prove to be unsuitable for unofficial economy's estimation because the basis of assumptions for this method is unjustifiable. The prime assumption of this approach is that the variations in the magnitude of the unofficial sector caused by a certain change is tax hikes and stricter regulation is visible through changes in currency demand. According to currency demand method, this happens because mostly all transactions that occur in the informal sector are mainly through cash. This hypothesis cannot be tested and does not hold true (OECD, 2002). Contrary to the currency demand approach, the transaction method does not assume any linkage between the monetary variables and GDP. This is unjustifiable as well. The main criticism received for transaction method is hypersensitivity of the outcomes when it comes to assumptions of base year. Most of the assumptions taken up by the method are unrealistic. Henceforth, the outcomes obtained through these assumptions become dubious.

### *Energy Consumption approach*

The energy consumption approach, also known as the physical input approach, takes its roots from electricity consumption when estimating the size of the informal sector. There are two distinctive methods used in literature. The first is Kaliberda and Kaufmann approach and the second is the Lacko approach. The Kaliberda and Kaufmann method employs aggregated energy consumption for all the economy to measure the informal sector size. On the contrary, the Lacko method only uses residential energy consumption to estimate the size of the black market.

#### *Kaliberda and Kaufmann Method*

Lizerri (1979) and Del Boca and Forter (1982) were the first to employ this approach. In the later years Johnson et al, (1998), Kaliberda and Kaufmann (1996) and Portes (1996) used this method with some alterations. To this date, the work of Kaliberda and Kaufmann for the energy consumption approach is considered as landmark in literature. This method assumes that the consumption of electricity is the best indicator to estimate the size of the informal and formal sector. The key role in employing this approach is that the elasticity of electricity consumption to GDP is approximately unit elastic. This propagates that the variable of aggregated energy consumption can prove to be a good measure for the overall aggregated economic growth (formal and informal). When we get the overall economic growth by following the electricity consumption approach, we subtract the official estimates of GDP from it. This gives us the estimates of the size of the informal sector. It is to be noted that literature terms the assumption of unit elasticity to be unrealistic. This approach seems an easy-to-use theoretical framework but criticism regarding this approach has been recorded in literature.

First, not all economic activities associated with the informal economic activity consume electricity; and for those economic activities that have a requirement of energy consumption, there are alternate resources available for example oil and gas (Shneider and Buehn, 2018). Second, the indicator of energy consumption has been modified in recent years. This mediation has led to the energy consumption indicator not being viable to measure the actual economic activity. Third, the constancy of elasticity is considered unrealistic in literature. Fourth, the output of certain economic sectors like agriculture, electricity consumption and GDP relationship might prove unstable since output in agriculture sector is highly dependent on climatic conditions (OECD, 2002). Lastly, according to OECD (2002), in low income and developing regions, electricity is not a prime source of production.

#### *Lacko Approach*

This approach takes into consideration the residential consumption of electricity to estimate the size of the informal sector. The method assumes that over the years, consumption of energy is constant. Lacko (1996) was the first to suggest that electricity consumption by residents has a strong linkage with the unofficial sector size. According to Lacko (1996), a higher degree of household informal activity suggests a rising value of overall unofficial sector. Electricity consumption approaches were subject to criticism as well. For Kaliberda and Kaufmann method, it is an open fact that not all economic activities need electricity consumption; other sources of energy can also be employed such as (coal, renewable energy etc.). For the Lacko method, it is

pertinent to note that not all informality is associated with the household sector. Furthermore, the base value used for informal sector for different country might prove doubtful.

The physical input approach is appalled for its simplicity and appeal for the measurement of informal sector. However, it has been criticized mainly for two reasons. The method has an inbuild requirement to estimate different electricity elasticities with respect to economic growth across countries for a provided period. The variations with respect to elasticities do happen and there are many other factors causing these variations rather than the informal economic activities of households and investment sector alone. Furthermore, both the methods are heavily reliant on broader definition of informal economy as physical input approach considers all legal and illegal activities requiring electricity consumption.

The current study identified different variants of the physical input approach used to mitigate the shortcomings of previously used methods. Two different methods were used by. Psychoyios, D, et al. (2021). The first approach was mainly reliant on simple electricity consumption methods. While the second one created a variant of the simple method incorporating the fact that sensitivity of electricity consumption might be caused by factors other than economic factors. The authors also suggested that instead of using growth in the consumption of electricity, the total energy consumption (aggregating all form of energy consumption) might prove more fruitful in estimating the size of the black economy. This opinion might help in adjusting for many shortcomings of the previous approaches.

### *The Model Approach*

Previous indirect methods model the shadow economy by considering only a small number of variables. Most of the studies associated with estimating the size of black economy consider only one indicator. Any information regarding previous theoretical frameworks and variables is either ignored or omitted. To address these issues, Frey and Weck (1983) proposed the use of a latent variable while employing multiple explanatory variables. On one end, informality in the economic activity is measured based on multiple variables affecting its magnitude, while trace variables resulting from the phenomenon is taken on the other. This approach use Linear Structural Relations-LISREL model as a basis of its technique, enabling a cross-sectional examination of the linkage between a dependent and one or more predictor variables.

The outcome of this method gives us the size of the non-observed variable in relativity for each country in question for a specific period. Frey and Wick (1983) propagated that informal sector size can be elaborated by variables such as tax burden, regulation control, rate of unemployment, income per capita, tax morale and tax burden perceptions. The predictor or tracer variables for shadow economy included by Frey and Weck (1983), included GNP growth rate, total amount of hours worked in a week and male labor force participation. The study calculated the informal sector size for many countries and then compared it with the official sizes by employing currency demand approach. They took Norway and Sweden as benchmarks.

The model was subject to serious criticism in the literature. Helberger and Knepel (1988) termed the outcomes of the study as highly unstable by showing that a small change in the countries result in variable results. They argued that the model's utility is severely compromised due to the ambiguity of used data. The study criticized the theoretical framework behind the use of explanatory and causing variable of the shadow economy. This latent variable model was employed and modified in several studies to aid in the explanation of black economy with the help of multiple variables. Notable studies include Shneider (2019), Shneider and Buehn (2018), Shneider and Enste (2007), and Medina and Shneider (2018).

The latent variable model proposed by Medina and Shneider (2018) is structured with the following steps:

- Modelling the informal sector as an unobserved variable.
- Explanation of the linkage between the latent variable and its causation in a structural equation given by

$$SE = LX + €$$

- Representing the relationship between the latent variable and its indicating variable in a model of measurement.

$$Y=ASE + \varepsilon$$

Where SE stands for shadow economy, X represents predictor variables and Y represents indicator variables.

Medina and Shneider (2018) are reliant on the following drivers for estimating informal economy. They are tax burden, trade openness, institutional quality, and unemployment. According to Elgin and Erturk (2019), different studies have employed different causing and indicating variables to estimate the size of shadow economy. The standardized version of MIMIC has been employed by several studies in recent times for example see (Shneider et al, 2015; Dell Ano and Schneider, 2009; William and Shneider, 2013). Like all the models of shadow economy MIMIC has also been subject to criticism. Studies associated with this model approach have used per capita GDP as cause variable and GDP per capita growth as indicator variable. While addressing this problem Medina and Shneider (2018) used the night light approach developed by Henderson et al (2012) for an independent estimate of economic activity. This method has its own shortcomings, for example, the agrarian areas of the country might not be completely dependent on lights.

The use of MIMIC model itself for the estimation of shadow economy was subject to major criticism. Feige (2016) and Breusch (2005) criticized the use of the variables and definitional approach to explain informal sector by Shneider. Feige (2016) propagated that use of MIMIC model to estimate the black economy as a latent variable only implies to measure the non-observed economy and does not actually measure it. Even with the drawn criticisms, the model approach by far remains the most effective method to measure the size of the shadow economy and can be termed as the starting point to quantify NOE (Non-observed Economy).

## CONCLUSION

After a thorough analysis of the literature, it can be concluded that there is no universal definition for the informal sector. Different definitional approaches are taken up by different scholars belonging to different academic fields. This variation in definitional approaches has resulted in researchers taking different routes for estimating the size of shadow economy. There are broken links between the theory and estimation techniques of informal economy which needs to be addressed for true estimation of shadow economy. Literature identifies three approaches taken by researchers to measure the informal sector. After an extensive evaluation, the current study identifies many advantages and disadvantages for each of the methods. The direct approach is highly useful when estimating informality for a specific sector but fails to deliver to measure the size of the whole informal sector. It proves to be a costly method as well. The indirect approach is criticized for taking only one factor into account while calculating the black economy. Furthermore, some methods involving the indirect approach (monetary methods) are subject to simple but unjustifiable assumptions. The model approach addresses the issue of considering one explanatory variable to estimate shadow economy. It considers different variable for the estimation of shadow economy, but these models tend to be unstable and overly complicated.

## Conflict of Interests

The authors has declared that no competing interests exist.

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