

Short-run and Long-run Effects of Financial Intermediation on Economic Growth

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Financial intermediation in Iran's banking system is negatively affected at least in two ways. First, there are many similarities between financial intermediation and usurious activities in the common interpretation of interest-free banking law. This encourages the banks to participate in various commercial activities. Second, the price setting policies of the central bank makes investment more attractive compared to financial intermediation. In this research, the ratio of interest margin to gross income is selected as an index of financial intermediation and its importance in increasing the short-run and long-run economic growth is investigated using a dynamic linear regression model. Annual data is used and the sample includes 2005 to 2015. Using a methodology similar to Leamer (1983), a large set of control variables is chosen. The main statistical hypothesis is that financial intermediation has negative effect on economic growth. The results show that the rate of rejection of this hypothesis increases as we move from short-run to long-run regressions. In other words, the positive effect of financial intermediation on growth is a long-run phenomenon.

Keywords: Interest Margin, Indicators of Bank Soundness, Interest-Free Banking Law, Leamer's Methodology

JEL Classification: C52, E58, G21

1 Introduction

Securities, credit and debt markets have specific functions in allocating the financial resources to real economic activities. There are controversial debates on these markets' informational and operational efficiency (for example, see Boyd and Prescott (1986), Bhide (1993), Stiglitz (1985), Allen & Gale (2000)). In general, the borrower has less credit in the credit market in comparison with the bond market and therefore, more rigorous regulation is needed to guarantee the contract enforcement (for example about granting the bail, transparency, type of activity etc.). The government and large corporations have significant contributions in bond market. On the other hand,

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in credit market, the provider of the funds faces constant rates so they take lower risk.

In Iran's economy, the credit market is the most developed among other financial markets, such that the economy is considered as a bank-based economy. However, financial intermediation in Iran's economy has some particular characteristics. It is negatively affected at least in two ways. First, there are many similarities between intermediation of banks and usurious activities in the common interpretation of Interest-Free Banking Law. This encourages the banks to participate in various commercial activities. Second, the price setting policies of the central bank discourages financial intermediation.

Instructions for Investment in Securities¹ and Connected People's Credit and Commitment Regulations² show that the central bank knows the importance of financial intermediation in macroeconomy. One of its direct limitations is that the sum of the investments of credit institution should not exceed 20% of the capital base of the credit institution. Also investment of the credit institution in each legal person should not exceed 5% of the institution's capital base. The net sum of granted credit and commitments to related people should not exceed 40% of the capital base or the net sum of granted facilities and commitments to related person should not exceed 3% of the capital base.

Financial intermediation and its importance in the economy is a classic subject in the corresponding literature. Bagehot (1873) seems to be the first scholar that has pointed out financial intermediation importance. Bagehot presented a clear example about how the development process of monetary market in England led to formation of capital flow among different regions of country and argued that financial intermediation provides suitable conditions for this flow and causes it to start searching the highest return rate. Completing Bagehot's analyses of important role of financial intermediation in economic development flow, Schumpeter (1911) argued that good banks can cause an innovation in technology by identifying the employers and supplying the financial sources for them, who have the greatest chance in producing the new products and performing the innovative plans. In more recent literature, some economists such as Mckinnon (1973) and Shaw (1973) describe the effects of financial sector development on economical growth from two viewpoints of supply and demand.

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In this research, we investigate the importance of financial intermediation using a statistical method. A dynamic linear regression is estimated. The most important challenge is how to quantify the economic variable. For this purpose, we use the ratio of interest margin to gross income, which is reported in the International Monetary Fund as financial soundness indicator. After controlling for the various factors of macroeconomics and soundness of banking system, we investigate the effect of the financial intermediation index of the current period on the economic growth of the next period. The number of control variables is relatively large and we use Leamer (1983) methodology to deal with the model's uncertainty.

Section 2 presents a background on the literature. The data and econometric model along with the statistical results are presented in section 3. Section 4 represents the conclusions.

2 Background of the Research

Economists have always paid attention to the factors of the growth and designed several growth patterns. For more than two centuries, classic economists introduced material and tangible capital as a stimulus for economic development; Solow (1956) and Swan's (1956) new classic growth pattern emphasizes on factors such as work force, physical assets and initial level of per capita income as determinants of economic development. Following theoretical and empirical studies show that only physical assets and work force cannot justify the difference of countries' economic growth.

However, there are a wide range of variables including natural resources, quality of institutions, human capital, geographic conditions, performance of governments, and several other factors, which have affected economic growth of countries during different periods. Sala-i-Martin, X. et al. (2004) have identified more than 145 variables, based on empirical and theoretical literature of growth in different economic areas, which can affect economic growth. Table 1 presents a summary of the most recent studies regarding output growth.

Table 1
A Summary of Literature on Output Growth

Type of study	Researcher	country	Year	Main results
	Quan & Williams (2016)	78 countries	1982-2011	Investigating how the financial development affects the institutions' policies, it evaluates the effect of democracy, which is dominant on financial development 4, on the economic growth. Using the panel and considering the indicators called financial development 5, it evaluates the effect of financial development on economic growth as a positive and meaningful effect. Finally, it concludes that democracy cannot raise the factors of financial development and economical growth; in emerging economies, with relatively weak institutions, this finding is consistent with their democracy situation which is affected by political elite and particular beneficiaries.
	Law, et. al. (2014)	87 countries	1980-2010	In investigation of the relationship between financial development and economic growth, It evaluates the effect of three indicators of financial development 7 on economic growth as a positive and meaningful effect by using the panel data.
Human capital	Zirk, et. al. (2016)	14 countries	1999-2011	In investigation of Islamic banking and economic growth it uses panel data to show a positive and meaningful relationship between human capital and economic growth.
Inflation	Zirk, et. al. (2016)	14 countries	1999-2011	In investigation of Islamic banking and economic growth, it uses panel data to show a negative and meaningful relationship between inflation and economic growth.
	Jood Eggoh, et. al. (2014)	102 countries	1960-2009	Using the panel data, it introduces a meaningful and negative relationship between inflation and economic growth and argues about two aspects in the relationship of inflation and growth: 1. It introduces several global thresholds of inflation based on various levels of income. 2. It recognizes

Type of study	Researcher	country	Year	Main results
				the indirect channels, relationship between inflation and economic growth.
	Lopez (2011)	42 countries	2005-2010	It investigates the effect of threshold of inflation on the economic growth and shows that this effect is negative and meaningful.
	Low, et. al. (2014)	87 countries	1980-2010	In investigation of the relationship between financial development and economic growth, it evaluates the effect of inflation on economic growth; a negative and meaningful effect by using panel data.
	Kemer, et. al. (2013)	124 countries	1955-2004	In investigation of the relationship between inflation and economic growth and estimation of thresholds of inflation in long-run economic growth for industrial and non-industrial countries, it evaluates the effect of inflation on the economic growth for industrial and non-industrial countries and finds a negative and meaningful effect.
Bank-based	Kojo Menyah, et.al. (2014)	21 African countries	1965-2008	Using panel Granger method in investigating the effect of trade liberalization on the economic growth, it evaluates the effect of banks' focus on the economic growth as a positive and meaningful one.
	Amit Ghosh (2016)	138 countries	1995-2013	Considering the index of ratio of bank assets to GDP using panel data method, it evaluates bank-based economy and shows that this index has a positive and meaningful relationship with economic growth.
	Wu, et. al. (2010)	35 countries	1996-2003	Using panel data method, it shows that the presence of foreign banks as liberalization of the bank sector has a negligible and negative effect on the economic growth.
	Zirk, et. al. (2016)	14 countries	1999-2011	In investigation of Islamic banking and economic growth, it uses panel data method and shows a positive and meaningful relationship between

Type of study	Researcher	country	Year	Main results
				economic growth and financial indicators 15 of Islamic banking
	Mamoru Nagano (2016)	11 countries	2000-2009	Investigating the relationships between 1011 banks and 17284 applicants for loan in 11 economies, it uses panel data method and shows that taking risks by the banks depends on their ownership; in this research the effect of banks ownership on their risk-taking power is positive and meaningful.
	Tobadu (2011)	63 countries	1995-2005	Investigating bank activities and using panel data method, it shows that in a focused program with ownership of the banks, we can increase the rate of giving loans to institutions with less interest, i.e. the effect of institution productivity in the provision of facilities by governmental banks is negative and meaningful.

Source: Research Findings

Based on the literature, several factors are effective on the economic growth. The empirical literature and access to data for the variables, which are effective on economic growth will be described briefly.

3 Econometric Model

Traditional approach in econometrics is obtained via efforts of Teenbergen, Havalmo, and economists of Cowles Committee. Separating empirical and theoretical activities is in the center of this approach. Theorists express conditional propositions (for example how does the demand change if the price increases) and the economists use regression to estimate conditional averages and test the accuracy of conditional propositions. This approach was dominant over most activities of econometrics (Pesaran and Smith, 1995).

Many economists such as Henson (1996) stated that economic theory is not rich enough to explain the details of empirical models. In this situation, regression helps us to consider various auxiliary hypothesis beside the hypothesis to which the theory points out: adding other variables in order to make other conditions invariant, determining the functional form, correcting the interruptions, and using the representative variables for invisible variables

are possibilities, which help us in rejecting no hypothesis. (Pesaran & Smith, 1995).

In 1980, Hendry in his paper titled “Econometrics- Alchemy or Science” explained this situation like this: econometricians have found their philosophers stone: regression, if they use it for data the results will become meaningful. His three golden rules are test, test, and test.

Hendry believes that the problem of traditional approach is due to the stipulation of econometrics model (Favero, 2007). He suggests searching among various models, evaluating and comparing each of them with a general model by using a set of statistical and diagnostic tests and separating unrelated models. The most important challenge of this approach is parameterization of general model because a general model is common distribution of all variables by considering non-linear relationships, inequality of variance, changes of coefficients, and abnormal errors. Alternative solutions affect generality of Hendry’s approach and make some criticisms, which are similar to ones that are expressed against traditional approach of macroeconomics (Hansen, 1996).

Leamer (1983) also believes that the problem of traditional approach is due to the stipulation of econometrics model but is more pessimistic about statistical tests. In 1983, in his paper titled "Let’s expel deceit from econometrics" he emphasized on Sherlock Holmes’s approach in which “formulating a theory is a big mistake before observing all evidences because it makes the judgment doubtful”, he warns about formulating a theory before observing the data. His program about “observing the data” is focused on investigating the uncertainty of statistical results and emphasized that “we should not rely on an uncertain result.” Leamer’s approach to report the analysis of sensitivity of the results can be an introduction for more complex models in uncertainty modeling such as Bayesian Averaging Model.

In this research, we focus on Leamer’s approach for modeling, and state the potential variables which affect dependent variable as follows:

Using Leamer's approach, assume that the set of potential variables that are the parts of the true model is:

$$\mathcal{X} = \{X_k | k = 1 \dots K\} \tag{1}$$

If $\mathcal{Z} = \{Z_k | k = 1 \dots K^*\} \subset \mathcal{X}$ is defined as a subset of the potential variables set \mathcal{X} , the following set of linear regression models can be defined:

$$\mathcal{M} = \{M_i: y = \alpha + \beta_1 Z_1 + \dots + \beta_{K^*} Z_{K^*} + \varepsilon\} \quad (2)$$

In this equation, ε is the disturbance of the regression model. The parameters are not generally identifiable and we follow an instrument variable approach.

We use a panel data set, collected from different international databases, such as World Bank and International Monetary Fund to estimate the model. Our sample is composed of 116 countries in 2005 to 2014. Short-run and long-run effects are distinguished based on an averaging procedure.

Consider a panel data set with T times and N individuals. Such data can be averaged, such that:

$$W_i^{(1)} = \frac{\sum_{t=T_1}^{T_1+G-1} Z_{it}}{G}, W_i^{(2)} = \frac{\sum_{t=T_1+G}^{T+2G-1} Z_{it}}{G} \quad (3)$$

This can be either the explanatory variable or dependent one. This type of averaging allow us to control the endogenous feature of the models, i.e. regression $Y^{(2)}$ over each variables $W_i^{(1)}$ generates a dynamic model. In other words, the lag of the variables is used as an instrumental variable.

However, this type of averaging allows us to divide the estimations into two categories: long-run and short-run estimations. If T_1 and therefore G are small, the coefficients are short-run. Since such definition is ad-hoc, we present the results of a sensitivity of coefficients.

Table 2

The Symbols Used in Reporting the Results

C	The number of estimations (number of models in which there is Z_1 variable)
Mean	Average of estimated values
Std	Standard deviation of estimated values
Avg.obs	The mean of number of observations in estimated regressions
Rej H0 neg (%)	Percentage of the models which reject the null hypothesis of parameter negativity

Source: Research Findings.

We describe model M_i in the set \mathcal{M} , more clearly, by breaking the set Z and separating one index of banking soundness as follow:

$$Y_{jt} = \alpha + \beta H_{j(t-1)} + x'_{j(t-1)}\theta + \varepsilon_{jt}, j = 1 \dots N, t = 1 \dots T \quad (4)$$

N is the number of the countries, which have the desired data, and t is the time index. Y_{jt} is the average rate of economic growth of country j in time t . $H_{j(t-1)}$ is the index of banking system soundness in the period before t in economy j . X is the vector of control variables. These variables are the same as set Z but this set does not have the banking soundness index.

3.1 Banking System Soundness Indicators

Choosing the banking soundness indicators is based on a set of indicators called Financial Soundness Indicators (FSI); which is introduced by International Monetary Fund in order to control the soundness and stability of financial institutions, markets, companies, and families (Sundararajan et. al., 2002). The core of this set is composed of twelve indicators called central indicators, which cover five aspects of banking soundness including capital adequacy, asset quality, profitability, liquidity, and dependency on the market risk.

3.2 Data

Dependant variable

- 1) Rate of GDP growth: (gdp)

Independent variables

- 1) Capital adequacy (capital to asset): (c2a)
- 2) Asset quality (ratio of non-current demands to whole demands): (npl)
- 3) Liquidity (ratio of current bank reserves to bank assets): (lr2a)
- 4) Profitability (ratio of profit to asset): (roa)
- 5) Ratio of interest margin to gross income: (im2gi)
- 6) Government's debt (ratio of central government's debt to internal gross production)
- 7) Export (ratio of the value of exporting goods and services to internal gross production)
- 8) Import (ratio of the value of importing goods and services to internal gross production)
- 9) Government's expenditures (ratio of government's current expenditures for buying goods and services to internal gross production)
- 10) Human capital (index of gender coherence of gross registration in elementary and secondary education, boys and girls)

- 11) Consumption inflation (price index via Laspeyres formula as changes of annual percentage of consumer's expenditures)
- 12) Production inflation (is an instrument for the rate of annual equilibrium growth of internal gross production and rate of price change in the whole economy)
- 13) Population growth rate
- 14) Efficiency of shareholders' income (dividing the net income to mean of capital value)
- 15) Rate of real interest (based on predetermined inflation and by balance of internal gross production)
- 16) Gross saving (Ratio of gross saving to internal gross production)
- 17) Monitoring the administrative corruption (index of using the government's power in fighting with small-scale to large-scale corruptions)

3.3 Statistical Analysis and Results of Models' Estimation

The results are presented in table 3 in short-run (2 to 4 years) and long-run (6 to 10 years) orders. The value of G in short run is 1 and 2 and in long run is 3, 4, and 5. Since the volume of sample of financial data is 10 years, value of T_1 changes from 2005 to 2014. It should be noted that the number of observations is zero in some cases.

Table 3 reports some meta-data regarding the estimations. It includes the number of estimated regressions, the average of number of observations in each regression, the standard deviation and the average of estimated values, and the results regarding the statistical hypothesis.

Table 3- Results of Estimation of Coefficients of Economic Growth in Short-Run (2 To 4 Years), and Long-run (6 To 10 Years)

exp.name	type	C	mean (std)	avg. obs.	Rej. short (%)	H0: neg (%)	Rej. H0: long neg (%)
c2a	sh	46566	0.1(0.22)	51	2.5		1.7
	lo	12772	0.09(0.14)	43			
npl	sh	64892	-0.36(0.19)	53	4.4		3.2
	lo	18472	-0.064(0.13)	43			
lr2a	sh	50588	0.0039(0.033)	50	3.5		6.3
	lo	11538	0.0092(0.037)	47			
roa	sh	52396	0.72(0.61)	53	0/14		0
	lo	15222	0.73(0.33)	44			
im2gi	sh	65934	-0.0052(0.028)	53	5/3		30
	lo	19160	-0.024(0.025)	44			

Note. Dependant variable and independent variable are explained in Appendix 1. *Source:* Research Findings.

According to the results, there is not strong evidence that if the ratio of capital to asset improves the economic growth will be enforced. For example, if the positive coefficient of capital to asset ratio increases –other conditions being fixed- an increase in economic growth will happen. The null hypothesis for this variable is not rejected in less than 3% of models. Mean of coefficient of im2gi is negative, i.e. if this ratio increases economic growth will decrease. The null hypothesis for this variable is rejected in 3/2% of regressions. Mean of coefficient of bank reserves to bank assets is positive which means if this variable increases - other conditions being fixed - economic growth will increase too. However, negativity of this variable's coefficient is rejected in less than 3% to 6% of regressions. Mean of coefficient of profitability ratio is positive and the null hypothesis for this variable is not rejected in any regressions. It means that the coefficient of this variable is meaningless in all cases. Finally, mean of coefficient of interest margin to gross income is estimated negative; i.e. if this coefficient increases, the economic growth will decrease. However, null hypothesis, which assumes that the coefficient of this variable is negative, is rejected in 5% to 30% of regressions.

Interpreting the coefficients of regressions reveals unexpected results. It shows there is not yet strong evidence that these indicators are appropriate measures for economic growth. However, long-run or short-run concept hidden in the coefficients is estimated but ignored in the descriptions. In other words, it is expected that the positive effects of banking soundness indicators will appear gradually; so the null hypothesis should be rejected more in long-run period than in short-run (last column of table 3 should have bigger numbers than its previous column).

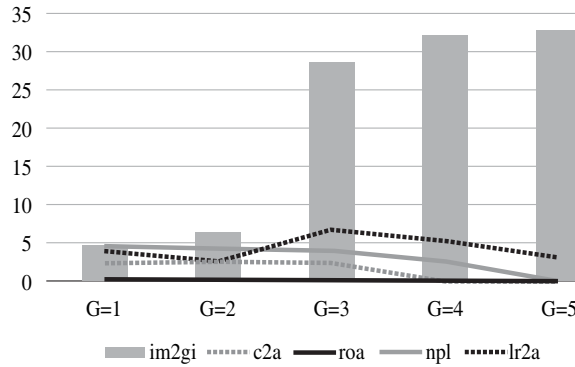


Figure 1. Sensitivity of the percentage of regressions in which the hypothesis of negativity of the variable's coefficient is rejected. *Source*: Research Findings.

Due to the importance of im2gi variable- interest margin to gross income ratio- we describe it further. In Diagram 1, the sensitivity of the percentage of the regressions in which the null hypotheses is rejected, is reported. As it is said earlier, long-run and short-run periods are separated with regard to parameter G . As we see in this diagram, if G increases, i.e. moving from short-run periods to long-run, the hypotheses of negativity of im2gi coefficient is rejected in more percentages of regressions. Therefore, we can conclude that the financial intermediation affects economic growth positively during long-run periods. As it is shown, this result is not true for other variables of financial soundness.

4 Conclusion

In this study the long-run and short-run effects of financial intermediation on economic growth is investigated. Based on the findings, the ratios of capital to asset, cash reserves to whole asset, and profitability to asset have positive effects on economic growth but the ratios of non-current demands to whole demands and interest margin to gross income have negative effects on the economic growth. In addition, there is not yet strong evidence which show that improving the ratio of capital to asset can enforce the economic growth. However, the duration of time- short-run or long-run- hidden in the coefficients is calculated, but overlooked in the descriptions. In other words, it is expected that the positive effects of indicators of bank soundness appear gradually. It means that the null hypothesis for coefficients of indicators of banking system soundness are rejected more in long-run periods. Due to the importance of the ratio of interest margin to gross income, it is chosen as an

introducer of mediation. We observe that moving from short-run periods to long-run causes more percentages of regression models reject the null hypothesis of negativity of this coefficient. Therefore, we can conclude that financial intermediation affects economic growth over time and in longer-run periods. This result is not valid in almost all other indicators of financial soundness.

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Appendixes

Appendix 1: Variables' Definitions

- **Rate of GDP growth:** It shows the percentage of annual growth in market prices based on currency
- **Ratio of capital to asset- asset quality:** Bank capital to asset, Ratio of bank capital and reserves to whole assets; Whole assets include financial and non-financial assets. Ratio of capital to asset measures enough capital or financial power of depository institutions; it calculates this amount of asset except financial resources as whole assets by collecting capital and reserves
- **Margin of profit or interest margin to gross income:** This index calculates the difference between the interest that is received from the borrower and the interest which is paid to investor as the gross income
- **Asset quality:** Ratio of non-current and non-refundable facilities to whole facilities, it measures quality of assets in a set of facilities.
- **Capital adequacy:** It shows the capital arranged for assets at risk. Dividing the collected data from legal capital for all banks to calculated assets at risk for all banks, it calculates the amounts of capital adequacy for depository institutions.
- **Asset returns:** This index shows the percentage of company's profitability in production. This is investors' returns from assets, which is calculated by dividing net income to average of whole assets in a period.
- **Returns of shareholders' income:** It shows the investors' returns from using the capital, which is calculated by dividing net income to average of

capital (capital and reserves) in a period. Amount of net income is a percentage of stockholders' share. Return on capital means company's profitability and shows that how much the company's profit is gained by investors.

- **Government's debt:** Debt of all direct governmental securities for fixed contracts in a particular period. This includes internal and external debts such as money, deposit, and securities except shares and loans. This gross amount is government's debt and is held by government. Since this debt is a share, it does not have a due date and its deadline is last day of financial year.
- **Export:** Exporting goods and services shows the value of all goods and services, which are delivered to other countries. They include value of merchandise, transportation cost, transportation insurance, travelling, royalty, license fee, and other services such as commercial, building, financial, informational, and governmental services and individual business.
- **Import:** Import of goods and services show the value of all goods and other services of the market, which are received from other parts of the world. They include the value of goods, transportation, transportation insurance, travelling, royalty, license fee and other services such as communication, construction, financial and informational services, business, individual and governmental services.
- **Government's expenditures:** It includes all government's current expenditures to purchase goods and services. It also includes expenditures of national and security defense except the military expenditures, which belong to government organization.
- **Human capital:** Index of gender coherence of gross registration in elementary and secondary education, ratio of boys and girls registered in private and governmental elementary and high schools
- **Consumption inflation:** Inflation that is measured by index of consumer price; it shows changes of annual percentage in consumer costs which is determined from purchasing goods and services. It shows that Laspeyres formula is used generally.
- **Production inflation:** Inflation determined by balanced annual growth rate of internal gross production and shows rate of price change in the whole economy. Index of internal gross production formed from ratio of internal gross production with current internal price to internal gross production with price of foreign currency, is a fixed amount.

- **Liquidity:** It shows the ratio of bank current reserves to bank assets. The ratio of bank current reserves to bank assets includes the ratio of internal debts and deposits to monetary authorities on behalf of government, non-governmental and non-financial companies, private sector, and other bank institutions.
- **Gross savings:** Gross savings is calculated as gross income minus whole consumption plus net transfers.
- **Control of administrative corruption:** This index shows using the government's power to fight small and big corruptions in order to secure interests of people in the society. The mentioned index is fluctuating between -2.5 and +2.5. If the index is closer to +2.5 it means that the corruption is controlled well. This index is published by governments' statistical agencies.

Appendix 2: Studied Countries

Afghanistan, Algeria, Argentina, Armenia, Australia, Austria, Bangladesh, Belarus, Belgium, Bhutan, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, China, China, Colombia, Congo, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, El Salvador, Equatorial Guinea, Estonia, Fiji, Finland, France, FYR, Gabon, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Honduras, Hong Kong SAR, Hungary, India, Indonesia, Iran, Ireland, Israel, Italy, Kazakhstan, Kenya, Korea, Kosovo, Latvia, Lebanon, Lesotho, Lithuania, Luxembourg, Macao SAR, Macedonia, Madagascar, Malaysia, Maldives, Malta, Mauritius, Mexico, Moldova, Namibia, Netherlands, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Rep., Rep., Romania, Russian Federation, Rwanda, San Marino, Saudi Arabia, Seychelles, Singapore, Slovak Republic, Slovenia, Solomon Islands, South Africa, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Tonga, Trinidad and Tobago, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Vanuatu, Vietnam, West Bank and Gaza, Zambia.