Vol. 28 No. 1

Global & Local Economic Review 2024

McGraw-Hill Education

Global & Local Economic Review

Volume 28 No.1 2024

€ 14,00 (i.i.) www.mheducation.it ISSN: 1722-4241

POLICY FOR THE SUBMISSION OF MANUSCRIPTS TO BE PUBLISHED IN GLOBAL & LOCAL ECONOMIC REVIEW

1. PRELIMINARY INSTRUCTIONS

For a manuscript to be accepted for publication in the Review, authors are required to abide by the publication rules and publication ethics that can be found on http://www.gler.it/. In particular, authors must state that:

- The manuscript, or relevant parts of the manuscripts, was not previously published;
- The manuscript is not simultaneously under review by any other journal (in whole or in part);
- The manuscript will not be submitted elsewhere before a decision is made by the Review;
- All data in the manuscript are real and authentic and there is no conflict of interest for any author.

2. MANUSCRIPTS SUBMISSION

Manuscripts must be submitted to the Editorial Team by e-mail at gler@fondazionepescarabruzzo.it. Manuscripts must be submitted following the instructions for authors (see http://www.gler.it/) and should include the main text, any additional materials, any footnotes, references, an Abstract not longer than 300 words, and one or more JEL codes (no more than five) available at https://www.aeaweb.org/econlit/jelCodes.php.

It is author's responsibility to ensure that manuscripts are written in clear and comprehensible English. Following the guide for authors, each author's institutional affiliation, telephone number, and e-mail address should be written on the first page of the manuscript. In the case of co-authorship, the authors should write who of them is in charge of corresponding with the editors.

3. REVIEWING PROCESS

Each manuscript is first assessed by an Editor from the Editorial Team and, if judged suitable for publication in the Review, is then sent to three reviewers for a rigorous double-blind peer review.

- The initial decision by the two Editors takes about two weeks.
- Authors will be informed of the review decision and all relevant comments by the reviewers within approximately two months.

Based on reviewers' comments and recommendations, the Editor then decides whether the manuscript should be accepted as it is, reviewed and resubmitted, or even rejected. In any case, the authors will be provided with constructive feedback and suggestions for manuscript improvement. In the case of acceptance, the publication process will start by assigning the manuscript a DOI code and, then, a volume number, an issue number, and page numbers of the Review. Proof corrections and the printing process takes approximately one month.

4. MISCELLANEOUS

Should it become necessary in the future, authors submitting manuscripts to the Review could be invited to contribute as reviewers, too. The articles published in Global & Local Economic Review are listed in EconLit and eJEL bibliographies (American Economic Association).

Global & Local Economic Review

Editorial Office: Corso Umberto I, n. 83, 65122 Pescara (Italy)
Telephone: +39 085 4219109 - Fax: +39 085 4219380
http://www.gler.it/ - gler@fondazionepescarabruzzo.it
Indexed in the electronic bibliography of the American Economic Association (EconLit and eJEL)

McGraw-Hill Education (Italy) S.r.l.
Corso Vercelli, 40 – 20145 Milano
Tel. 02535718.1 - www.mheducation.it

Stampa: Logo Srl, Borgoricco (PD)

McGraw-Hill Education (Italy) 2020
Printed in Italy
ISSN (print) 1722-4241 - ISSN (online) 1974-5125

Global & Local Economic Review

Volume 28 No. 1 **2024**

TABLE OF CONTENTS

G. & L. E. R., Vol. 28 No. 1, 2024

Nhat Tan Nguyen[1], Roop Raj[2], Iskandar Muda[3], Gioia Arnone[4], Waqas Amin[5]

RURAL WOMEN PARTICIPATION IN LIVESTOCK MANAGEMENT: FREEDOM AND CONSTRAINTS

Received: 25 April 2022 / Accepted: 9 October 2023

Abstract

In Pakistan, rural women were the major labor suppliers for domesticated livestock raising, providing monetary revenue and reducing family and farm budgets. Thus, variables affecting women's livestock management involvement are crucial to rural livelihoods. However, rural women's livestock sector involvement factors have received minimal research. To this end, this study examines the factors that influence women's livestock management in Khyber Pakhtunkhwa, Pakistan. To gather data, 200 women were chosen and interviewed face-to-face using multistage sampling. In data analysis, descriptive statistics, frequencies, percentages, and multiple regression were employed. Compared to males (1.16 hours/day), rural women (3.21 hours/day) participate more in livestock management. Women participated more in indoor livestock operations than males in outdoor activities including fodder cutting and milk and milk product selling. Age, livestock raising experience, financial availability, and livestock income determined women's livestock management involvement. The research proposed that government and non-government organizations recognize rural women's livestock

[1] Faculty of Business Administration, Ho Chi Minh City University of Foreign Languages - Information Technology, Ho Chi Minh City, Vietnam, *Email*: tannn@huflit.edu.vn.
[2] Department of Economics, Bhartiya Mahavidyalaya, Roorkee, Uttrakhand, India. *Email*: rooprajgahlot@gmail.com.
[3] Universitas Sumatera Utara, Medan, Indonesia. *Email*: iskandar1@usu.ac.id.
[4] Department of Managerial and Quantitative Studies Università degli Studi di Napoli Parthenope, Naples, Italy. *Email*: gioia.arnone@studenti.uniparthenope.it.
[5] School of Economics and Management, Zhejiang Normal University, China. *Email*: Waqas.amin97@yahoo.com.

management contributions and provide credit to boost their engagement in the study region.

JEL CODES: Q12, Q13, Q18, J16, D13

KEYWORDS: LIVESTOCK MANAGEMENT, KHYBER PAKHTUNKHWA, RURAL WOMEN'S PARTICIPATION

1. Introduction

Livestock is an important sub-sector of agriculture that plays a pivotal role in the development of an economy (Naz and Khan, 2018). Livestock contributes to income and employment generation and food and fuel provision thus having a significant role in rural livelihood support especially in developing countries (Andaleeb et al., 2017). It has been reported that the majority of the poorer households around the world are involved in livestock rearing to attain multiple benefits (Smith et al., 2013). These benefits included economic and social security during the time of crisis as well (Ahmad, 2014; Biradar et al., 2013).

It is acknowledged in the literature that livestock are reared under the various farming systems due to the associated multiple benefits to support rural livelihoods. The literature also shows that in livestock rearing rural women have a great role (Andaleeb et al., 2017; Naz et al., 2018; Ahmad, 2014). Rural women not only perform their household chores like cooking, cleaning, dishwashing, washing clothes, care of elders and children, etc. but also actively participate in managing livestock both at the farm and household level (Naz et al., 2018). Livestock management is predominantly regarded as a women's job around the developing world (Ali, 2016; Batool et al., 2014; Issac et al., 2012; Grace, 2007). However, women's contribution to livestock management is largely ignored in developing countries including Pakistan as well (Ahmad, 2014).

Few time allocation studies have examined women's livestock management engagement nationwide (Ahmad, 2014; Andaleeb et al., 2017; Khan, 2012). According to these studies, women usually spend 2 to 5 hours daily in livestock management activities in rural areas of the country. It has been acknowledged in the literature that women perform almost all of the livestock management activities (Ali, 2016; Uttami and Seruni, 2013; Ahmad, 2014;

Naz et al., 2018; Andaleeb et al., 2017). These activities included mostly feeding animals, watering, shed cleaning, milking, and milk products processing (Naz et al., 2018), etc. which had an active participation of rural women as depicted by several research studies (Naz et al., 2018; Andaleeb et al., 2017; Ahmad and Tanwir, 2013; Khan et al., 2012).

Women's role in livestock management further accounted for the economic and social well-being of the respective households and thus to the respective locality and national accounts as well (Ahmad, 2014). The contribution of livestock rearing to the respective households is comprised of cash income, food, fertilizer, and fuel provision (Issac et al., 2012; Nirmala et al., 2012; Biradar et al., 2013; Naz and Khan, 2017). The results of a study conducted by Hashmi, et al. (2007) in the rural areas of district Toba Tek Singh of the Punjab province showed that due to women's active role in livestock management, poverty has been significantly decreased which showed that livestock rearing contributed towards the provision of cash income along with the food and fuel provision.

The manure provision in the form of farm yard manure from livestock rearing accounted for the increased soil fertility which further boosted crop and vegetable production and thus contributed to rural household food security (Naz and Khan, 2018; FAO, 2015). Making dung cakes from the dung of animals served as a source of fuel in the rural areas which have been used for cooking purposes in the rural areas of the country (Ahmad, 2014). The food, fuel, fertilizer, and cash income provision from livestock rearing thus contributes towards lowering the household and farm budget in the rural areas of the country (Naz and Khan, 2018). All these benefits were enjoyed by the rural households mainly due to the active participation of women in livestock management (Andaleeb et al., 2017; Ahmad, 2014; Khan et al., 2009).

According to the findings, rural households benefited greatly from women's participation in livestock raising. Therefore, it is to everyone's advantage to have more women working in the industry. Yet research is deficient not just in gauging women's participation in livestock management but also in identifying factors that encourage women to participate. This research in Khyber Pakhtunkhwa, Pakistan, tries to fill that void by examining the variables that encourage or discourage women's participation in livestock management. The main goals of this study are to investigate the following questions.

1. To quantify the role that women play in livestock management.

2. To identify the determinants of women's participation in livestock management.

2. Description of Study

The current research study has been conducted in the Khyber Pakhtunkhwa Province of Pakistan. The province is comprised of a total of 24 districts however, recently the area of Federally Administered Tribal Areas (FATA) has also been included in the province raising the number of districts. Various types of livestock including goats, sheep, cattle, buffalo, etc. have been reared in the province which had a significant contribution towards rural livelihood support (Khan et al., 2012; Naz and Khan, 2018; Andaleeb et al., 2017). Mostly, the poor households in the province kept livestock to derive multiple benefits in the shape of cash income, food, fuel, fertilizer, etc. (FAO, 2015; Andaleeb et al., 2017). These reasons mainly accounted for the selection of the province as the study area for the current research.

Moreover, it was found that livestock is domesticated and rural women have been involved in the rearing of livestock (Khan et al., 2012; FAO, 2015). However, the extant research on the topic has hardly examined the amount to which women contribute to livestock management operations including feeding, milking, watering, shed cleaning, milk product processing, etc. As a result, research on women's roles in cattle management in the region is highly sought. Research on the factors that encourage or discourage women's involvement in livestock management is therefore not only important for the advancement of livestock but also for the advancement of women's rights. All of this laid the groundwork in the province for such a study to be conducted. Two districts i.e., Mardan and Chrsadda from the Khyber Pakhtunkhwa province have been randomly selected which are part of Peshawar Valley (Naz et al., 2018).

2.1. Types of Livestock

The knowledge about major types of livestock is important in the context of this research study. Therefore, the required data in this case were collected and presented in Table 1. Data show that the major types of livestock included buffalo, cows, goats, and sheep with the respective percentages of 16, 33, 40, and 11. The average number of livestock per household was 2.85. The average number of buffalo, cows, goats, and sheep per household was 0.45, 0.95, 1.15, and 0.30, respectively. Data reveal that goats were the major types of livestock

followed by cows and buffalo. The reason behind the rearing of goats and cows in increased numbers in the study area may be associated with its easy management as it requires less feed as compared to buffalo. The same fact has been described by other researchers which supported the current study results (Naz et al., 2018). Moreover, it has been observed that these animals were mostly reared for milk and milk products production in the study area at the domestic level which further contributes towards lowering the household and farm budget as well.

Table 1. Major Types of Livestock in The Study Area

Livestock type	Frequency	Percentage	The average number of livestock
Buffalo	90	16	0.45
Cow	190	33	0.95
Goats	230	40	1.15
Sheep	60	11	0.30
Total	570	100	2.85

2.2. Description of Livestock Management Activities

The current research study selected eight types of livestock management activities after the review of relevant literature. The main reason behind the selection of these activities is related to their daily occurrence. These activities included fodder cutting, animal feeding, watering, cleaning of sheds, young animal care, milking, and the processing and distribution of my goods. These activities have been described by Naz et al., (2018) as below.

Fodder Cutting: The activity of fodder cutting describes the harvesting of forage crops, grass, and plants which are provided as feed to animals. This activity has been mostly performed manually with the use of certain tools like spade, sickle, etc.

Animal Feeding: The second livestock management activity was animal feeding in which the chopped green fodder dry fodder or a mixture of both the fodders were provided to animals in their containers.

Watering of Animals: The third activity watering refers to providing water to animals in a container at their living place or either the animals to the nearby streams, canals, etc.

Cleaning of Sheds: In this activity, the living place of the animals is kept clean by taking away the animal's excrement. The excreta was then utilized as farm yard manure and also in the form of dung cakes for fuel purposes. The activity of cleaning sheds is performed manually with the use of some hand implements.

Young Animal Care: This activity refers to taking care of young animals in the form of their feeding, health care of the limb, calf, etc. at the homesteads or farms.

Milking: Milk is collected from the mammary glands of mammals, namely cows, buffalo, sheep, and goats.

Preparation of Milk Products: the surplus quantity of milk is converted into various milk products like yogurt, butter, and butter oil for home use and marketing purposes.

Marketing of Milk and Dairy Products: This activity is related to the marketing of surplus quantities of milk and dairy products like yogurt, butter, butter oil, etc. for cash income.

2.3. The Role of Women in Livestock Management

According to studies (Naz et al., 2018; Andaleeb et al., 2017), women in the study area play a crucial role in livestock management. When looking for statistics on women's participation, particularly in terms of time invested, the literature comes up short. table 3 displays how much time women spend on different tasks related to livestock management was the focus of the current study. Both sexes were determined to spend 4.38 hours daily, on average, on the eight distinct kinds of cattle management responsibilities. It took a median of 4.80 hours per day per man and 1.75 hours per day per woman to cut fodder, feed animals, water animals, clean sheds, care for young animals, milk animals, prepare milk and milk products, and market milk and milk products. According to the findings, caring for livestock ranks first in terms of time spent, followed by milking, and then cutting fodder. The average daily time spent on livestock activities by women and men was 3.21 hours and 1.16 hours, respectively, with women spending much more time on the activities than males.

Women were found to be in charge of all aspects of caring for farm animals, including feeding (six hours), watering (four hours), cleaning (four and a half hours), tending to young animals (two hours), milking (four hours), and educating (two and a half hours) about milk and milk products. However, men

are superior at two tasks associated with animal management: fodder cutting (2.8 hours) and marketing (1.25) of milk and milk products. Only women in the inspection area were responsible for the guiding of milk and milk products. Current results are consistent with those of Naz et al. (2018), who found that farm girls in the Mardan area have been instrumental in educating the community about the benefits of milk products. Consistent with the limited prior research by Naz et al. (2018), Andaleeb et al. (2017), and Khan et al. (2009), the present study found that girls devoted around five hours per week to various livestock control sports. the data also showed that women participated at a higher rate in indoor activities, while males were more engaged in outside activities such as fodder cutting and milk and milk product marketing. Supporting these findings are studies published in peer-reviewed journals (Naz et al., 2018; Andaleeb et al., 2017; FAO, 2015; Arshad et al., 2013; Amin et al., 2010). The dominant culture of the target area restricts women's freedom of movement, which may explain why more women than males participate in indoor cattle management sports. Not only in Pakistan (Naz et al., 2018; Khan et al., 2009), but also in other developing countries (Utami and Seruni, 2013; Rais et al., 2013), the literature has provided the same reason for the increased participation of women in indoor livestock control activities.

Table 2. Women's Roles in Livestock Management in The Research Field

Livestock Management Activities	Time Spent on Average (Per Hour)		Total Time Spent
	Men	Women	
Fodder cutting	2.8	2	4.8
Feeding animals	3	6	9
Watering of animals	0.5	4	4.5
Cleaning of sheds	0.5	4.5	5
Young animal care	0.25	2	2.5
Milking of animals	1	4	5
Preparation of milk products	--	2.75	2.75
Marketing of milk and dairy products	1.25	0.5	1.75
All activities	1.16	3.21	4.38

3. Research Methodology & Estimation Strategy

3.1. Sampling Technique and Sample Size

The current research study employed the multistage sampling technique of the probability sampling method. The multi-stage sampling technique has been extensively used in the literature relevant to the current issue (Naz and Khan, 2018). In the first stage of sampling, two districts Mardan and Charsadda were selected randomly. In the second stage, one tehsil from each of the districts has been selected randomly. In the last round of sampling, two union councils were selected at random from each of the selected tehsils. Two villages from each of the two selected union councils were randomly selected in the last round of sampling. In the fifth and last stage of sampling, 200 households involved in livestock rearing were selected from the respective villages randomly 50 households from each village. The respective households were selected from the list provided by the respective Nazims (head of the local administrative setup) of the villages. It indicates that the sample size is comprised of 200 households involved in livestock rearing which have been equally distributed among the selected villages as shown in table 3.

Table 3. Distribution of Sample Size

Selected districts	Selected Union Councils	Selected villages	Sample size
Mardan	Alo	Qasmi	50
	Bakhshali	Bakhshali	50
Charsadda	Dherizardad	Dherizardad	50
	Abazai	Abazai	50
		Total	200

3.2. Data Collection:

For the collection of data, a pre-tested semi-structured questionnaire is used. The questionnaire was prepared based on the specific objectives of the study and then reviewed by the two relevant experts and amended in light of their valuable guidelines. This effort was made to improve the reliability and

validity aspect of the data. The respondents of the study were women who were actively involved in livestock rearing in the selected households. The reason behind the selection of women respondents included the management of livestock both on the farm and within households in the respective area (Andaleeb et al., 2017; Khan et al., 2009).

For the data collection from women respondents, the semi-structured questionnaire was used while employing face to face interview method. Before, the start of the interviews, respondents were informed about the purpose of this research study and usage of data only for this research. Moreover, formal permission has also been sought from these respondents, and those who refused to interview were replaced with another available women respondent. The questionnaire included mainly the information about socio-economic characteristics of the respondents, major types of livestock, and time allocation to various livestock management activities.

3.3. Econometrics Analysis:

The collected data while using the questionnaire through the interview method have been entered in Statistical Package for Social Sciences (SPSS) version 20 and subjected to the required analytical techniques like frequencies, percentages, descriptive statistics, and multiple linear regression wherever required. Women's contributions to livestock management have been measured using a time allocation technique (Naz et al., 2018) which has been further analyzed through descriptive statistics like mean values. Following the lead of Andaleeb et al. (2017), we employed multiple regression analysis to investigate the variables that affect women's participation in livestock management. Here is a rough calculation based on the linear regression model;

The formula for determining WPLMA is as follows:

$$WPLMA = \beta_1 + \beta_1 AGER + \beta_2 EDUR + \beta_3 HS + \beta_4 AC + \beta_5 EXP + \beta_6 FS + \beta_7 FT + \beta_8 LI + \cdots \quad [1]$$

Women's involvement in livestock management activities (WPLMA); respondents' ages in years; respondents' levels of education in years; respondents' levels of experience in years; herd size in animals; respondents' access to credit in years; herd size in years; respondents' income from livestock in dollars; coefficients (β); error term (). Women's age, education,

experience, family size, family type, access to credit, herd size, and livestock income were selected as independent variables based on a literature review, and the dependent variable was the amount of time women spent managing livestock. Ordinary Least Squares (OLS) were used to estimate multiple linear regression models. Model estimation preceded the execution of post-estimation diagnostic tests for things like multicollinearity, heteroscedasticity, and normality.

4. Results and Discussion

The results of the multiple linear regression model after the checking of diagnostics tests have been presented in Table 4. After the running of diagnostic tests, no violation has been detected and thus results have been presented and interpreted with full confidence. The value of R-square has been reported as 0.55 which explains that 55% variation has been explained by the independent variables in the dependent variable. The results of each variable have been presented briefly as follows.

Table 4. Influences on Women's Livestock Management

Variable	Coefficients	Student Error	T-ratio	P-value
Constants	1.60	0.60	2.67	0.014
Respondent's Age	0.04	0.02	2.00	0.042
Education of the respondent	0.05	0.03	1.67	0.431^{NS}
Experience in livestock rearing	-0.06	0.016	3.75	0.000
Family size	0.04	0.03	1.33	0.115^{NS}
Family types	0.14	0.24	0.58	0.645^{NS}
Credit access	0.00	0.00	5.10	0.000
Herd size	0.02	0.01	2.10	0.548^{NS}
Livestock income	0.00	0.00	5.22	0.000

Level of significance= 5%, R-square= 0.55, NS= non-significant

The age has been deemed significant having a positive link with the dependent variable as evidenced by the high t-ratio (2.00) and p-value less than 5% of the significance threshold. Women over 40 years of age were primarily involved in livestock management activities as with the passage of

age these women have fewer home obligations and thus, they find time for livestock keeping. These results have been found compatible with the findings of Andaleeb et al. (2017) who claimed that women over 40 years of age had a greater degree of engagement in livestock activities in district Mardan. Results show that the educational level of the respondent has no significant effect on their participation in livestock management activities as indicated by a low t-ratio value (1.67). However, the positive sign of the variable indicates that educated women mostly involve themselves in income-generating activities like livestock rearing as well.

There is a statistically significant inverse relationship between this factor and women's involvement in livestock management (t-ratio=-3.75). The findings show that more seasoned women handle animals in less time and with more efficiency than their less seasoned counterparts. The current result was found consistent with the findings of Andaleeb et al., (2017). It was discovered that family size had a positive but statistically insignificant influence; its p-value was higher than 5%. Women with bigger families often have more free time to devote to livestock management because they get help around the home from other members of the family. Andaleeb et al. (2017) and Ahmad (2014) both find results consistent with these conclusions.

There is a negative and statistically insignificant influence of the family type on women's involvement in livestock management. In contrast to women living in joint family systems, where they typically have more free time owing to the existence of assistants for home tasks, women living in nuclear family systems spend less time caring for livestock, as shown by the negative coefficient. The high t-ratio of 5.10 for credit access indicates that it is a positive and significant factor in explaining women's involvement in livestock management. Increased herd size results from increased access to financing, which in turn encourages women to devote more time and energy to livestock management. Ahmad's (2014) and Zahoor et al.'s (2013) conclusions are in agreement with these findings.

Women's involvement in livestock management is significantly influenced by the number of animals owned by the household (the "herd size"). It is a well-known fact that as the size of a herd grows, so does the amount of time spent on tasks like milking, feeding, and watering, allowing women to take on more of these responsibilities. We find that livestock income is a significantly significant predictor of women's involvement in livestock management (t-ratio of 5.22). This evidence points to a two-way causality between women's involvement in livestock management and the money generated by animals.

Livestock income rises as the number of women in the labor force rises and vice versa.

A high t-ratio of 5.22 indicates that livestock income is a positive and highly significant driver of women's involvement in livestock management. This evidence points to a two-way causality between women's involvement in livestock management and the money generated by animals. Livestock income rises as the number of women in the labor force rises and vice versa. These findings are in line with those of Andaleeb et al. (2017) and Khan et al. (2009), who also found a positive and statistically significant correlation between women's involvement in livestock management and livestock revenue.

5. Conclusion and Recommendations

Women in Pakistan, like in many other developing countries, are essential to the success of livestock farms. In addition to their more typical tasks within the home, such as childcare, cooking, cleaning, and more, women also manage animals for food, fuel, fertilizer, and financial earnings. Women play an important role in livestock management, but there is a paucity of studies on the factors that motivate and measure their involvement. Therefore, the findings of this study are essential for expanding our understanding of this field. Khyber Pakhtunkhwa is a province in Pakistan known for its abundance of animals, particularly goats and cows. Time spent caring for cattle may be an indicator of women's participation in livestock management. The aforementioned responsibilities include but are not limited to fodder cutting, feeding, watering, stall cleaning, newborn animal care, milking, product preparation, and product marketing. On average, women spend 3.21 hours each day caring for cattle, while men contribute just 1.16 hours. Many domestic tasks, including milk product production, animal feeding, and milking, shed watering and cleaning, and infant care, are often performed by women. Due to societal norms and restrictions, men are more likely to work outside the home, such as selling milk and other dairy products or chopping fodder.

Several variables were found to influence women's participation in livestock management, including their age, level of experience in livestock raising, access to financing, and livestock revenue. In light of these facts, it is strongly recommended that women's contributions to cattle management be recognized and actively fostered on a global scale. This calls for a concerted effort to broaden the scope of programs that help rural women earn a living.

Government and non-governmental organizations (NGO) efforts to empower women in livestock management should prioritize women's access to capital and educational opportunities.

References

Ahmad, T.I. (2013), *The role of rural women in livestock management: socio-economic evidences from diverse geographical locations of Punjab* (Pakistan) (Doctoral dissertation, Université Toulouse le Mirail-Toulouse II).

Ali, H.L. (2016), *Livestock farming and participation of women; A case study of district Charsadda Pakistan*. J. Cult. Soc. Dev. 18, 22-31.

Amin, H., Ali, T., Ahmad, M., & Zafar, M.I. (2010), *Gender and development: roles of rural women in livestock production in Pakistan*, Pakistan Journal of Agricultural Sciences, 47(1), 32-36.

Andaleeb, N., Khan, M., & Shah, S.A. (2017), *Factors affecting women participation in livestock farming in District Mardan, Khyber Pakhtunkhwa, Pakistan*. Sarhad Journal of Agriculture, 33(2), 288-292.

Arshad, S. Muhammad & Ashraf, I. (2013), *Women's participation in livestock farming activities*, The Journal of Animal & Plant Sciences, 23(1), 304-308.

Batool, Z., Warriach, H.M., Ishaq, M., Latif, S., Rashid, M.A., Bhatti, A., Murtaza, N., Arif, S., & Wynn, P.C. (2014), *Participation of women in dairy farm practices under smallholder production system in Punjab, Pakistan*, The Journal of Animal & Plant Sciences, 24(4), 1263-1265.

Biradar, N., Desai, M., Manjunath, L., & Doddamani, M.T. (2013), *Assessing contribution of livestock to the livelihood of farmers of Western Maharashtra*, Journal of Human Ecology, 41(2), 107-112.

FAO (Food and Agriculture Organization) (2015), *Women in agriculture in Pakistan*, Food and Agriculture Organization of the United Nations Islamabad.

Grace, D. (2007), *Women's reliance on livestock in developing-country cities*, ILRI Working Paper. Int. Livestock Res. Inst. Nairobi, Kenya.

Hashmi, A.H. Maann, A.A, Asghar, K. & Riaz, M. (2007), *Gender role in livestock management and their implication for poverty reduction in rural Toba Tek Singh*, Pakistan Journal of Agriculture Sciences, 44(4), 674-678.

Oluwatayo, I.B., & Oluwatayo, T.B. (2012), *Small ruminants as a source of financial security: a case study of women in rural Southwest Nigeria*.

Institute for Money, Technology and Financial Inclusion (IMTFI), Working Paper, 1, 21.

Khan, M., Sajid, M., Hameed, B., Khan & A.U. Jan. (2009), *Participation of women in agriculture activities in district Peshawar*, Sarhad Journal of Agriculture, 28(1), 121-127.

Naz, S., & Khan, N.P. (2018), *Financial contribution of livestock at household level in Federally Administered Tribal Areas of Pakistan: An empirical perspective*. Sarhad Journal of Agriculture, 34(1), 1-9.

Shaista Naz, S.N., Khan, N.P., Naveed Afsar, N.A., & Shah, A.A. (2018), *Women's participation and constraints in livestock management: A case of Khyber Pakhtunkhwa Province Pakistan*, Sarhad Journal of Agriculture, 34(4), 917-923.

Nirmala, G., Ramana, D.B.V., & Venkateswarlu, B. (2012), *Women and scientific livestock management: Improving capabilities through participatory action research in semi arid areas of south India*, APCBEE Procedia, 4, 152-157.

Rais, M.U.N., Solangi, A.W., & Sahito, H.A. (2013), *Economic assessment of rural women involved in agriculture and livestock farming activities. Wudpecker*, Wudpecker Journal of Agricultural Research, 2(4), 115-121.

Khan, M., Sajjad, M., Hameed, B., Khan, M.N., & Jan, A.U. (2012), *Participation of women in agriculture activities in district Peshawar*, Sarhad Journal of Agriculture, 28(1), 121-127.

Smith, J., Tarawali, S., Grace, D., & Sones, K. (2013), *Feeding the World in 2050: Trade-offs, synergies and tough choices for the livestock sector*, Tropical Grasslands-Forrajes Tropicales, 1(2), 125-136.

Utami, H.D., & Seruni, A.P. (2013), *Determinants of household labour allocation to small scale dairy farming activities* (Case Study at Pasuruan Regency, East Java, Indonesia), Livestock Research for Rural Development, 25(10).

Zahoor, A., Fakher, A., Ali, S., & Sarwar, F. (2013), *Participation of rural women in crop and livestock activities: a case study of tehsil Tounsa Sharif of southern Punjab (Pakistan)*, International Journal of Advanced Research in Management and Social Sciences, 2(12), 98-121.

G. & L. E. R., Vol. 28 No. 1, 2024

Salvatore Villani[1], Stefano Fiorentino[2], Edgardo Bucciarelli[3], Aurora Ascatigno[4]

EXAMINING THE IMPACT OF THE ITALIAN TAX SYSTEM ON THE NATURE AND EXTENT OF THE UNOBSERVED ECONOMY AND UNDECLARED WORK

Received: 21 March 2024 / Accepted: 26 May 2024

Abstract

This paper examines the influence of the Italian tax system on the characteristics and extent of the unobserved economy and undeclared work. Recognising the complexity and heterogeneity of the phenomenon under study, the first part of the paper examines the definitions and classifications used to describe it. The current spatial and temporal extent of undeclared work and its determinants are also examined. The second part reviews the strategies and measures implemented to combat undeclared work in Italy over the last forty years. Strategies and measures are distinguished according to their nature (direct and indirect) and the approach adopted (contractual and fiscal). Finally, the third part aims to study the impact of the tax reforms that have changed the discipline of the personal income tax (IRPEF) and the value added taxes (VAT and IRAP) applied in Italy in order to reduce the so-called "tax wedge on labour" and, more generally, the incentives for tax evasion and undeclared work. By examining the relationship between tax policy and undeclared economic activity, we can identify effective strategies

[1] University of Naples Federico II, via Rodinò, 22, Naples, Italy. Phone: +39-081-2188404; *E-mail address: salvatore.villani@unina.it*
[2] University of Naples Parthenope, via Generale Parisi, 13, Naples, Italy. Phone: +39-08118891090; *E-mail address*: stefano.fiorentino@uniparthenope.it.
[3] University of Chieti-Pescara, viale Pindaro 42, Pescara 65127, Italy, Phone: + 39 085 453 7980; *E-mail address*: edgardo.bucciarelli@unich.it .
[4] School of Advanced Studies, University of Chieti-Pescara, via dei Vestini 31, Chieti 66013, Italy, Phone: + 39 0871 3556077; *E-mail address*: aurora.ascatigno@unich.it .

to improve tax compliance and promote sustainability. This paper will provide insights for future research in this area.

JEL CLASSIFICATION: E26, H26, J30, J46

KEYWORDS: ECONOMIC ANALYSIS OF LAW, TAX AND SOCIAL SECURITY EVASION, TAX WEDGE ON LABOUR, UNDERGROUND ECONOMY, INFORMAL LABOUR MARKET, POLICY MEASURES

1. Introduction

In recent years, the Italian government has intensified its efforts to combat the unobserved economy, paying particular attention on the phenomenon of undeclared work. As will be discussed in detail, the undeclared work in Italy is particularly widespread in some economic sectors, such as domestic services, construction and agriculture, and in some regions of the country (southern and central Italy). In December 2022, the Ministry of Labour and Social Policies launched two necessary measures (the adoption of the National Plan to Combat Undeclared Work 2023-2025; the establishment of the National Committee for the Prevention and Fight against Undeclared Work), which were widely promoted for their effectiveness in reducing irregular behaviour and encouraging the adoption of virtuous behaviour (i.e. in line with the current legislation on the combat against undeclared or irregular work). On 4 May, the so-called "Decreto Lavoro" (Decree-Law No. 48/2023) was also published in the Official Gazette, introducing several innovations and urgent measures aimed at promoting social inclusion and young people's access to the world of work: From the reform of the citizen's income (and new special measures to support workers and reduce the tax burden) to the further reduction of the tax wedge on wages, from the provision of "large shirts" (i.e. the possibility of more flexible use) for fixed-term contracts to the new tax incentives for youth employment.

These can be seen as measures that deserve recognition and that serve to confirm the government's commitment to implementing a stable strategy capable of enhancing the role and synergies between the various actors, not only institutional, involved in the prevention, contrast of irregular work, and the evaluation of policies, according to a multi-agency approach, also concerning the diversity of productive sectors and territorial contexts (see Ministry of Labour and Social Policies, 2022). However, it should be noted

that there are still several gaps and critical issues in this area. Essentially, the gaps and problems are related to the discontinuity of the completed legislative processes and to the lack of awareness of the Legislator of the complex economic implications of the measures adopted, especially at the fiscal level, to combat the phenomenon of undeclared work.

A comprehensive assessment of these implications should begin with an analysis of the terminology and classifications used to describe the unobserved economy, its dimensions and the strategies and measures that have been adopted in recent years to combat it. The phenomenon is clearly broad and multifaceted, leading to equally varied and nuanced responses from the legal system. An analysis of these responses, while essential, is beyond the scope of this study. This paper aims to provide an overview of the unobserved economy, focusing in particular on the tax measures that have been implemented over time to address this problem in Italy. In particular, the paper examines, among other things, the primary economic effects of the implementation of such measures over time. We were motivated by the fact that the economic aspects are too often underestimated and, in some cases, completely overlooked.

The remainder of the paper is structured as follows: Sections 2 and 3 examine the definitions and classifications used to describe the phenomenon of unobserved economy. It should be noted that these definitions are not always unambiguous. Nevertheless, they provide an insight into the current extent of the phenomenon. In this respect, the sections consider both the spatial spread of the phenomenon, including its sectoral and territorial distribution, and its temporal spread, including past trends and recent developments. The underlying causes or determinants of the phenomenon are also considered. Section 4 provides an overview of the fiscal strategies and measures implemented over the last four decades to combat undeclared work. Sections 5 and 6 respectively examine the impact of tax reforms that have reshaped the discipline of income and value-added taxes (VAT and IRAP) in Italy to reduce the so-called "tax wedge on labour" and, more generally, the incentives for tax evasion and undeclared work.

2. The unobserved economy: Definitions, classifications, and dimensions of the phenomenon

A corpus of production activities and work units that evade statistical observation for various reasons (e.g. evasion of taxes and contributions,

evasion of labour regulations, non-compliance with administrative rules) is a constant feature of all economic systems. Such activities are neither registered nor subject to regular taxation and are therefore not included in official statistics. Nevertheless, they are documented and quantified in a large number of studies and research reports of international importance, using a wide range of techniques and methodologies. According to the most recent estimates, the current average size of the so-called "shadow economy" (the estimate refers to 2021) represents a significant share of economic output in many countries. Indeed, it represents 16.1% of gross domestic product (GDP) in the countries generally considered to be the most advanced or developed in the world. The 36 countries of the Organisation for Economic Co-operation and Development (OECD) include 31 European countries, with estimates ranging from 5.8% in Switzerland to 32% in Turkey (see Table 1)[5].

Table 1. Size of the unobserved economy
(values as a percentage of GDP; years: 2015-2021)

	2015	2016	2017	2018	2019	2020	2021
Austria	8,2	7,8	7,1	6,7	6,1	7,2	6,9
Belgium	16,2	16,1	15,6	15,4	15,1	16,2	16,0
Bulgaria	30,6	30,3	29,6	30,8	30,1	32,9	32,4
Croatia	27,7	27,1	26,5	27,4	26,4	29,6	29,0
Czech Republic	15,1	14,9	14,1	13,6	13,1	14,2	13,9
Denmark	12,0	11,6	10,9	9,3	8,9	9,8	9,6
Estonia	26,2	25,4	24,6	23,2	22,1	23,6	23,1
Finland	12,4	12,0	11,5	11,0	10,6	11,4	10,9
France	12,3	12,6	12,8	12,5	12,4	13,6	13,1
Germany	11,2	10,8	10,4	9,7	8,5	10,4	10,0
Greece	22,4	22,0	21,5	20,8	19,2	20,9	20,3
Hungary	21,9	22,2	22,4	22,7	23,2	26,0	25,0
Ireland	11,3	10,8	10,4	9,7	8,9	9,9	9,4
Italy	20,6	20,2	19,8	19,5	18,7	20,4	20,2
Latvia	23,6	22,9	21,3	20,2	19,8	20,9	20,2
Lithuania	25,8	24,9	23,8	23,0	21,9	23,1	22,9
Luxembourg	8,3	8,4	8,2	7,9	7,4	8,6	8,4
Malta	24,3	24,0	23,6	23,2	22,0	23,5	23,1
Netherlands	9,0	8,8	8,4	7,5	7,0	8,1	7,8

[5] See Schneider (2022), pp. 303-305.

Table 1. Size of the unobserved economy (continued)
(values as a percentage of GDP; years: 2015-2021)

	2015	2016	2017	2018	2019	2020	2021
Poland	23,3	23,0	22,2	21,7	20,7	22,5	22,0
Portugal	17,6	17,2	16,6	16,1	15,4	17,0	16,5
Romania	28,0	27,6	26,3	26,7	26,9	29,3	28,9
Slovenia	23,3	23,1	22,4	22,2	21,5	23,1	22,5
Cyprus	24,8	24,2	23,6	23,2	22,1	24,3	23,7
Spain	18,2	17,9	17,2	16,6	15,4	17,4	16,9
Slovakia	14,1	13,7	13,0	12,8	12,2	14,0	13,7
Sweden	13,2	12,6	12,1	11,6	10,7	11,7	11,0
United Kingdom	9,4	9,0	9,4	9,8	9,6	10,7	10,2
Norway	13,0	12,6	12,2	11,8	10,8	11,6	11,1
Switzerland	6,5	6,2	6,0	5,8	5,5	6,1	5,8
Turkey	27,0	26,8	27,2	28,3	29,4	32,5	32,0
Australia	10,3	9,8	9,4	9,2	8,9	9,7	9,5
Canada	10,3	10,0	9,8	9,6	9,4	10,3	9,7
Japan	8,4	8,5	8,6	8,5	8,2	9,1	8,8
New Zealand	8,0	7,8	7,4	6,9	6,8	7,9	7,3
USA	5,9	5,6	5,4	5,1	4,8	6,1	6,6
28 European countries of the OECD (average)	18,3	17,9	17,3	17,0	16,3	17,9	17,4
3 non-EU European OECD countries (average)	15,5	15,2	15,1	15,3	15,2	16,7	16,3
31 European countries (average)	17,9	17,7	17,1	16,7	16,2	17,8	17,3
5 highly developed non-European OECD countries (average)	8,6	8,3	8,1	7,9	7,6	8,6	8,4
Average of entire sample of 36 OECD countries	16,7	16,4	15,8	15,4	15,0	16,5	16,1

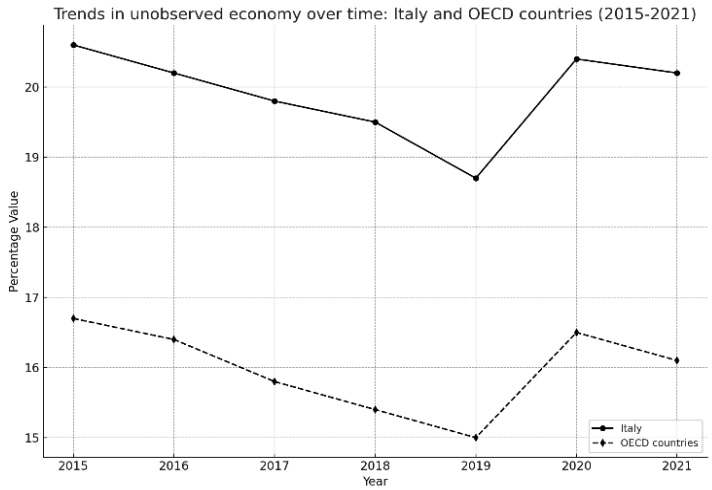
Source: Authors' own elaboration on OECD data and based on Schneider's (2022) analysis.

However, the average size of the shadow economy is higher in Europe (17.4% of GDP in the 28 Member States of the European Union and 17.3% in the 31 European countries included in the sample of OECD countries surveyed) than in the five non-European OECD countries considered to be among the most developed in the world (Australia, Canada, Japan, New Zealand and the United States), where it is 8.4% of GDP. It is clear that the

performance of European countries is negatively affected by the prevailing trends in Eastern, Central and Southern Europe (such as Bulgaria, Cyprus, the Czech Republic, Latvia, Lithuania and Poland), where the shadow economy is more pronounced than in the countries of the Western European Union (see Table 1). Moreover, the estimated size of the shadow economy in Italy is subject to a negative bias due to the observed increase (+8.5%) in recent years, after a significant decrease between 2003 and 2019 (-28.3%), as shown in Table 1.

More specifically, Figure 1 shows the evolution over time of the average size of the shadow economy in Italy and in the 36 OECD countries (data taken from Table 1). Essentially, a similar trend can be observed within the two variables. At first sight, however, there are significant differences in the percentages of the shadow economy between Italy and the other OECD countries.

Figure 1. The evolution over time of the average size of the shadow economy in Italy and in the 36 OECD countries



Source: Authors' own elaboration.

To verify this first intuition, we use the t-test for paired samples (Kim, 2015). Using Python software, we first calculated the difference between

each pair of observations (the size of the unobserved economy in Italy and the OECD countries) by adopting this formula:

$$d_i = X_{Italy,i} - X_{OECD,i} \quad (1)$$

Subsequently, we calculated the average of the differences, $\bar{d}$:

$$\bar{d} = \frac{1}{n}\sum_{i=1}^{n} d_i \quad (2)$$

where *n* represents the number of pairs of observations.

We then calculated the standard deviation of the differences, s_d, as follows:

$$s_d = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(d_i - \bar{d}\right)^2} \quad (3)$$

Once these calculations had been performed, we then calculated the t-value, *t*:

$$t = \frac{\bar{d}}{s_d/\sqrt{n}} \quad (4)$$

Overall, the paired samples t-test performed on our data shows a statistically significant difference between Italy and the OECD for the whole period, with a very low p-value ($5.98\times10^{-105.98}$). This suggests that, on average, there is a persistent and significant difference between the size of the unobserved economy, expressed as a percentage of GDP, of Italy and the OECD.

Despite its considerable economic importance, the phenomenon of the unobserved economy has been the subject of little academic research. It is only since the end of the 1990s that some national institutions have shown an interest in the subject. At the Italian level, the debate on the size of the unobserved economy and its determinants has received very uneven

attention over a long period of time. In Italy, there has been a reawakening of interest in the unobserved economy that has coincided with the manifestation of other phenomena of global scope, such as waves of migration, climate change, trade tensions and rapid technological progress.

The intermittent interest in studying the unobserved economy can also be attributed to the challenges faced by scholars and researchers in obtaining sufficiently reliable data for statistical purposes. The most significant contribution to our understanding of this phenomenon has been made by the analysis of territorial business systems and, more generally, of social networks and the problems of territorial development (see Roma, 2001, p. 5). The limited focus, both scientific and institutional, has also been influenced by terminological confusion. This is due to the coexistence of numerous definitions, often used in an imprecise and ambiguous manner. It is therefore appropriate to clarify this point before analysing the phenomenon, its constituent elements and the various policies that can be used to combat or limit it.

According to the classifications derived from the most authoritative national accounting manuals and used by ISTAT, the Non-Observed Economy (NOE) includes all economic activities that, for various reasons, escape direct statistical observation. The main components of this phenomenon are the underground economy and the illegal economy, while the statistical underground and the informal economy represent the remaining elements of the spectrum. More precisely, within the broader category known as the "unobserved" or "unofficial" economy, it is common to distinguish between the illegal or criminal economy, the underground or unobserved economy, the statistical unobserved economy economy and the shadow economy.

The term "illegal economy" is used to describe the production of goods and services that are illegal in nature, or the production of goods and services that are legal in nature but carried out without the necessary authorisation or title. In this context, three distinct categories of illicit activities can be identified: the production and trafficking of illicit substances, the provision of prostitution services and the smuggling of tobacco products.

The shadow economy includes all activities that are legal but are voluntarily concealed from the tax, social security and statistical authorities through the submission of false declarations, both in terms of turnover

and/or costs of production units (under-declaration of value added) and the use of undeclared labour[6].

This portion of the unobserved economy can be conceptualised as a complex network of parallel flows in comparison to those recorded by official statistical sources. It is important to note that this portion is not synonymous with tax evasion. Nevertheless, instances of evasion are frequently observed in such cases. It is, in fact, possible for tax evasion to exist independently of submergence when national accounting data report the amount of evasion and include it in their assessments of national magnitudes. Conversely, instances of tax evasion may occur in the absence of any underlying evasion, when no tax is owed on the unrecorded activity. This is exemplified by numerous agricultural activities, in which the evasion of social security contributions is nevertheless prevalent (see Monda, 2012).

This part of the unobserved economy can be conceptualised as a complex network of parallel flows compared to those recorded by official statistical sources. It is important to note that this part is not synonymous with tax evasion. Nevertheless, tax evasion is often observed in such cases. Tax evasion can indeed exist independently of the "shadow economy" if national accounts report the evaded amounts and include them in estimates of the national economy Conversely, there may be cases of evasion where there is no underlying evasion, where no tax is due on the unrecorded activity. This is the case for many agricultural activities, where evasion of social security contributions is nevertheless widespread (see Monda, 2012).

The unobserved economy is also characterised by a high degree of informality, which includes all productive activities carried out in contexts that are either poorly organised or not organised at all. These activities are based on labour relations that are not regulated by formal contracts, but rather defined in the context of personal or family relationships. In more advanced or industrialised countries, the unobserved economy is often seen as a marginal sector of the economy, whose relevance is limited to specific geographical areas and activities. For example, domestic work and childcare are prevalent in metropolitan areas, while home-based agricultural work is more common in rural areas. In the economies of poorer and/or developing countries, the prevalence of irregular work hampers the ability to benefit

[6] The measurement of undeclared economic activities mainly involves the underestimation of value added, including that generated by informal work. In addition, estimates often include: (1) the valuation of tips received by employees in certain sectors; (2) adjustments resulting from the reconciliation of independent estimates of supply and demand; and (3) the estimated value of undeclared rental income.

from open trade, creating a cycle of poverty for workers in transition (see Bacchetta & Bustamante, 2009). However, the precariousness of the labour market and the race to the bottom in wages and workers' rights increasingly characterise contemporary forms of production (organised according to what Gallino, 2015, has termed the "Walmart model"), thereby facilitating the global spread of these forms of work.

Finally, the unobserved statistical component includes all activities that are not observed because of information inefficiencies inherent in the databases, such as sampling and non-sampling errors, or because of coverage errors in the archives. However, the prevalence of this component has now been reduced as a result of innovations in the sources of information on the economic accounts of enterprises, which reduce the need to resort to sample data and thus virtually eliminate statistical errors.

These brief preliminary remarks on the characteristics of the unobserved economy and its main components are sufficient to show that we are dealing with a complex and diverse set of phenomena. The total value of these phenomena in Italy, as estimated by the most recent ISTAT assessment (based on 2020 data), is 174.6 billion euro, or 10.5% of GDP. This value represents a decrease of 14.1% compared to the previous year. This decline was observed in all components of the unobserved economy (see Table 2). The shadow economy, which amounted to around 157.4 billion euro or 9.5% of GDP, contracted by around 26.5 billion euro compared to the previous year. This decrease was driven by a reduction in its main sub-components, namely the underestimation of value added and the use of irregular work. The former decreased by around 10.7 billion euro compared to 2019, while the latter decreased by around 14.6 billion euro compared to the same year. Conversely, the illegal economy contracted by more than €2.1 billion compared to 2019 (-10.96%), the first decrease since 2015.

Table 2. The shadow economy and illegal activities (current values in millions of euro and percentage incidence of the components on GDP; years: 2015-2020)

	2015	2016	2017
Shadow economy (current values)	191.145	189.392	194.965
- from sub declaration	93.910	95.020	98.473
- from irregular work	79.729	78.403	80.234
- other	17.506	15.969	16.257
Shadow economy (% of GDP)	11,5	11,2	11,2
- from subdeclaration	5,7	5,6	5,7
- from irregular work	4,8	4,6	4,6
- other	1,1	0,9	0,9
Illegal activities (current values)	17.233	18.078	18.896
Illegal activities (% of GDP)	1,0	1,1	1,1
Unobserved economy (current values)	208.379	207.469	208.169
Unobserved economy (% of GDP)	12,6	12,2	11,8
Value added (current values)	1.488.049	1.522754	1.589.576
GDP (current values)	1.655.355	1.695.787	1.771.391

Table 2. The shadow economy and illegal activities (continued)

	2018	2019	2020
Shadow economy (current values)	188.931	183.893	157.366
- from sub declaration	93.953	90.397	79.710
- from irregular work	78.034	77.033	62.427
- other	16.944	16.463	15.228
Shadow economy (% of GDP)	10,7	10,2	9,5
- from subdeclaration	5,3	5,0	4,8
- from irregular work	4,4	4,3	3,8
- other	1,0	0,9	0,9
Illegal activities (current values)	19.238	19.411	17.283
Illegal activities (% of GDP)	1,1	1,1	1,0
Unobserved economy (current values)	208.169	203.304	174.649
Unobserved economy (% of GDP)	11,8	11,3	10,5
Value added (current values)	1.589.576	1.611.368	1.502.119
GDP (current values)	1.736.593	1.796.649	1.660.621

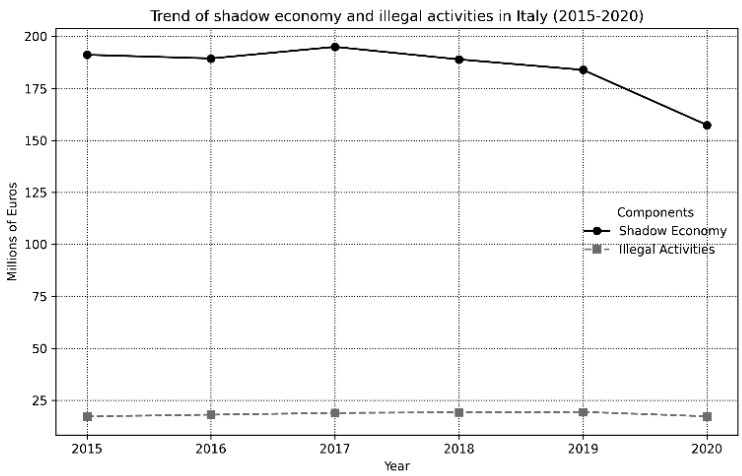
Source: Authors' own elaboration based on ISTAT data.

There was also a slight change in the weight of the different components of the unobserved economy (see Table 2). The decrease in the share of the sub-declaration (from 45.1% to 44.5%) was accompanied by an increase in the shares of undeclared work (from 37.5% to 37.9%) and the black

economy (from 9.2% to 9.6%). However, the contribution of the other components of the shadow economy remained unchanged.

Based on the data presented in Table 2, Figure 2 shows the joint evolution of the shadow economy and illegal activities in Italy from 2015 to 2020. At first sight, we can see that the current value of illegal activities, expressed in millions of euro, is part of the total shadow economy. We can therefore see that the shadow economy is made up of other components, as we have seen in Table 2.

Figure 2. The joint evolution of the shadow economy and illegal activities in Italy from 2015 to 2020



Source: Authors' own elaboration.

At this point, we ask whether there is a correlation between the two variables over time. To do this, we calculate the Pearson correlation coefficient (e.g., Benesty et al., 2009), which measures the strength and direction of the linear relationship between two variables. The analytical formula for the correlation coefficient r between two variables, the shadow economy, X, and illegal activities, Y, is as follows:

$$r = \frac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum(X_i - \bar{X})^2} \cdot \sqrt{\sum(Y_i - \bar{Y})^2}} \quad (5)$$

where X_i e Y_i represent the values of X and Y; $\bar{X}$ are $\bar{Y}$ the average values of X and Y, respectively. As widely known, this coefficient varies between -1 and 1. Applying this formula to our data, we obtained a correlation coefficient of 0.44, representing a positive but moderate correlation between shadow economy and illegal activities.

We also ask whether there is a correlation between the shadow economy and GDP and between illegal activities and GDP. In particular, applying equation (5) to these specific data in Table 2, we obtain the following results: The correlation between the shadow economy and GDP is equal to 0.4, indicating a moderate and positive correlation between the two variables. The correlation between illegal activities and GDP is very strong and positive, equal to 0.94. The latter result, in particular, suggests that illegal activities would tend to increase as GDP increases and vice versa.

As shown in Table 3, the sectors with the highest prevalence of irregular work are other personal services, agriculture, forestry and fishing, and construction. Together, these sectors account for 22%, 16.9% and 8.2% respectively of value added in 2020.

By comparison, the prevalence of irregular work is less pronounced in industry. In this sector, irregular work accounted for 1.1 % of value added in the production of intermediate goods, energy and waste, and 2.6 % in the production of capital goods. Furthermore, the phenomenon is less significant in the industrial sector, where it accounts for 1.1 % in the production of intermediate goods, energy and waste and 2.6 % in the production of capital goods. Furthermore, the tertiary sector activities dedicated to professions and business activities, including professional services (3.6 %) and other business services (1.5 %), also show a lower prevalence of irregular work.

Table 3. Incidence of the components of the shadow economy on total value added by economic activity (percentage values; years: 2018-2020)

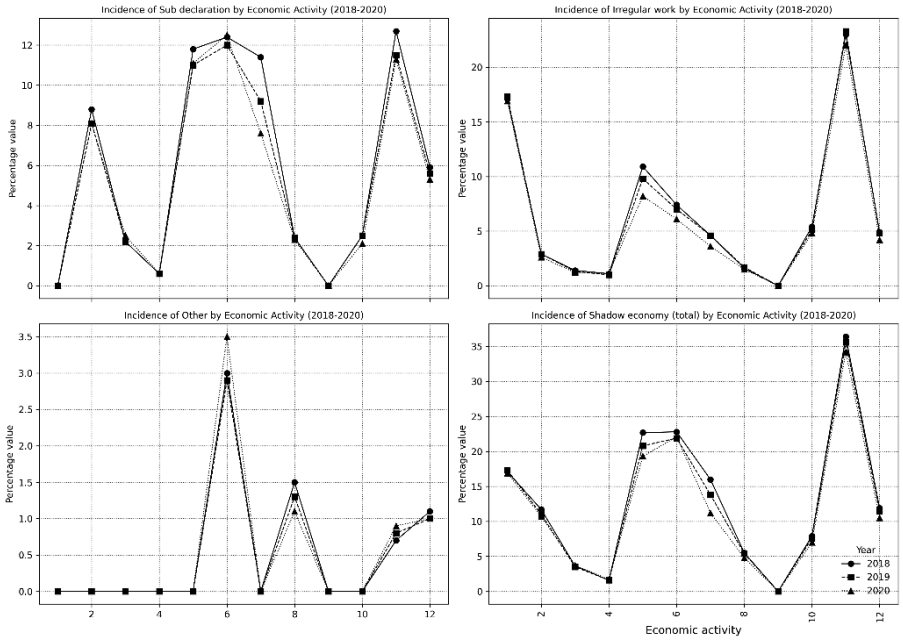
2018				
	Sub declaration	Irregular work	Other	Shadow economy (total)
Agriculture, forestry and fishing	0,0	17,1	0,0	17,1
Production of food and consumer goods	8,8	2,9	0,0	11,7
Production of capital goods	2,2	1,4	0,0	3,6
Production of intermediate goods, energy and waste	0,6	1,1	0,0	1,6
Construction	11,8	10,9	0,0	22,7
Wholesale and retail trade, transport and storage, accommodation and food service activities	12,4	7,4	3,0	22,8
Professional services	11,4	4,6	0,0	16,0
Other business services	2,4	1,6	1,5	5,5
General services for A.A.P.	0,0	0,0	0,0	0,0
Education, health and social work	2,5	5,4	0,0	7,9
Other services to people	12,7	23,0	0,7	36,4
Total	5,9	4,9	1,1	11,9
2019				
	Sub declaration	Irregular work	Other	Shadow economy (total)
Agriculture, forestry and fishing	0,0	17,3	0,0	17,3
Production of food and consumer goods	8,1	2,9	0,0	11,0
Production of capital goods	2,2	1,3	0,0	3,5
Production of intermediate goods, energy and waste	0,6	1,0	0,0	1,6
Construction	11,0	9,8	0,0	20,8
Wholesale and retail trade, transport and storage, accommodation and food service activities	12,0	7,0	2,9	21,9
Professional services	9,2	4,6	0,0	13,8
Other business services	2,4	1,7	1,3	5,4
General services for A.A.P.	0,0	0,0	0,0	0,0
Education, health and social work	2,5	5,1	0,0	7,6
Other services to people	11,5	23,3	0,8	35,6
Total	5,6	4,8	1,0	11,4

	2020			
	Sub declaration	Irregular work	Other	Shadow economy (total)
Agriculture, forestry and fishing	0,0	16,9	0,0	16,9
Production of food and consumer goods	8,1	2,6	0,0	10,7
Production of capital goods	2,5	1,2	0,0	3,7
Production of intermediate goods, energy and waste	0,6	1,1	0,0	1,7
Construction	11,1	8,2	0,0	19,3
Wholesale and retail trade, transport and storage, hotels and restaurants	12,5	6,1	3,5	22,1
Professional services	7,6	3,6	0,0	11,2
Other business services	2,3	1,5	1,1	4,8
General services for A.A.P.	0,0	0,0	0,0	0,0
Education, health and social work	2,1	4,8	0,0	7,0
Other services to people	11,3	22,0	0,9	34,2
Total	5,3	4,2	1,0	10,5

Source: Authors' own elaboration based on ISTAT data.

In order to provide a relatively comprehensive overview of the incidence of the components of the shadow economy on total value added by economic activity, four graphs are presented in Figure 3. In these graphs, for each economic activity defined in Table 3 and numerically indexed in the graphs (1,...,12), we show the evolution over the period 2018-2020 of the incidence, expressed in percentage terms, with respect to sub-declaration, irregular work, other sources of the shadow economy and the total shadow economy, respectively.

Figure 3. A comparison of economic activities, for each component of the shadow economy, over the period 2018-2020



Source: Authors' own elaboration.

Figure 3 shows that the trend in the incidence of the components of the shadow economy in total value added by economic activity is almost stable over the period considered. However, there are differences in the percentage of these incidences for construction (5), wholesale and retail trade, transport and storage, hotels and restaurants (6) and professional services (7).

From a territorial point of view, the northern regions of Italy have the highest concentration of irregular workers, with a total of 1,281,900. The southern regions have the second highest concentration of irregular workers, with a total of 1,202,400. The central regions, on the other hand, have a concentration of 787,700.

However, a different perspective emerges when the irregularity rate is taken into account. This is defined as the share of irregular work in total employment, including both regular and non-regular jobs. In this context, the

southern and central regions of Italy present the most critical scenarios, with the prevalence of irregular employment in 2020 exceeding the national average by 17.5 and 13.1 percentage points respectively. Furthermore, the unobserved economy contributes 7.4% and 4.9% respectively to the regional total, compared to the national average of 4.8%.

The most problematic situation is observed in Calabria, where 131,700 irregular workers contribute to an irregularity rate of 21.5% and an informal economy incidence of 9.2% of the regional total. The added value of irregular work is estimated at 2.7 billion euros. Similarly problematic is the situation in Campania, where 352,700 undeclared workers contribute to an irregularity rate of 18.7% and a GDP from undeclared work of 8.1% of the regional total (equivalent to 8.1 billion euro). The situation in Sicily is similarly worrying. The number of undeclared workers is 280,200, which corresponds to an irregularity rate of 18.5%. The added value of the unobserved economy compared to the official economy is 7.4% (5.9 billion euro).

Table 4. Incidence at territorial level (regional and by macro-areas) of Value Added (V.A.) from irregular work on the total Value Added of the economy (2020)

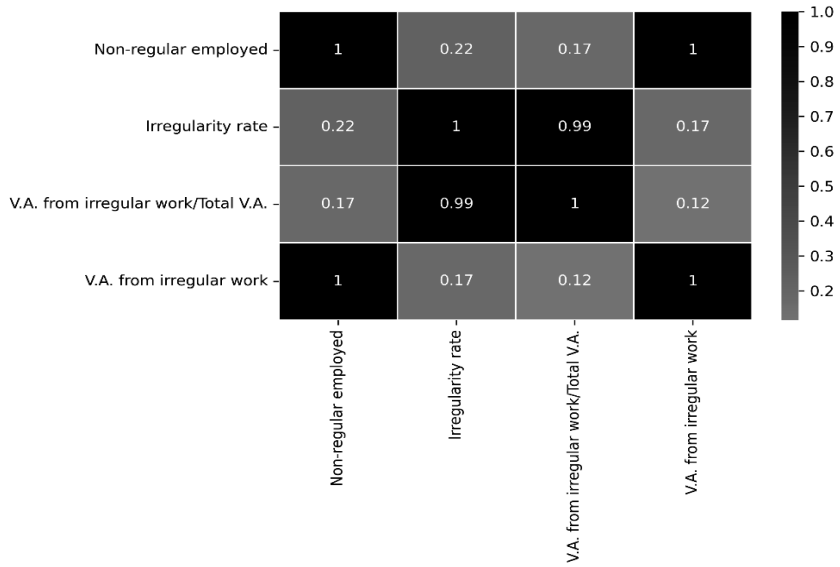
	Non-regular employed (number)	Irregularity rate (%)	V. A. from irregular work/Total V.A. (%)	V.A. from irregular work (million €)
Calabria	131.700	21,5	9,2	2.759
Campania	352.700	18,7	8,1	8.103
Sicilia	280.200	18,5	7,4	5.954
Puglia	221.200	15,9	6,9	4.784
Sardegna	94.100	15,3	6,6	2.111
Molise	17.100	15,8	6,2	366
Abruzzo	76.000	14,5	5,7	1.700
Basilicata	29.400	14,3	5,6	651
Umbria	48.300	13,0	5,4	1.124
Lazio	421.100	15,3	5,4	9.812
Valle d'Aosta	6.000	9,8	4,3	189
Liguria	79.800	11,8	4,3	1.928
Marche	70.300	10,5	4,3	1.647
Toscana	179.000	10,5	4,1	4.493
Emilia Romagna	207.700	9,5	3,9	5.651
Piemonte	190.900	10,0	3,9	4.770
Friuli V. Giulia	53.000	9,7	3,7	1.310
A.P. Trento	25.800	9,5	3,6	699
A.P. Bolzano	26.000	8,4	3,6	837
Lombardia	489.500	10,0	3,6	12.671
Veneto	203.200	8,8	3,5	5.259
Italy	**3.203.000**	**12,6**	**4,8**	**76.817**
North-west	766.200	10,2	3,7	19.558
North-east	515.700	9,2	3,7	13.755
Centre	718.700	13,1	4,9	17.076
South	1.202.400	17,5	7,4	26.428

Source: Authors' own elaboration based on ISTAT data.

On the basis of the data in Table 4, the average number of irregular workers in Italy is 1281200, with a standard deviation of 1103080 and a minimum observed in the north-east of Italy (515 700). The average rate of

irregularity in Italy is 12.52% with a standard deviation of 3.22%, with a minimum of 9.2% (North-East) and a maximum of 17.5% in the centre. As regards the share of value added from irregular work in total value added, the average percentage is 4.9% with a standard deviation of 1.51%, with a minimum of 3.7% (North-West and North-East) and a maximum of 7.4% in the South. Overall, the average value added of irregular work, expressed in millions of euro, is 30,326 8 with a standard deviation of 26,181.65, with a minimum of 13,755 in the North-East. To support what has been stated so far, Figure 4 shows the heat map of the correlation between the different economic variables related to irregular work in Italy reported in Table 4.

Figure 4. Correlations between specific economic variables and irregular work



Source: Authors' own elaboration.

Figure 4 shows that the correlation between the number of non-regular workers and the value added generated by non-regular work is particularly strong, reaching a value of 1.0. This indicates that as the number of irregular workers increases, there is also a direct increase in the economic value generated by non-regular work in absolute terms. This relationship suggests

that areas with a greater presence of irregular workers tend to have a greater economic impact from these activities.

An analysis of the correlation between the irregularity rate and the share of value added generated by non-regular work in total value added also shows a very high correlation of around 0.99. This means that in areas where the rate of irregular work is higher, the share of value added generated by this type of work in total value added is also higher. This indicates a strong economic influence of irregular work in percentage terms in regions with higher levels of irregularity. Other variables, on the other hand, show weaker correlations, with values below 0.3, indicating that there are no significant linear relationships between the number of irregular workers and the rate of irregularity, or between the value added generated by non-regular work and this rate, apart from the relationships already discussed. In summary, the heatmap clearly shows that the number of irregular workers and the economic value generated by these activities are closely linked. There is also a strong relationship between the irregularity rate and the share of non-regular work in total value added, suggesting that the economic importance of non-regular work increases in proportion to the irregularity rate.

3. The determinants of the unobserved economy

The complexity and multidimensionality of the unobserved economy phenomenon can be attributed to the multiplicity of its causes or determinants, which have been the subject of extensive study in the economic literature. In addition to an analysis of the phenomenon itself and its constituent components, it is also important to study the factors that give rise to it. As will be discussed below, the determinants of the phenomenon may depend on the appropriate combination of policies and strategies that governments should adopt in order to address it.

Table 5 presents estimate of the average size of the unobserved economy in 38 OECD countries, along with the relative average impact of each determinant of the phenomenon, expressed as a percentage of the respective GDP. These estimates have been obtained through the application of the Multiple Indicators Multiple Causes (MIMIC) estimation method (for further details, see, for example, Buehn & Schneider, 2008), which is designed to analyse the impact of the un The observed economy policies adopted by a substantial number of countries across the globe (for example, 162 countries, including developing countries, Eastern European countries, Central Asian

countries and, finally, high-income OECD countries) over a specified time period. In this study, the period under consideration is 1999 to 2007. On the basis of the aforementioned estimates, which have been revised and updated to 2017, it is possible to assess the adequacy of policies designed to combat the unobserved economy by comparing them with the average relative impact of the determinants of the phenomenon. Indeed, an examination of the data presented in Table 5 allows for the calculation of the average relative impact of each determinant of the unobserved economy. Furthermore, it permits the assessment of the efficacy of the public policies implemented by the governments of the countries under study.

Table 5. Average relative impact of the determinants of the shadow economy in 38 OECD countries (percentage values; years 1999-2017)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Australia	10,8	21,3	25,4	7,4	15,8	19,3	0,9	9,9
Austria	8,8	18,5	27,4	11,6	12,1	20,5	0,8	9,1
Belgium	20,5	19,2	20,2	19,1	16,5	17,3	0,4	7,2
Bulgaria	35,6	5,1	37,7	5,7	25,9	17,5	1,9	6,2
Canada	13,6	22,1	17,5	7,7	19,2	22,4	0,7	10,4
Chile	18,4	1,8	35,3	5,5	17,3	32,7	0,8	6,7
Cyprus	28,2	4,3	35,9	9,1	11,2	29,9	0,8	8,7
Czech Replublic	15,6	7,8	30,7	9,4	19,0	23,5	1,2	8,3
Denmark	16,3	34,6	33,5	4,0	9,5	9,9	0,3	8,2
Estonia	20,7	10,0	36,0	11,7	21,8	10,4	1,8	8,3
Finland	15,4	19,7	29,1	8,7	18,6	15,2	0,8	7,9
France	14,8	12,8	24,3	15,5	23,2	15,1	0,4	8,6
Germany	15,7	16,6	24,2	8,3	24,3	16,9	0,6	9,1
Greece	27,0	5,8	21,8	10,4	18,0	37,6	0,7	5,7
Hungary	24,1	12,3	34,9	6,4	18,6	18,5	1,2	8,0
Iceland	14,2	19,9	39,7	6,5	7,1	17,9	0,6	8,2
Ireland	15,1	12,5	36,4	7,9	12,5	21,3	1,0	8,5
Italy	26,9	15,5	18,9	9,0	18,6	31,0	0,1	6,8
Korea	25,2	5,7	27,3	3,4	9,8	44,3	1,4	8,0
Latvia	21,0	8,2	32,3	13,3	23,3	14,6	1,8	6,6
Lithuania	25,4	9,0	28,8	17,5	19,9	17,1	1,5	6,1
Luxembourg	8,6	13,2	33,4	20,0	10,4	11,9	1,2	9,8
Malta	26,3	5,9	39,7	3,2	20,0	21,2	0,8	9,3

Table 5. Average relative impact of the determinants of the shadow economy in 38 OECD countries (percentage values; years 1999-2017) (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mexico	31,0	2,3	42,1	10,2	5,9	33,8	0,4	5,3
Netherlands	11,8	13,6	32,5	13,0	10,4	19,7	0,8	10,0
New Zealand	11,2	21,8	25,4	8,4	11,9	22,9	0,6	9,1
Norway	17,6	21,2	31,5	12,5	10,8	13,0	0,5	10,5
Poland	25,4	6,1	27,8	7,8	26,1	25,7	1,3	5,3
Portugal	21,2	8,1	29,9	8,7	14,6	31,1	0,4	7,2
Romania	33,2	4,2	24,5	14,2	13,1	37,7	1,1	5,2
Slovakia	18,5	4,8	31,7	6,4	34,9	13,7	1,5	7,1
Slovenia	24,1	9,6	33,9	9,6	15,4	21,7	1,2	8,6
Spain	21,8	10,6	17,9	10,4	29,1	23,8	0,6	7,5
Sweden	16,6	23,5	30,6	8,7	15,2	13,2	0,8	8,0
Switzerland	7,3	17,7	30,7	9,0	9,6	23,8	0,5	8,7
Turkey	31,6	4,9	31,4	0,7	16,4	41,4	0,6	4,6
United Kingdom	11,5	18,2	30,8	8,1	14,3	18,0	0,6	9,9
USA	8,2	27,5	5,1	13,2	22,0	16,0	0,9	15,4
Tot. average	19,4	13,1	29,4	9,5	16,9	22,2	0,9	8,1

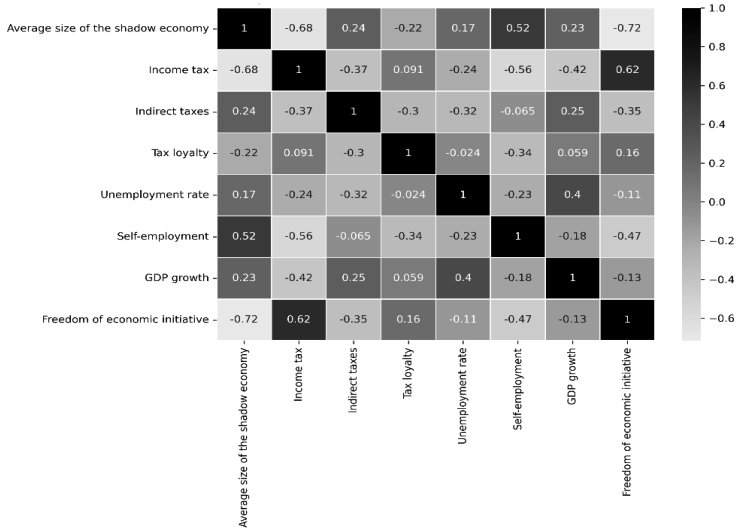
Source: Authors' own elaboration on OECD data and based on the analysis by Schneider (2022). Legend: (1) Average size of the shadow economy; (2) Income tax; (3) Indirect taxes; (4) Tax loyalty; (5) Unemployment rate; (6) Self-employment; (7) GDP growth; (8) Freedom of economic initiative.

The descriptive statistics on the determinants of the shadow economy show that the average size of the shadow economy is 19.45%, with a standard deviation of 7.38%. The observed values range from a minimum of 7.3% to a maximum of 35.6%, showing some variability in the distribution. For personal income tax, the average is 13.05%, with a standard deviation of 7.65% and values ranging from 1.8% to 34.6%. Indirect taxes also show an average of 29.37% with a standard deviation of 7.20% and values ranging from 5.1% to 42.1%.

When analysing tax loyalty, the mean value is 9.53% with a standard deviation of 4.13% and a range of 0.7% to 20.0%. The unemployment rate is on average 16.90% with a standard deviation of 6.27%, ranging from 5.9% to 34.9%. The self-employment rate is 22.15% on average with a standard

deviation of 8.61%, ranging from 9.9% to 44.3%. The GDP growth rate is lower, with an average of 0.88%, a standard deviation of 0.43% and a range of 0.1% to 1.9%. Finally, freedom of economic initiative has an average of 8.11 and a standard deviation of 1.93, ranging from a minimum of 4.6 to a maximum of 15.4. Figure 5 shows a heat map of the correlations between the different determinants of the shadow economy in the OECD countries.

Figure 5. Correlations between the different determinants of the shadow economy in the OECD countries



Source: Authors' own elaboration.

Figure 5 depicts a negative correlation between the average size of the shadow economy and personal income tax, with a coefficient of -0.68. This indicates that an increase in personal income tax is associated with a reduction in the shadow economy. This may be indicative of more rigorous tax administration in countries with higher income taxation. Similarly, there is a robust negative correlation between economic freedom and the size of the shadow economy (-0.72), indicating that greater economic freedom is associated with a reduction in incentives to operate in the shadow sector. However, the self-employment rate displays a positive correlation with the size of the shadow economy (0.52), suggesting that a greater prevalence of

self-employment may facilitate tax evasion or the utilisation of undeclared work.

A positive correlation is evident between personal income tax and economic freedom (0.62), indicating that countries with greater economic freedom also tend to have structured tax systems. Conversely, a negative correlation is observed between personal income tax and the self-employment rate (-0.56), indicating that higher taxation may act as a disincentive to self-employment. In contrast, indirect taxes demonstrate a moderate positive correlation with GDP growth (0.25), indicating that they may serve as a means of promoting economic expansion. Nevertheless, their impact on the unobserved economy seems to be relatively constrained.

The analysis yielded no statistically significant relationships between tax loyalty and the majority of variables. This indicates that the level of tax compliance is not significantly correlated with the size of the shadow economy or other economic variables. The unemployment rate is positively correlated with GDP growth (0.4), which may reflect circumstances of economic expansion that do not immediately result in the creation of new employment opportunities. Conversely, this rate exerts a constrained influence on the shadow economy in comparison to other factors.

The correlation between self-employment and the size of the shadow economy remains positive, while the correlation with economic freedom is negative ($r = -0.47$). This indicates that in economies with greater economic freedom, there is a reduced propensity for individuals to engage in self-employment as a means of irregular employment. In addition to its correlation with the unemployment rate and indirect taxes, GDP growth exhibits low correlations with the other variables, indicating its relative independence from factors related to the shadow economy. Economic freedom is inversely correlated with the size of the shadow economy and positively correlated with income taxation, indicating that countries with greater economic freedom often also have an established tax structure.

In summary, the magnitude of the shadow economy is predominantly shaped by economic freedom and income taxation, both of which exhibit a negative correlation. The data suggests a positive correlation between self-employment and irregular work, indicating a potential link between this form of employment and this problem. The findings of the comprehensive analysis suggest that factors such as economic freedom and tax structure can serve as pivotal determinants in the reduction of the shadow economy.

A comprehensive examination of the data presented in Table 5, employing the MIMIC approach, enables the formulation of eight pivotal hypotheses concerning the underlying forces driving the unobserved economy and their influence on economic size.

(1) An increase in the tax burden results in an expansion of the unobserved economy.
(2) The presence of excessive and intricate regulatory frameworks gives rise to incentives for evasion and the operation of shadow economies.
(3) A decline in the quality of institutions gives rise to greater incentives to engage in shadow economic activities.
(4) A reduction in the level of tax compliance (institutional trust) will result in an increase in the incentive to evade taxes and engage in shadow economic activities.
(5) A lower GDP per capita in a country provides greater incentives for individuals to engage in shadow economic activities.
(6) An increase in unemployment rates is associated with an increase in hidden economic activities.
(7) Countries with a higher prevalence of self-employment tend to exhibit elevated rates of tax evasion and a more substantial shadow economy.
(8) The greater the freedom of private economic initiative, the smaller the unobserved economy.

The determinants of the unobserved economy are numerous and varied. However, the incidence of these determinants differs significantly depending on the case in question and the historical period under examination. To illustrate, an examination of the period between 1999 and 2017 (see Table 5) reveals that for certain countries, including Germany, Austria and Denmark, the primary driver or determinant of the unobserved economy is the direct and/or indirect tax burden. In contrast, in the case of other countries, such as Italy, Greece and Romania, the significance of the primary factors contributing to this phenomenon appears to be distinct. Firstly, the extent of the diffusion of self-employment would exert an influence, which would then be followed by the indirect tax pressure, the unemployment rate and the degree of tax loyalty diffused in the country, in order of relevance.

In conclusion, an effective policy to combat the unobserved economy should focus on the analysis of the main factors specific to each context. This approach should comprise a comprehensive package of reforms, the design of which should be meticulous in order to address these determinants. Such measures could include regulatory and institutional reforms, fiscal

policies and the promotion of a culture based on legality and administrative integrity. In the case of emerging economies, the implementation of key policies should include the reduction of regulatory and administrative burdens, the enhancement of transparency, the improvement of government efficiency, the promotion of tax fairness, the automation of processes and the encouragement of electronic payments. Moreover, well-designed policies should provide incentives for firms and workers to transition into the formal sector, particularly in countries that rely on remittances and where the unobserved economy often serves as a social safety net. In essence, policies designed to stimulate the creation of private sector jobs and promote inclusive growth have the potential to facilitate the transition of numerous firms and workers into the formal economy.

An appropriate combination of policies and measures should be evaluated and designed on a case-by-case basis, with an initial assessment of the principal factors influencing the observed phenomenon. Nevertheless, statistical analysis is frequently inadequate for discerning the actual impact of implemented policies. It is common practice for governments to address the issue of undeclared work through the implementation of punitive measures, which are occasionally complemented by incentive-based strategies designed to promote formal employment through individual initiative. Despite the utilisation of sophisticated methodologies, recent statistical research has frequently been unable to assess the efficacy of sanctions and incentives. The analysis of these effects is particularly complex, especially when considered in a comparative context. In order to gain an accurate understanding, it is necessary to gain detailed knowledge of the scope of sanctions, the mechanisms for imposing them, and the specific requirements for qualifying for incentives or benefits aimed at facilitating formal employment.

It is necessary, therefore, to adopt a multi-faceted approach in order to gain a comprehensive understanding of the phenomenon of the unobserved economy. This approach combines statistical analysis of the determinants of the phenomenon with a legal assessment of the system of sanctions and incentives, including their evolution over time.

In the following sections, we will apply this approach to the Italian case, examining the evolution of relevant policies and measures over the last 35 years (starting in 1989 with the introduction of "reorientation contracts") and comparing their initial objectives with the actual results, which have often been disappointing.

4. Evolution of policies to combat undeclared work adopted in Italy: Fiscal measures

Over the last few years, public policies to combat undeclared work have become an absolute priority on the political agenda, both at the national and European levels. This has profoundly changed the institutional context of reference regarding the institutional subjects involved and the choice of legal instruments used. The "direct" intervention measures and strategies based on the negotiation approach go beyond the scope of the work performed (among these, in particular, the so-called "realignment contracts", which reached their definitive configuration only after constant feedback and updating work, started since the late 1980s). However, we will focus, albeit quickly for the specific and limited purposes of the investigation entrusted, on the evolution of measures and strategies of a "fiscal nature", i.e. implying an interference by tax institutions with this phenomenon, and with it a "relationship" between the parties to the negotiating as mentioned earlier relationship and the Financial Administration. This is in order to evaluate, albeit in brief and limited to some more significant measures, the consistency of these interventions with the original rationale and with the superordinate principles, also because of the consequent - and too often neglected - economic implications.

4.1 "Direct" intervention strategies based on tax breaks and substitutive tax regimes: An outline

In Italy, towards the end of the 1990s and the beginning of the new century (that is, while the experience of realignment contracts was still ongoing), to combat the phenomenon of the shadow economy and irregular work more effectively, new "direct" intervention measures and strategies began to be developed, mainly based on a fiscal approach, such as the so-called "emergence programs" and tax incentives for building renovation costs and the purchase of used materials.

The first instrument is still governed today by Law No. 383/2001 (so-called "Tremonti-bis"), amended several times over time but still in force. This law had the objective of encouraging the spontaneous emergence of irregular work through the granting of tax and social security benefits (for further details on the functioning of the tax reduction mechanism provided for by Law No. 383/2001, see Villani, 2002). The advantages envisaged for

entrepreneurs who have resorted to irregular work, failing to fulfil the obligations established by current legislation on tax and social security matters, consist in the regularization of previous years through the payment of a tax in lieu of personal income tax and the income tax of legal persons (today corporate income tax), a substitute contribution on the higher taxable social security related to the declared income from work, and consequent to the declaration of emergence, and the payment of reduced premium rates, for insurance against accidents at work and occupational diseases (Art. 1, Paragraph 2, letter a), of Law No. 383/2001)..

The declaration of emergence, therefore, constitutes an "admission entitlement" to a special tax and social security incentive regime and can also be valid, upon specific request by the entrepreneur, as a proposal for a tax and social security "composition agreement", if presented before the start of any accesses, inspections and checks or of the notification of the assessment or rectification notice. In this case, specifically, the entrepreneur is required to pay a substitute tax for personal income tax and corporate income tax, VAT, IRAP, social security contributions and insurance premiums, to the extent of 8% of the total labour cost declared for each tax period, without the application of penalties and interest (Art. 1, Paragraph 3, of Law No. 383/2001).

For their part, the workers of the companies adhering to the emergence programs can extinguish their tax and social security debts connected to the provision of irregular work for each of the years they intend to regularize through the payment of a substitute contribution, with separate taxation with respect to the remaining taxable amount, without the application of interest or penalties (Art. 1, Paragraph 4, of Law No. 383/2001).

The tax concessions for building renovation costs and for the purchase of used materials, on the other hand, unlike the emergence programmes, had a dual objective: on the one hand, they were intended to discourage recourse to undeclared work through a system of concessions which reduced the threshold of interest of clients in accessing a service that violates tax and social security obligations; on the other hand, they were aimed at supporting investments in the construction sector in times of recession or slowdown in demand. To achieve these objectives, Law No. 449/1997 and the 1999 and 2000 financial laws introduced a tax mechanism that acts through the application of IRPEF and VAT to bring exclusive advantage to those who can legally 29ulfil the order, allocating the production units that continue to be marginalized to resort to the submerged. Numerous other financial laws

then intervened to change the application mechanism of the aforementioned tax benefit, which was extended several times with subsequent provisions and is still operational today (see Budget Law 2022 and Art. 16-bis of Presidential Decree No. 917/86).

4.2 Fiscal strategies of "indirect" intervention: Framework and general profiles

Some intervention strategies, while not directly aimed at emergence, may be able to produce positive effects on irregular work. These tools include, in general, interventions that subordinate the benefits (of a fiscal and/or social security nature) envisaged by the Legislator to the increase in the workforce (new hires), to the use of contractual forms that facilitate entry into the world of work, to the creation of new businesses in poorer or economically disadvantaged territorial areas, in which it is more challenging to create development opportunities or to embark on a path of growth. At the same time, it is easier for forms of irregular work to develop.

In particular, in Italy, starting from the second half of the 1990s, various measures of this type have been implemented, which can basically be classified into five categories: (i) incentives for new employment; (ii) tax breaks aimed at encouraging and facilitating entrepreneurial initiatives; (iii) incentives for investments in disadvantaged areas of the country; (iv) incentives to favour entry into the world of work; (v) fiscal measures (such as the provision of changes to the main elements of the tax, the application of flat-rate regimes, substitute taxes and so on) which form part of the functioning of already structured and consolidated institutes and/or taxes and are aimed to indirectly create an incentive to emerge or a disincentive to enter into irregular employment contracts.

Among the indirect measures of fiscal nature, it is worth mentioning the tax credit for new hires introduced by Art. 7 of the Finance Law for 2001; the tax credit for new investments in disadvantaged areas (the so-called "Visco Sud") according to Art. 1, paragraphs 271 to 279, of the Finance Law for 2007; tax breaks (of various types) "aimed at promoting the creation and growth of new innovative businesses", provided for the first time with Decree-Law no. 179/2012 (but modified, increased and strengthened over the years)[7]; the so-called flat tax of individual VAT numbers and the

[7]These concessions can be classified among the "indirect" tax measures to combat undeclared work, enhancing the significant contribution that innovative *startups* (i.e. newly established companies that

changes to the regulation of the regional tax on productive activities (IRAP) introduced to reduce the cost of labour and the tax wedge borne by companies and to favour the hiring of permanent workers.

The difficulties encountered by businesses during and after the recent economic crisis caused by the COVID-19 pandemic led to a particular and broader spread of irregular work.

To contain the foreseeable repercussions of the health emergency on the country's economic and social system and to ensure adequate income support for those at risk of economic and social hardship in crises, new and specific economic measures have been introduced, both fiscal and non-fiscal, which are also potentially suitable for producing effects beneficial for combating irregular work[8]. Among the fiscal measures of this type, it is worth mentioning the tax credit for sports sponsorships (see Art. 81 of the so-called "August Decree" and Art. 10, Paragraphs 1-2 of the so-called Sostegni-bis Decree), the so-called holiday bonus (which essentially consisted of a tax credit, recognized up to a maximum amount of 500 euros, which can be used to pay for the services offered by tourist accommodation, bed & breakfast and agritourism companies: see Art. 176 of the so-called Relaunch Decree) and the recognition (Art. 79 of the so-called August Decree), only for the 2020 and 2021 tax periods, of the tax credit for the redevelopment and improvement of tourist accommodation facilities hotels under Art. 10 of Legislative Decree No. 83/2014.

Some economic support measures respond to the same logic, however essentially non-fiscal in nature, provided for in the so-called "Decreto Lavoro" in favour of people in impoverished conditions and at risk of social and/or occupational exclusion. Among these, we mention, in particular, the Inclusion allowance (governed by Art. 10 of the Decree as discussed above), the Support for training and work (established by Art. 12 of the Decree), the concessions provided (see Art. 27 of the Decree) for the hiring of the so-called "NEETs" (young people under 30 who are not engaged in instruction, work or training courses), incentives for the hiring of young people under 35 with disabilities (of which Art. 28 of the Decree) and the further reduction

carry out development, production and marketing activities of innovative products or services with high technological value) provide, nowadays, to economic growth and employment, especially of youth.

[8] Indeed, according to ISTAT assessments (2022), these measures produced a strong unobserved reduction in the value of the economy in 2020 (by 14.1% compared to the previous year), which generally affected all components of the phenomenon. Non-regular employment, in particular, recorded a decrease of 18.4% compared to 2019, recording a decrease that is almost double that of the regular one (-9.9%). For further information on the impact of the aforementioned measures, see ISTAT 2022.

(provided for by Art. 39 of the Labour Decree) of 4 percentage points of the social security contributions payable by workers, which is added to that already provided for by the last Budget Law for on 2023.

Without prejudice to the summary survey carried out up to now of the fiscal measures indirectly and vaguely adopted to combat undeclared work, two types of tax interventions with a very significant economic impact have recently come to the attention, and to which the tax Legislator seems to have focused more to combat the spread of undeclared work. We are referring, in particular, to the subsidized tax regime, which replaces the IRPEF, envisaged for VAT holders and to the regulatory changes that have recently changed the structure of the IRAP to obtain a reduction in the cost of labour and the wedge tax levied on companies. The following paragraphs will, therefore, illustrate the discipline envisaged for these measures, analyzing their rationale and the main economic implications.

5. The effects of the introduction of the new flat-rate regime for individual VAT identification numbers

The flat-rate regime (or flat tax) of individual VAT identification numbers (that is, intended for natural persons carrying out business or self-employment activities who meet specific requirements) was introduced in 2015, with the 2015 Stability Law, to bring the tax treatment of self-employed workers and individual entrepreneurs closer to that of dependent workers and pensioners and, in this way, reduce their incentives to evade (tax and social security contributions) and to hire undeclared workers. This regime provided, in particular, that subjects already in business or starting a new business, art or profession could benefit from the 15% substitute tax, provided that in the previous year, they had: (1) achieved revenues not exceeding certain thresholds, differentiated according to the ATECO sector group; (2) sustained expenses for ancillary work, employee work and salaries to collaborators (also hired concerning specific projects) not exceeding 5,000 gross euros; (3) sustained a cost for capital goods (gross of depreciation) not exceeding 20 thousand euros (see Art. 1, Paragraph 64, Law No. 190/2014).

In 2019, new rules for accessing the scheme, as mentioned earlier, were introduced. Indeed, the 2019 Budget Law established that the maximum threshold of revenues and fees should no longer vary according to the ATECO code and, moreover, the elimination of the access requirements

previously envisaged concerning the cost of capital goods and personnel. According to the new rules, therefore, taxpayers who are already in business or starting a new business, art or profession and who have revenues or fees not exceeding 65 thousand euros can benefit from the 15% substitute tax. (Art. 1, co. 9, Law No. 145/2018). With the 2020 Budget Law, the criterion relating to personnel costs was instead restored, allowing access to the 2019 flat-rate scheme only to persons who have incurred expenses for a total gross amount not exceeding 20 thousand euros for employment, work ancillary and remuneration to collaborators, also hired in the manner attributable to a project.

Finally, with the 2023 Budget Law, the Government expanded the number of beneficiaries of this subsidy, introducing the following important innovations: (1) the raising from 65,000 euros to 85,000 euros of the threshold for revenues or fees that allow access to the flat-rate scheme; (2) the immediate obligation to leave the flat-rate regime for taxpayers who exceed the limit of 100,000 euros in revenues or fees during the year; (3) a fixed tax of 15% instead of IRPEF and related surtaxes, to be applied on the portion of income accrued only in 2023 over the highest among those of the previous three-year period (so-called " flat tax incremental"). According to the Government's intentions, these last modifications should have a double effect: to stimulate economic growth, thanks to the raising of the threshold of revenues or compensations that allow access to the flat-rate scheme, and simultaneously, due to the incentive mechanism envisaged with the introduction of the incremental flat tax, to stimulate taxpayers to declare the tax base that had been hidden to return to the "old" flat-rate regime, with significant effects in terms of reducing evasion and irregular work. Above all, with the introduction of the incremental flat tax, the distorting effects produced by the pre-existing regime should be eliminated or reduced, i.e. the impact of self-selection of taxpayers with revenues and fees below the maximum threshold of 65 thousand euros, to benefit from the facilitation provided by the flat-rate scheme. According to Ministry of Economy and Finance technicians, this effect probably depended on taxpayers reducing their productive activity or on a tendency to under-declare revenues to avoid exceeding the threshold described above.

The inspiring rationale of the modifications above is, therefore, undoubtedly appreciable. However, we believe it is our duty to propose some observations below, which should push the Legislator to resort to a less

distortive instrument in order to achieve the even more commendable objectives that have been proposed.

First of all, the possible adverse effects that the measures introduced could produce on IRPEF and the very structure of the tax system as a whole should be taken into consideration. The innovations introduced with the 2023 Budget Law contribute, indeed, to further eroding the income tax base and increasing the system's erratic nature, complexity, and unfairness.

Furthermore, within the group of beneficiaries of the measures, as mentioned earlier, there is the risk of discrimination between those who could be defined as "safeguarded by the flat tax" and those "abandoned to the progressivity of the IRPEF". This effect would certainly arouse strong perplexities and criticisms regarding the constitutional stability of the system, regarding both the principle of ability to pay and that of equality.

Finally, if we consider the tax savings resulting from the application of the incremental flat tax, we can realise that the tax savings would be minimal, so much so that, it is difficult to understand how they can incentivise behaviour aimed at increasing the taxpayer's income. On the other hand, it is more probable, in the event that incremental taxation really does affect workers' choices, that opportunistic behaviours aimed at having income increases every other year will occur[9].

6. Changes to the IRAP regulation and its effects on labour costs and the tax wedge

In recent years, significant regulatory changes have been introduced which have directly influenced the structure of IRAP (for a summary description of only the changes aimed at reducing the so-called "tax wedge" on labour, see Table 6), changing the rate and introducing deductions to encourage permanent employment, and indirectly, through measures to reduce social security contributions which have reduced the wedge borne by the employer between the gross salary of employees and the cost of labour:

– in 2011, the so-called "Salva Italia" manoeuvre (launched with Legislative Decree No. 211/2011) introduced two structural measures, intending to reduce the tax burden on corporate profits (the ACE) and the

[9] In this regard, see the results of some recent simulations, which demonstrate how the changes made to the 2023 Budget Law would produce insignificant tax savings and, therefore, not sufficient to push people to improve their position.

reduction of labour costs[10] obtained through the full deduction of IRAP on labour costs from income taxes;

– in 2012, differentiated territorial measures were introduced in favour of companies located in the Southern regions, which increased the deductions from the IRAP taxable base on the cost of labour in the case of hiring new permanent workers (Art. 1, Paragraphs 484 and 485 of the 2013 Stability Law);

– in 2013, the measures adopted (Art. 1, Paragraph 132 of the Stability Law for 2014) led to a continuation of the manoeuvres aimed at reducing the cost of labour and the tax wedge for the company through the increase of deductions from the IRAP taxable base on labour costs in the case of new permanent hires (see Art. 1, paragraph 132, of the Stability Law for 2014) and a reduction in the IRAP rate (provided for by Art. 2 of the so-called "IRPEF-Spending Review Decree", launched on 26 April 2014);

– the 2015 Stability Law included further amendments to IRAP that were not differentiated at a territorial level: the complete elimination of labour costs from the taxable amount (see Art. 1, Paragraph 20) and the almost complete deduction of social security contributions for three years in favour of companies that take on permanent contracts in 2015 alone (see Art. 1, Paragraphs from 118 to 122);

– the 2016 Stability Law provided (Art. 1, Paragraph 70), starting from the tax period following the one in progress on 31/12/2015, for the exclusion from IRAP of subjects operating in the agricultural sector, small-scale fishing cooperatives and their consortia, and cooperatives and their consortia which mainly provide services in the forestry sector, also in the interest of third parties; the same provision also increased the amounts deductible from IRAP in favour of some more minor subjects, strengthening the deductions in favour of general partnerships and limited partnerships (and equivalent) and natural persons carrying out commercial activities, as well as natural persons and simple companies exercising arts and professions;

[10] The Aid for Economic Growth (ACE) introduced by the so-called "Salva-Italia" manoeuvre is a form of incentive which, by allowing the deduction from taxable income of the notional return on equity capital contributions, intends to favour capital strengthening and corporate restructuring. Basically, it promises facilitated taxation inspired by the well-known ACE (Allowance for Corporate Equity) model, proposed by the Biasco Commission in 2007-2008, which in fact, constitutes a reformulation of the DIT (Dual Income Tax), introduced with Legislative Decree No. 466/1997 (so-called Visco reform) and subsequently repealed by the so-called "100-day manoeuvre" of the so-called second Berlusconi government (Art. 5 of Law No. 383/2001).

– the 2022 Budget Law no longer intervened on the system of deductions from the IRAP tax base but established (Art. 1, Paragraph 8) a critical novelty: The exclusion from IRAP of taxpayers who are natural persons who carry out commercial activities, as well as arts and professions. The exemption concerns individual entrepreneurs and non-associated professionals/artists who have not chosen the flat-rate and advantageous regimes (old minimums) and for whom the requisites of "autonomous organization" are met, a concept that has been gradually consolidating over time through the rulings of the Court of Cassation.

Table 6. Evolution of the IRAP deduction system for the reduction of the so-called "tax wedge"

	Main changes to the labour cost deduction system from taxable base of IRAP envisaged by Legislative Decree No. 446/1997
Law 388/2000 (Finance Law 2001).	For the generality of taxable persons, the deductibility from the taxable base is also foreseen of expenses relating to the disabled (Art. 16, Paragraph 1, letter a).
Law 289/2002 (Finance Law 2003).	Introduction of a further deduction (flat-rate deduction for employees) in favour of small-sized subjects who make use of employees.
Law 311/2004 (Finance Law 2005).	Granted the possibility of deducting (deduction for the increase in the employment base) the cost incurred for workers hired with open-ended contracts in each of the three tax periods following the one in progress as at 31/12/2004, provided that they constitute an increase with respect to the number of employees (hired under the same contract) on average employed in the current tax period as at 31/12/2004 (so-called "basic deduction"). It has been envisaged that, in the depressed areas of the country, the aforesaid deduction for the increase in the employment base is due in double amount (so-called "increased deduction").
Law 296/2006 (Finance Law 2007).	- Introduction of new deductions aimed at reducing the IRAP tax base in the presence of permanent employees. Provision of a new deduction from the IRAP tax base for the hiring of disadvantaged female workers.

Table 6. Evolution of the IRAP deduction system for the reduction of the so-called "tax wedge" (continued)

	Main changes to the labour cost deduction system from taxable base of IRAP envisaged by Legislative Decree No. 446/1997
Law decree 185/2008 (so-called "First anti-crisis law decree").	Provided for the deductibility from income taxes (IRPEF and IRES) of an amount equal to 10% of IRAP , on a flat-rate basis referring to the taxable portion of interest expense (net of interest income) and labour costs for employees or similar.
Law Decree 201/2011 (so-called "Save Italy Decree").	Introduced an analytical deduction from the IRAP income tax relating to personnel expenses.
Law 228/2012 (Stability Law 2013).	Expected increase in IRAP deductions for the reduction of the so-called "tax wedge" (ie the lump-sum deductions provided for new permanent hires) and the additional lump-sum deduction by bracket (envisaged to favour smaller companies).
Law 147/2013 (Stability Law 2014).	Introduction of a new deduction for the increase in the employment base.
Stability Law 2015.	Full deductibility of the labour cost incurred for employees hired with permanent contracts from the IRAP taxable base (Paragraph 20, Art. 1: under Art. 5 of the Stability Decree) and a tax credit of 10% are envisaged of the IRAP liquidated by taxpayers who do not make use of employees (Paragraph 21, Art. 1) . – Exemption from INPS social security contributions for companies that take on new permanent workers in 2015, up to a maximum of 8,060 euros and for a maximum period of 36 months (Paragraphs from 118 to 122, Art. 1: pursuant to Art. 12 of Stability Law). – For the financing of the de-contribution of social security contributions (equal to 1 billion euros for each of the years 2015, 2016 and 2017 and to 500 million euros for the year 2018) provision has been made (Art. 1, Paragraph 122, of the Law of Stability) the use of the resources of the Action and Cohesion Plan, or of the European funds assigned by the European Union and not yet committed as of 09/30/2014.

Source: Stornaiuolo & Villani (2015).

The estimates relating to the economic effects produced by the most significant of the amendments mentioned above, i.e. the elimination of labour costs from the IRAP taxable base, as envisaged by Art. 1, co. 20, of the 2015 Italian Stability Law, have shown (see Tab. 7) a potential substantial reduction in the cost of labour and the tax wedge in favour of businesses. But, as happened in the years in which the tax measures aimed at reducing IRAP were homogeneous throughout the national territory, the entity of these reductions—both in absolute and relative value—was much more significant in favour of companies in the Centre-North of the country (see Stornaiuolo & Villani, 2015).

Table 7. Changes in the marginal cost of labour determined by the maneuvers on the tax wedge, by deductions from the IRAP taxable base and by the reduction of the rate (2014-2015) - Absolute values in euro

	North	Center	Center-North	South
Year 2014 (2014 Stability Law; Law No. 147/2013 + IRPEF Spending Review Decree)				
(a) Gross salary (average values, estimate)	31,730	28,544	30.137	25,488
Contrib . paid by the employer	10.020	9.014	9,517	8.049
Labour cost for the employer net of IRAP	41,750	37,558	39,654	33,537
Base deduction for new occ. (Finance law 2013)	7,500	7,500	7,500	15,000
Additional deduction for new occ. (Stability Law 2014)	15,000	15,000	15,000	10,488
IRAP tax base (net deducted)	9,230	6.044	7,637	-
IRAP revenue net of deductions and contributions (α=0.039)	360	236	298	-
Indirect effect on unit cost	326	316	321	398
Overall effect of IRAP on the marginal cost of labour	686	552	619	398
Marginal cost of labour gross of IRAP	42,436	38.110	40,273	33,935
Employer wedge	10,706	9,566	10.136	8,447
Employer wedge % labour cost	25.23	25.1	25.17	24.892
IRAP tax advantages for businesses	942	913	928	1.151

Table 7. Changes in the marginal cost of labour determined by the maneuvers on the tax wedge, by deductions from the IRAP taxable base and by the reduction of the rate (2014-2015) - Absolute values in euro (continued)

	North	Center	Center-North	South
Year 2015 (Stability Law 2015)				
(a) Gross salary (average values)	31,730	28,544	30.137	25,488
Contribution paid by the employer	10.020	9.014	9,517	8.049
Deduct . of social charges . for new occ. (upper limit, Art. 1, Paragraphs from 118 to 122, of the 2015 Italian Stability Law)	8.060	8.060	8.060	8.049
Contrib. payable by the employer net of deductions on social charges.	1,960	954	1,457	0
IRAP tax base (net deducted)	33,690	29,498	31,594	25,488
IRAP revenue: deduct. full cost of labour (Art. 1, Paragraph 20, of the 2015 Italian Stability Law)	-	-	-	-
Indirect effect on unit cost	338	296	317	303
Overall effect of IRAP on the marginal cost of labour	338	296	317	303
Marginal cost of labour gross of IRAP	34.028	29,794	31,911	25,791
Employer wedge	2,298	1,250	1,774	303
Employer wedge % labour cost	6.75	4.2	5.48	1.17
IRAP tax advantages for businesses (deductions)	1,327	1.162	1,245	1,192

Source: Stornaiuolo & Villani (2015).

Such empirical evidence raises fears that the minor benefits in the reduction of labour costs and the tax wedge, together with other production and financial constraints present in the South (lower value added per employee, higher effective interest rates, credit rationing), can make it more attractive for an entrepreneur to increase the demand for labour in companies located in the Centre-North areas rather than in the South. All this would not lead to a reduction in the rates of irregularity found in this area of the country and would lead to an increase in pre-existing development gaps rather than a decrease.

7. Conclusions

The analysis carried out in the work shows how there has been a progressive specification over the years of the tools and strategies adopted by the Legislator to contrast and prevent the spread of undeclared work and, in particular, irregular work. It should also be noted that, to this end, there seems to be a tendency to use—to an increasingly intense extent—fiscal instruments, both direct and indirect. However, the legislative path undertaken was not always logical and consistent with the inspiring rationale of the measures adopted. It should be pointed out that there are various gaps and critical issues, essentially linked to the lack of awareness of the Legislator about the complex economic implications of the measures adopted from time to time, especially on a fiscal level, to counter the phenomenon of undeclared work. Notable systematic problems, in particular, are attributable to the variety and heterogeneity of the so-called "incentive" tax measures, both when structured through the pervasive use of substitute regimes not coordinated with the "general" IRPEF discipline and when implemented with subtractive measures of the tax whose specific rationale is difficult to grasp, both in terms of the comparison of conformity with the superordinate constitutional principles and in terms of the enucleation of criteria that allow a reasonably foreseeable application[11]. In particular, it was found that the provision and subsequent extension of the flat-rate regime for VAT numbers do not adequately consider the possible adverse effects that the introduced measures could have on IRPEF and on the structure of the tax system as a whole. Much less have the risks of constitutional stability of the system been taken into due consideration concerning both the principle of ability to pay and that of equality.

Furthermore, it is difficult to understand how the measures introduced can encourage virtuous behaviour (e.g., the emergence of previously hidden tax bases and irregular employment relationships), given the smallness of the tax savings that should derive from them.

Finally, it is necessary to underline the Legislator's lack of consideration of the different possible territorial effectiveness of the tax innovations introduced. The estimates relating to the economic effects produced by the

[11] For further information on these profiles (Fiorentino, 2022a, 2022b) where, among other things, it is noted that the Constitutional Court itself (Sentence No. 120/2020) has recently affirmed the need to reiterate and clarify the conceptual distinction—also relevant in terms of constitutionality control—between subtractive tax measures that operate in line with the *ratio* of the tax and those that instead have their own subsidy *ratio*, concretely derogating from the tax to which they access.

changes to the IRAP structure approved in recent years have shown how the homogeneity of the subsidised measures adopted has created a reduction in labour costs for all businesses, wherever they are located, but the reduction of labour costs and tax wedges was lower for firms in the South than for those in the Centre-North, thus reducing the potential positive effect on the demand for labour in these areas of the country (see Stornaiuolo & Villani, 2015). These effects lead us to expect an increase rather than a reduction in the rates of irregularity in employment relationships, albeit geographically diversified, as well as in the pre-existing development gaps between the main macro-areas.

Acknowledgements

The authors appreciate and acknowledge the comments and suggestions from two anonymous reviewers. The authors declare no conflicts of interest. All the authors contributed to the study's conception and design. Salvatore Villani carried out a first descriptive statistical analysis of the sizes of the underground economy, prepared the material for legislative documentation, and performed normative analysis. Stefano Fiorentino dealt with the evolution of fiscal policies and interventions. Edgardo Bucciarelli and Aurora Ascatigno performed the quantitative analysis and other computations after reorganising the data sets and then conducted the final review and editing. The introduction and the conclusions originated from a joint reflection of all authors who commented on previous versions and approved the final manuscript.

References

Bacchetta, M., Bustamante, J.P. (2009), *Globalization and informal jobs in developing countries: A joint study of the International Labour Office and the Secretariat of the World Trade Organization*, WTO Secretariat, Geneva.

Benesty, J., Chen, J., Huang, Y., & Cohen, I. (2009), *Pearson Correlation Coefficient*, in: Noise Reduction in Speech Processing. Springer Topics in Signal Processing, Vol 2. Springer, Heidelberg, DE.

Buehn, A., & Schneider, F.G. (2008), *MIMIC models, cointegration and error correction: An application to the French shadow economy* (No. 2200), CESifo working paper.

Fiorentino, S. (2022a), *L'agevolazione fiscale: riflessioni critiche e spunti ricostruttivi*, Diritto e Pratica Tributaria, 2, 245-280.

Fiorentino, S. (2022b), *The right to advantageous regimes: tax relief*, in A. Carinci and T. Tassani (edited by), *The rights of the tax payer. Principles, protections and defense models*, Giuffrè Francis Lefebvre, Milan, IT.

Gallino, L. (2015), *Il denaro, il debito e la doppia crisi*, Einaudi, Torino.

ISTAT (2022), *The economy not observed in the national accounts - Years 2017-2020*, Rome, 14 October.

Kim, T.K. (2015), *T test as a parametric statistic*, Korean journal of anesthesiology, 68(6), 540-546.

Ministry of Economy and Finance (2022), *Report on the unobserved economy and on tax and social security evasion*, Rome, 19 September 2022.

Ministry of Labour and Social Policies (2022), *National plan to fight undeclared work for the three-year period 2023-2025*, Ministerial Decree No. 221 of 19 December 2022, Rome.

Monda, M. (2012), *L'evasione dei contributi sociali nel settore agricolo*, Agriregionieuropa, VIII, n. 30, Settembre 2012.

Roma, G. (2001), *L'economia sommersa*, Laterza, Bari, IT.

Schneider, F. (2022), *New COVID-related results for estimating the shadow economy in the global economy in 2021 and 2022*, International Economics and Economic Policy, 19(2), 299-313.

Stornaiuolo, G., & Villani, S. (2015), *Changes to the discipline of IRAP and its effects on the labour costs and the tax wedge: A territorial comparison*, Rivista Economica del Mezzogiorno – Trimestrale SVIMEZ XXIX, 1-2, 5-42.

Villani, S. (2002), *Il regime di alternatività fra Tremonti-bis e Visco-Sud*, Rivista della Guardia di Finanza, 4, 1537-1570.

G. & L. E. R., Vol. 28 No. 1, 2024

Piera Cascioli[*], Emiliano Colantonio[†], Donatella Furia[‡], Davide Quaglione[§]

HEALTH AND SCHOOL DROPOUT: UNCERTAINTY OR RECIPROCITY?

Received: 5 December 2022 / Accepted: 26 July 2023

Abstract

It is well known that education plays a central role in modern globalized economies, and it is a strategic strength for the knowledge-based economy. For this reason, among other determinants, early school leaving, otherwise known as dropout, contributes to hindering the development of human capital. Although in Western economies it is common practice to reach a third-level degree, in Italy the phenomenon of dropout, especially at secondary school level, is widespread. It is closely linked to the socio-economic context, which involves aspects of culture and local habits that characterize many regions of the country, specifically in the southern area. The aim of the paper is to deepen knowledge of this topic with regard to obesity as an indicator of poor physical and psychological health which, especially in recent years, has become an important issue involving increasing numbers of young people. We employed a panel vector autoregressive (PVAR) model in first differences to test the dynamic relationships between dropout rate, obesity, and other indicators. The study involved 20 Italian regions for the period 2004 to 2017 (the Italian National Institute of Statistics -ISTAT). The results of our analysis confirm that obesity can lead to an early abandonment of studies since it is known that overweight people are often victims of bullying and, consequently, are prompted to live in isolation.

JEL CLASSIFICATION: I12, I21, C33

KEYWORDS: SCHOOL DROPOUT, HEALTH, PVAR

[*] University of Chieti-Pescara. *Email address*: piera.cascioli@unich.it.

[†] University of Chieti-Pescara. *Email address*: emiliano.colantonio@unich.it.

[‡] University of Chieti-Pescara. *Email address*: donatella.furia@unich.it.

[§] University of Chieti-Pescara. *Email address*: davide.quaglione@unich.it.

1. Introduction

The importance that society attaches to education is the basis for the development of its human capital. Indeed, education is one of the major factors capable of increasing the productivity and competitiveness of a country, generating economic growth as the first material result, and representing a fundamental need for expanding the number of people able to participate in an inclusive, social life.

In this regard, the problems related to education and human capital and, more generally, of economic development are some of the most crucial concerns at the international level, attracting not only growing attention from the institutions of underdeveloped countries but arousing just as much concern among the advanced countries. Among the latter, Italy is currently struggling with a 'new' industrial revolution triggered by digital technologies. Education plays a key role in this context due to the growing importance of the information age and the knowledge economy. Accordingly, it is essential to reconcile the speed of the technological changes taking place with the slower pace of education. This is aimed at widening the audience of those who complete the education cycle in order to avoid falling behind and increasing the educational gaps between countries. Although in Western economies it is common practice to reach a third-level degree, in Italy the school dropout rate, especially at secondary school level, is widespread and closely linked to the socio-economic context which involves aspects of culture and local habits that characterize many regions of the country, specifically in the southern area (Colombo, 2019). This negatively reflects the level of education achieved. Indeed, about 44.5% of young people aged between 25 and 35 reach the third level of education in the most developed countries; this percentage drops to 27.7% in Italy (OECD database). This data is alarming due to the negative effects of school dropout in terms of economic growth and development.

According to the relevant literature (Cook-Gumperz, 1986; Coleman, 1988; Dika & Singh, 2002; De Witte et al., 2013), the causes of school dropout are attributable mainly to the family environment and, in particular, to the lack of family support of young people, the role and quality of institutions and the school system, the teachers' distrust of students that inevitably affects the teacher-student relationship, the absence of didactic and educational programmes especially for children with disabilities, inequalities affecting educational attainment, the local economic situation, crime and consequent marginalization, social capital and social participation, and health, especially

referring to the use of alcohol and drugs. As regards the latter, there are programmes, including the "Empowerment Theory" and the "Youth Empowerment Solutions for Positive Futures" (YES-PF), which promote actions to improve the health conditions of young people by helping them to gain confidence, think critically, take action to address stressful situations, and reduce drug use (Zimmerman, 1995; Zimmerman, 2000; Zimmerman, 2018).

Some recent studies have investigated the effect of obesity on the level of education achieved by identifying an association between childhood obesity and low educational level in early adulthood, also with reference to gender differences (Hagman et al., 2017; Levasseur, 2020; Classen, 2017).

The aim of the paper is to investigate the most important factors that can lead to an increase in school dropout, focusing, in particular, on the role of obesity as an indicator of poor physical and psychological health which, especially in recent years, has become an important issue involving more and more young people.

2. Empirical analysis

2.1 Methodology and model specification

The purpose of the analysis is to highlight the role of some determinants of the dropout phenomenon, specifically obesity, as an indicator of poor physical and psychological health, in a panel of 20 Italian regions, using the longest timespan possible from 2004 to 2017. Our empirical strategy is based on the PVAR approach, combining the traditional VAR, which treats all the variables in the system as endogenous, with the panel data approach, which borrows strength from the cross-sectional dimension and focuses on bidirectional effects. Following the previously revised literature, we have introduced a model based on the variables listed in Table 1.

Table 1. Data description and sources.

Variable	Definition	Source
DROPOUT	Dropout rate at the end of the first year of upper secondary school (dropouts are based on the total number of students enrolled in the first year of upper secondary school) (%)	ISTAT
VOLUNT	Persons aged 14 years and over who have carried out free activities for voluntary associations in the last 12 months (%)	ISTAT
GDP	GDP per capita using constant 2010 prices (euros)	ISTAT
SPEDU	Final expenditures on education by public administrations divided by the total population (euros)	ISTAT (per capita)
CRIME	Perception of families regarding the risk of crime in the area in which they live, namely, families who feel very or fairly uncomfortable regarding the risk of crime in the area where they live out of the total number of families	ISTAT
OBESITY	Standardized proportion with the European population in 2013 of people aged 18 and over overweight or obese on the total of people aged 18 and over. The indicator refers to the World Health Organization (WHO) classification of the Body Mass Index (BMI: ratio between weight, in kg, and the square of height in meters).	ISTAT

We are aware that the variables chosen are not an exhaustive explanation of the phenomenon of school dropout. It is, however, a preliminary analysis which provides a basis for a future deeper investigation of the subject. The limitations of this study suggest, in fact, the adoption of further indicators to focus on the investigation of the relationship between school dropout and health.

Following Love and Zicchino (2006), we introduced the specified PVAR model:

$$X_{it} = f_i + \Gamma(L)X_{it} + \varepsilon_{it} \quad (1)$$

where X_{it} represents the vector of stationary variables in our analysis, $\Gamma(L)X_{it}$

is a square matrix of polynomials in the lag operator, and ε_{it} is the random error term (later, Δ denotes the first difference operator). The descriptive statistics for the variables are reported in Table 2.

Table 2. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
DROPOUT	280	9.44	2.94	4.03	19.24
VOLUNT	280	9.80	3.93	4.40	23.96
GDP	280	25961.50	6579.89	15309.73	36892.29
SPEDU	280	1846.52	170.68	1365.68	2366.22
CRIME	280	25.87	10.82	5.15	53.91
OBESITY	260	45.42	4.43	36.70	54.40

For obesity, there are only 260 comments, as one observation is missing for each of the 20 regions. Missing data, however, are not a problem for the econometric analysis (PVAR).

2.2 Empirical testing

Macroeconomic variables are usually characterized by non-stationarity, which can cause spurious results in the context of VAR and panel analyses. A possible solution is the use of the first-difference transformation. The first step of the empirical analysis is to check the stationarity of the various series using both first and second generation unit root tests. Specifically, the IPS tests (Im & Pesaran, 2011; Im et al., 2003), the MW tests (Maddala & Wu, 1999) and the Pesaran tests (Pesaran, 2007) have been used. All tests are characterized by a null hypothesis that assumes a unit root. The results of these panel unit root tests are reported in Table 3 (variables in level) and Table 4 (variables in first differences).

Table 3. Unit root tests: variables in level

Variable	IPS W-t-bar	MW	Pesaran Z-t-bar
DROPOUT	1.6597	14.633	-4.768***
VOLUNT	-4.1831***	63.648***	-4.835***
GDP	1.1299	23.593	0.485
SPEDU	-7.9675***	128.653***	-2.9***
CRIME	-4.2462***	80.035***	-1.505**
OBESITY	-7.4205***	70.711***	-4.42***

Note: *p < 0.1; **p < 0.05; ***p < 0.01

Table 4. Unit root tests: variables in first differences

Variable	IPS W-t-bar	MW	Pesaran Z-t-bar
ΔDROPOUT	-10.5101***	126.143***	-7.259***
ΔVOLUNT	-15.7823***	222.103***	-6.355***
ΔGDP	-7.201***	134.151***	-1.511**
ΔSPEDU	-6.5411***	123.482***	-5.578***
ΔCRIME	-10.5467***	190.414***	-5.787***
ΔOBESITY	-13.7277***	181.971***	-4.728***

Note: *p < 0.1; **p < 0.05; ***p < 0.01

The results show that not all the variables are stationary in level. However, all the chosen variables are stationary after the first difference: all the series are integrated of order one (I(1)).

Table 5 shows the results of the cointegration tests introduced by Westerlund (2007). These tests assume the null hypothesis of no cointegration, which cannot be rejected based on the results of all four tests. Therefore, the empirical characteristics of the chosen variables require estimation in first differences, as the variables in level are not cointegrated.

Table 5. Cointegration tests

Statistic	Value	p-value
G_τ	-6.013	0.49
G_α	-0.378	0.34

P_τ	-4.673	0.41
P_α	-0.344	0.40

Note: p-value are robust critical values obtained through bootstrapping with 100 replications

We examined the correlation matrix and the variance inflation factor (VIF) to assess whether collinearity and multicollinearity were a concern for our analysis. The statistics are shown in Table 6 (ΔDROPUT is used as dependent variable). Given the low correlation values and the low VIF and mean VIF values, we can conclude that collinearity and multicollinearity were not a concern.

Table 6. Correlation matrices and VIF statistics

	ΔDROPOUT	ΔVOLUNT	ΔGDP	ΔSPEDU	ΔCRIME	ΔOBESITY
ΔDROPOUT	1.000					
ΔVOLUNT	0.159	1.000				
ΔGDP	0.038	0.114	1.000			
ΔSPEDU	0.215	0.101	0.042	1.000		
ΔCRIME	-0.010	0.161	0.174	-0.024	1.000	
ΔOBESITY	0.009	-0.011	-0.062	0.083	-0.119	1.000
VIF		1.05	1.04	1.02	1.07	1.02
Mean VIF	1.04					

The final preliminary step is lag order selection. Following the econometric literature, the optimal lag length should minimize the moment model selection criteria developed by Andrews & Lu (2001): the Moment Bayesian Information Criterion (MBIC), Moment Akaike's Information Criterion (MAIC), and Moment Hannan and Quinn Information Criterion (MQIC). Based on the three model selection criteria, a first order PVAR model was chosen.

Table 7. Lag order selection criteria

Lag	MBIC	MAIC	MQIC
1	-283.993	-62.581	-152.489
2	-118.699	-7.994	-52.948

We removed the deterministic fixed effects f_i in Eq. (1) by using the first-difference transformation. As well known, this method may generate the so-called Nickell bias (Nickell, 1981) due to the correlation between the first-

differenced lag and the first-differenced error term, which both depend on ε_{it-1}. In this context, estimating the model using OLS will produce biased and inconsistent results (Baltagi, 2008). We used forward mean-differencing, also referred to as the Helmert transformation (Love & Zicchino, 2006; Arellano & Bover, 1995) to overcome this problem. The system may thus be estimated using the Generalized Method of Moments and the lagged values of regressors can be used as instruments.

2.3 Results and discussion

The first order PVAR results are shown in Table 8.

Table 8. PVAR results

	Dependent Variables					
Independent Variables	ΔDROP	ΔVOLU	ΔGDP	ΔSPEDU	ΔCRIME	ΔOBESITY
ΔDROP	-0.234**	-0.219**	33.445	13.322***	1.809***	0.143*
ΔVOLUNT	-0.500***	-0.574***	-520.338***	-27.768***	0.722	-0.340***
ΔGDP	0.000	0.000**	0.680***	-0.001	0.002	0.000
ΔSPEDU	0.007**	0.002	-0.350	-0.001	-0.027	0.005*
ΔCRIME	0.016	-0.143***	-134.455***	3.696***	-0.608***	-0.058*
ΔOBESITY	0.754***	0.005	-597.608***	19.649***	-5.236***	-0.621***

Note: *p < 0.1; **p < 0.05; ***p < 0.01

An increase in volunteering seems to counteract the dropout phenomenon; conversely, an increase in education spending seems ineffective. This result offers a number of points to consider and deserves further study. In fact, it suggests that school dropout has deeper roots and an increase in expenditure on education itself is not enough to combat it unless it is properly targeted and finalized. Together with the other results of the model, it may be appropriate in future research to consider the above expenditure in its two components, cash transfers and benefits in kind, to assess which is more effective, or also to consider the delayed effects of an increase in expenditure on education. An increase in obesity seems to favour the increase in dropouts, probably due to isolation, discrimination, and bullying. An increase in dropouts also generates a reduction in voluntary activities, as well as a higher crime rate. Volunteering is instead favoured by the increase in income. Crime and obesity (or more generally psycho-physical discomfort) can cause an economic slowdown. A higher number of dropouts should increase spending on education. However,

this has been ineffective so far against the phenomenon, as previously stated before. Finally, the increase in the number of dropouts is also associated with an increase in obesity.

Table 9 reports the variance decomposition, which assesses the relative weight of shocks in one variable to variation in other variables over time. The forecast error variance decomposition follows the Cholesky decomposition method and was performed using 1000 Monte Carlo simulations for ten periods. The table shows that each variable is mainly influenced by its lag. In particular, DROPOUT is mainly determined by OBESITY (39%) on average during a ten-year period.

Table 9. Variance decomposition analysis

	Impulse Variable					
Response Variable	ΔDROPOUT	ΔVOLUNT	ΔGDP	ΔSPEDU	ΔCRIME	ΔOBESITY
ΔDROPOUT	0.43	0.03	0.09	0.01	0.05	0.39
ΔVOLUNT	0.14	0.33	0.06	0.01	0.16	0.29
ΔGDP	0.18	0.07	0.25	0.00	0.10	0.40
ΔSPEDU	0.21	0.08	0.08	0.24	0.06	0.32
ΔCRIME	0.25	0.02	0.12	0.01	0.16	0.44
ΔOBESITY	0.17	0.04	0.10	0.01	0.07	0.61

Note: Variation in Response Variable explained by the Impulse Variables in the columns (10 periods ahead)

3. Conclusions and policy implications

The above findings confirm that school dropout is a multidimensional process. In this regard, one could argue that school dropout is a phenomenon or a series of symptoms that might be explained based on a variety of reasons, none of which are compartmentalized. There is relatively little research to determine the reasons why so many people, especially children, drop out of schools in Italy. This, in turn, might lead to a tendency to point to single causes or explanations. Nevertheless, our analysis shows that an increase in volunteering seems to counteract the phenomenon of early school-leaving, most likely due to social initiatives promoting training, even if a high school dropout rate negatively affects participation in social activities and, at the same time, leads to a higher crime rate. On the contrary, an increase in spending on education seems ineffective and, even if existing, often the investments made are not functional in terms of quality. Obesity also causes an increase in school dropout, probably due to situations of isolation, bullying,

and discrimination.

It is important, therefore, that the State invests in the teachers' training. They are key figures in schools, especially in lower grades, which makes them able to recognize and deal with situations of distress, help children in difficulty, and encourage them to continue their studies.

The State should also better support, at an economic level, all those families that have the desire to educate their children, but because of scarce finances and, as unfortunately happens today, the lack of employment, fail to provide adequate health care. The relationship between psycho-physical hardship and education, especially at non-low levels of education, can push children to lead a criminal life. This has negative consequences at a microeconomic level, drastically reducing the opportunities for a better individual life, and at a macroeconomic level, slowing down the process of development of the country.

The limit of this analysis is that the indicators considered are not exhaustive to explain a complex phenomenon such as school dropout as different and additional aspects may push young people to leave school early. However, the results of the analysis specifically highlight the existence of a two-way relationship between obesity and school dropout that deserves further investigation.

Future research may implement different models to consider other factors that can slow the dropout rate in Italy, a theme partly treated in a recent work with particular reference to additional indicators of the state of health of young people.

References

Andrews, D.W.K., & Lu, B. (2001), *Consistent model and moment selection procedures for GMM estimation with application to dynamic panel data models,* Journal of Econometrics, 101, 123-164.

Arellano, M., & Bover, O. (1995), *Another look at the instrumental variable estimator of error-components models*, Journal of Econometrics, 68, 29-52.

Baltagi, B. (2008), *Econometric analysis of panel data*, John Wiley & Sons.

Classen, T. (2017), *Changes over time in the relationship of obesity to education accumulation*, Eastern Economic Journal, 43(3), 496-519.

Coleman, J. (1988), *Social capital in the creation of human capital.* American Journal of Sociology, 94 (issue supplement), S95-S120.

Colombo, M. (2019), *Policy against dropout in Italy*, Central European Journal of Educational Research, 1(1), 1-9.

Cook-Gumperz, J. (1986), *The social construction of literacy*, Cambridge University Press, Cambridge (UK).

De Witte, K., Cabus, S., Thyssen, G., Groot, W., & van den Brink, H.M. (2013), *A critical review of the literature on school dropout*, Educational Research Review, 10, 13-28.

Dika, S.L., & Singh, K. (2002), *Applications of social capital in educational literature: A critical synthesis*, Review of Educational Research, 72(1), 31-60.

Hagman, E., Danielsson, P., Brandt, L., Svensson, V., Ekbom, A., & Marcus, C. (2017), *Childhood obesity, obesity treatment outcome, and achieved education: a prospective cohort study*, Journal of Adolescent Health, 61(4), 508-513.

Im, K.S., Pesaran, M.H., & Shin, Y. (2003), *Testing for unit roots in heterogeneous panels*, Journal of Econometrics, 115, 53-74.

Im, K.S., & Pesaran, M.H. (2011), *On the Panel Unit Root Tests Using Nonlinear Instrumental Variables*, SSRN Electron. J. https://doi.org/10.2139/ssrn.482463.

Levasseur, P. (2020), *'Fat black sheep': Educational penalties of childhood obesity in an emerging country*, Public Health Nutrition, 23(18), 3394-3408.

Love, I., & Zicchino, L. (2006), *Financial development and dynamic investment behavior: Evidence from panel VAR*, The Quarterly Review of Economics and Finance, 46(2), 190-210.

Maddala, G.S., & Wu, S. (1999), *A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test*, Oxford Bulletin of Economics and statistics, 61, 631-652.

Nickell, S. (1981), *Biases in dynamic models with fixed effects. Econometrica*, Journal of the Econometric Society, 49, 1417-1426.

Pesaran, H. (2007), *A simple panel unit root test in the presence of cross-section dependence*, Journal of Applied Economics, 222, 265-312.

Westerlund, J. (2007), *Testing for error correction in panel data*, Oxford Bulletin of Economics and Statistics, 696, 709-748.

Zimmerman, M.A., Eisman, A.B., Reischl, T.M., Morrel-Samuels, S., Stoddard, S., Miller, A.L., & Rupp, L. (2018), *Youth empowerment solutions: Evaluation of an after-school program to engage middle school students in community change*, Health Education & Behavior, 45(1), 20-31.

Zimmerman, M.A. (2000), *Empowerment theory*, in Handbook of

community psychology, 43-63, Springer, Boston, MA.

Zimmerman, M.A. (1995), *Psychological empowerment: Issues and illustrations*, American Journal of Community Psychology, 23(5), 581-599.

Ms. Saumya Gaur[1], Dr. Bharti Shukla[2], Er. Bijendra Kumar Pushkar[3]

INTERACTIVE MARKETING STRATEGIES: A NEW APPROACH TOWARDS POSITIVE CONSUMER BUYING BEHAVIOR

Received: 16 September 2023 / Accepted: 25 June 2024

Abstract

Conventionally, when there is talk about advertising, it only flowed in one direction. While this is known that one-way communication random initiate a product dialogue; rather, it just carries a message to customers, who can accept or reject it without having full information. But in recently the discipline of marketing is rapidly changing and growing with the advent of internet. The new study focuses on a combination of factors which are changing marketing in fundamental ways. Customer engagement, interactive content, permission marketing, personalization, direct response marketing, service quality/relationship marketing, behavioral targeting, and enhanced user experience are all examples of interactive marketing strategies that have a significant impact on customer engagement, buying behavior, and satisfaction. The study takes primary data from 252 respondents through online survey, which was then analyzed using Pearson's Correlation, Regression, and ANOVA using IBM SPSS Software 21. The main objective of the research is to look into interactive marketing tactics and practices that businesses may employ to respond to ongoing developments in marketing to stimulus a consumer's purchasing decisions via customer engagement and to enhance customer satisfaction.

[1] Management Student, Department of Management Studies, Madan Mohan Malaviya University of Technology, Gorakhpur, Uttar Pradesh -273010, Email ID- gaursaumya14995@gmail.com, +91 7784074080

22Assistant Professor, Department of Management Studies, Madan Mohan Malaviya University of Technology, Gorakhpur, bsmba@mmmut.ac.in, +918318309525, https://www.researchgate.net/profile/Dr-Shukla-4; Orcid Id:0000-0002-6400-265X.

[3] Assistant Professor, Department of Management Studies, Madan Mohan Malaviya University of Technology, Gorakhpur, bkpmba@mmmut.ac.in, +918381912495; https://www.researchgate.net/profile/Bijendra-Pushkar; Orcid Id: 0000-0002-7272-664X.

JEL CLASSIFICATION: M31, D12, C836

KEYWORDS: CUSTOMER SATISFACTION, BUYING BEHAVIOR, PERSONALIZATION, CUSTOMER ENGAGEMENT, RELATIONSHIP BUILDING

1. Introduction

Advertising has traditionally flowed in one direction. A marketer will create an advertisement, purchase ad space, and then wait for the results to appear in the cash register. This one-way communication doesn't start a conversation about a product; instead, it merely sends a message to customers, who can accept or reject it. Today with increasing digital-savvy consumers and customer expectations, traditional marketing strategies no longer serve the function of increasing consumer engagement. Customers now expect to be welcomed and be respected participants in the brand they love. Interactive Marketing is one such Digital marketing technique used by the marketers with an aim of increasing customer engagement. Interactive Marketing not only attracts customers but also enables them to actively participate in company's marketing strategy by paving way for consumer empowerment. Customers express their preferences through interactive marketing, allowing marketers to create more relevant marketing messages. Through Interactive Marketing, marketing has moved from a transaction-based effort to a conversation. Because consumers can join in a discourse about their favorite items, this communication leads to higher customer satisfaction and longer brand loyalty.

Interactive marketing is a subset of digital marketing that entails a more sophisticated level of engagement between the brand and the user. The primary distinction between interactive and static marketing is that interactive marketing is completely driven by user data and behavior.

According to John Deighton "the ability to address an individual and the ability to gather and remember the response of that individual" leading to "the ability to address that individual once ore in a way that takes into account his or her unique response" (Deighton & Kornfeld, 2009). Interactive Marketing is a process through which marketers create interest in customers for a product or service through interactive ways of communication. Generally, interactive marketing better meets customer's needs because companies act in response to customer actions. The ability to remember what customer has said has become easier by the collection of customer information online. In response

of the audience's actions the marketer then formulates his marketing Strategies.

Because they already know what their customers want, companies that use interactive marketing successfully reduce risk and improve sales. Interactive marketing, when done correctly, creates a personalized experience that leads to longer site visits and more transactions. There are various advantages to interactive marketing, including increased sales, more consumer happiness, and cheaper marketing expenses (It is more cost-effective to keep a customer than to acquire a new one). Companies can use interactive marketing to get to know their customers better, provide better offers and recommendations, and remove the need for them to repeat themselves, all while using an automated approach (gives customers the recommendations they want based on their actions).

2. Literature review

This section offers a thorough examination of the extant literature on the issue. The research are displayed in chronological order, with the most recent studies appearing first, followed by the subsequent studies. Research gaps have been identified, and suggestions have been suggested.

2.1 Moderating Variables or Demographic Factors

Moderating variable or age, gender and income have significant impact on buying decision. It is highlighted in few research that young Indian has a positive influence on the product purchase decision (Maney & Soney, 2021). Here many times buying may get affected by age. And income obviously playing a critical role in buying decision making. Few research shows that lifestyle and demographic variables affects buying decisions (Jain, 2020).

H1- Buying Decision is influenced by Moderating Variables like Income and Age.

Celebrity Endorsement

Celebrity endorsements are certainly an efficient way of marketing communication. The customer attitude and buying behavior influence by endorsers. And this is the reason a marketers must make a crucial decision on celebrity endorsements (Knoll & Matthes, 2017). Celebrities who have some expertise in that field and are considered to be trustworthy, may positively influences the purchase intention (Adam & Hussain, 2017). There is a positive impact of celebrity endorsement on the buying behavior of

consumers. There are various parameters like attractiveness, credibility and image of celebrity among the public. (Baheti, Raguvanshi, & Toshniwal, 2023). People get more attracted towards celebrity endorsed advertisements than the ones that doesn't have celebrities into them which ultimately leads them to recall the products (cosmetics) much easier because celebrities appeared into those advertisements (Adam & Hussain, 2017) .

H2 - Celebrities endorsement influences customer's buying decision.

Customer Feedback and Relationship Marketing

According to Berry (2002), relationship marketing is a good technique for recruiting new consumers, retaining existing customers, and improving client relationships. Both field service marketing and industrial marketing have embraced the concept of relationship marketing. The effective implementation of Relationship Marketing strategies along with regular feedback mechanism in banks certainly will result in quality services, positive-word-of-mouth, positive switching barriers and perceived-risk towards alternatives (Ganaie & Bhat, 2023).

H3 - Customer feedbacks have a significant impact on buying decision of customers.

Personalization and Information Sharing (Privacy Concerns/ Permission Marketing)

Interactive Marketing Contributes to Customer Satisfaction. Customer satisfaction is aided by interactive marketing. Trust, relationship commitment, quality of personnel, quality of atmosphere, familiarity, personalizing services, and complaint handling are the seven elements that support interactive marketing (Dushyenthan, 2012). Websites can use information from on-site surveys and "the trails users leave as they browse through a website" to collect and update customer preferences, which can then be used to tailor interactions like permission-based email communication. If consumers are very concerned about their privacy, the negative effects can at least be compensated for by designing interactive marketing content that fits their needs. The same attenuating interaction effect can be observed when both expected entertaining content and privacy concerns are pronounced. As soon as individuals are concerned about their personal data, the strong positive

effect of anticipated entertainment on the willingness to grant permission will be mitigated. (Kraffta, Arden, & Verhoef, 2017).

H4 - Customization has a significant impact on Buying Decision of customers.

Communication (promotion) for customer participation/ engagement

(Deighton & Kornfeld, 2009) Claim that consumer-controlled, interactive communication is replacing marketer-directed, one-way communication (Promotion) and that the new marketplace promotes more participatory, honest, and less directive marketing methods. Consumers are becoming increasingly important in the marketplace and there is more focus on customer participation in recent marketing strategies to make it more interactive and engaging. Study conducted by (Sicilia & Palazon, 2023) reveal that integration efforts at a communication level should be added to integration efforts at a channel level to better capture their potential influence on customer engagement behavior, Which leads better promotional activities.

H5 - Promotional offers has significant impact on customer satisfaction.

Some more important Factors are:

Customer heterogeneity

(Ansari & Mela, 2003) show that individual customization helps to accommodate consumer choice heterogeneity, resulting in increased web site traffic and better consumer targeting.

Service quality

(Bolton & Saxena-Iyer, 2009) Stated that Interactive services are those that allow customers and businesses to interact in some way. Customers may interact with a company's technology, procedures, and people during the design and delivery of services, thereby directly influencing service quality.

Research Gap Identified after Literature Review

- Interactive Marketing requires an amazing understanding of Human Behavior (Consumer Behavior).
- Interactive Marketing is not possible without data collection.
- Consumers may face problems of Security and Privacy.
- Customers are prone to be affected by another user’s negative comment.

Objectives of the study

This research is focused on fulfilling the below-mentioned purposes:

1. Study of the Factors that affect Interactive Marketing strategies.
2. Impact of Interactive Marketing on Consumer Buying Behavior and Satisfaction

3. Methodology adpoted

3.1 Survey instrument

A standardized questionnaire was created for the survey, which included questions about gender, age, occupation, education, monthly household income, and marital status, which indicates demographic aspects. The questionnaire was divided into several sections. The first section dealt with socioeconomic, demographic, and geographic issues. The remaining sections of the questionnaire were all matched with specific characteristics that influenced interactive marketing, such as purchasing power, customer engagement, interactive content, and communication channel employed, among others.

To check questionnaire language and understanding of consumers a pilot study on 25 people was conducted.

The collected data was statistically analyzed using IBM SPSS 21 software. The relationship between numerous interactive marketing parameters was investigated using regression analysis with the help of Anova testing to know the impact of interactive marketing and Pearson's correlation to the existing relationships between variables.

In order to complete this project, a graphical representation of the response data was also necessary. Closed-ended and Likert Scale (a 5-point scale consisting of remarks on Interactive Marketing Strategies employed by brands) questionnaires were utilized in this study. For Likert Scale-based measuring items, "Strongly Disagree" was labelled as "1," and so on until "5", which is reserved for "Strongly Agree."

Data Sources- Both Primary (questionnaire) and Secondary data (research papers, articles, journals, books etc.) sources were used.

Data Collection- The data was gathered from Eastern Uttar Pradesh, India, using the questionnaire that had been designed. Consumers were chosen at random with the help of convenience sampling as the data collection method and were contacted to complete the survey. Over the course of two months, the data was collected. Three hundred and fifty people were contacted and

asked to fill out the survey form, with 252 people completing the entire questionnaire. To compare the data collected from 252 respondents, various statistical methods were used.

3.2 Data analysis and interpretation (Source: Primary Data)

Respondents' demographics are as follows:

1. Age

Table 1.

	Frequency	**Percentage**
Less Than 25	133	52.8
25-35 Yrs.	90	35.7
36-45 Yrs	22	8.7
More Than 45	7	2.8
Total	252	100.0

Majority age of respondents are less than 25 and below 35 which showing that youngsters taking more seriously interactive marketing communication and paying attention.

2. A company launches different interactive promotional schemes on its product. Which of the following methods will largely impact my buying decision?

Table 2.

	Frequency	Percentage
Discount on the product on sharing promotional scheme with 50 contacts	85	33.7
Free Home delivery service for the product	112	44.4
Free product on the purchase of a certain amount of product	55	21.8
Total	252	100.0

Interpretation - Receiving free delivery from brands influenced the buying decision of the majority of respondents (112 out of 252). While a free product with the purchase of a specified amount of goods and a discount on the product influenced the purchasing behavior of some of the respondents

3. I like to buy more often from a brand if I get an additional discount from it on my birthday or other occasion.

Table 3.

	Frequency	**Percentage**
Strongly Disagree	11	4.4
Disagree	22	8.7
Neutral	38	15.1
Agree	92	36.5
Strongly Agree	89	35.3
Total	252	100.0

Interpretation - From the above data it can deduce that for majority of respondents receiving a special discount on their birthday from a brand influenced the majority of respondents' purchase decisions.

4. Income of respondents

Table 4.

	Frequency	**Percentage**
Less than 3 Lakhs	170	67.5
3 Lakhs- 5 Lakhs	45	17.9
5 Lakhs – 7 Lakhs	20	7.9
Above 7 Lakhs	17	6.7
Total	252	100.0

Interpretation - The above data depicts that majority of respondents prefer visiting a store, whose staff are very supportive and friendly.

5. I prefer visiting a store whose staff are very supportive and friendly

Table 5.

	Frequency	**Percentage**
Strongly Disagree	9	3.6
Disagree	5	2.0
Neutral	22	8.7
Agree	112	44.4
Strongly Agree	104	41.3
Total	252	100.0

Interpretation - The above data depicts that majority of respondents prefer visiting a store, whose staff are very supportive and friendly.

6. I recommend a brand/store/website to my friends and family if I find its product and service good.

Tab. 6

	Frequency	**Percentage**
Strongly Disagree	12	4.8
Disagree	9	3.6
Neutral	25	9.9
Agree	103	40.9
Strongly Agree	103	40.9
Total	252	100.0

Interpretation - The above chart shows that majority of respondents recommend a brand/store/website to my friends and family.

7. My decision of buying a product is largely affected by the reviews of the product.

Table 7

	Frequency	**Percentage**
Strongly Disagree	9	3.6
Disagree	8	3.2
Neutral	25	9.9
Agree	101	40.1
Strongly Agree	109	43.3
Total	252	100.0

Interpretation - The above chart shows that for the majority of respondents the reviews about product largely affects their purchasing decision.

8. I would love to shop from brands which may prepare customized products for me.

Table 8

	Frequency	**Percentage**
Strongly Disagree	11	4.4
Disagree	6	2.4
Neutral	38	15.1
Agree	111	44.0
Strongly Agree	86	34.1
Total	252	100.0

Interpretation - There is an impact of personalization on buying behavior customer satisfaction. From the above Data, it can interpret that

Personalization customization motivates people to buy from a brand more frequently, according to 44 % and 34.1 % of survey respondents, respectively.

FINDINGS

H1- Buying Decision is influenced by Moderating Variables like Income and Age.

Table 9.

Correlations Analysis of Hypothesis 1

		Age	buying decision
Age	Pearson Correlation	1	0.174**
	Sig. (2-tailed)		.006
	N	252	252
A company launches different interactive promotional schemes on its product. Which of the following methods will largely impact your buying decision?	Pearson Correlation	0.174**	1
	Sig. (2-tailed)	.006	
	N	252	252

**. Correlation is significant at the 0.01 level (2-tailed).

Source - IBM SPSS 21

It is clear from Table that there is a positive connection between demographic factors such as age and income and purchasing decisions, with a value of 0.174 and a 0.06 level significance.

Table 10.

Correlations Analysis of Hypothesis 1

		Income	buying decision
Income	Pearson Correlation	1	0.131*
	Sig. (2-tailed)		.038
	N	252	252
	Pearson Correlation	0.131*	1
	Sig. (2-tailed)	.038	
	N	252	252

*. Correlation is significant at the 0.05 level (2-tailed).

From Table it is seen that a positive connection between Income and purchasing decisions, with a value of 0.131 and a 0.038 level significance. So, first hypothesis that Buying Decision is influenced by Moderating Variables like Income and Age accepted.

Different interactive promotional schemes of company largely impact your buying decision?

H2 - Celebrities endorsement influences customer's buying decision.

Table 11.

Correlation Analysis of Hypothesis 2

		Celebrity endorsement
Different interactive promotional schemes of company largely impact your buying decision?	Pearson Correlation	-.254**
	Sig. (2-tailed)	0.000
	N	252

**. Correlation is significant at the 0.01 level (2-tailed).

Table shows Pearson's correlation analysis between factors such as Celebrity endorsement and buying decision have negative relation. This is possible as there may be some other factors too, involve in buying process. Hypothesis 2 Rejected.

H3 - Customer feedbacks have a significant impact on buying decision of customers.

Table 12.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	106.459	1	106.459	198.810	.000[b]
	Residual	133.870	250	.535		
	Total	240.329	251			

a. Dependent Variable: [My decision of buying a product is largely affected by the reviews of the product]

b. Predictors: (Constant), [I recommend a brand/store/website to my friends and family if I find its products and service good] Customer Feedback/ Recommendation

Source- IBM SPSS 21

According to the numerical numbers in Table 12, the value of F, which is 198.810, indicates statistical significance because the p-value, which is 0.000, is within the 0.05 significance limit, implying that the regression model is overall fit.

- *Customer Recommendation is highly correlated with Buying Decision*

Table 13.

Correlation Analysis for hypothesis 3

		Customer Recommendation	Buying Decision
[I recommend a brand/store/website to my friends and family if I find its	Pearson Correlation	1	.666**
	Sig. (2-tailed)		.000

products and service good] Customer Recommendation	N	252	252
[My decision of buying a product is largely affected by the reviews of the product] Buying Decision	Pearson Correlation	.666**	1
	Sig. (2-tailed)	.000	
	N	252	252

**. Correlation is significant at the 0.01 level (2-tailed).

Table 13 displays Pearson's correlation analysis between factors such as Customer feedback and Buying Decision. The outcome value of the Analysis is highly positive, which indicates a positive relationship between them.

H4 - Customization has a significant impact on buying decision.

Table 14.

Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.393[a]	.154	.151	1.026

a. Predictors: (Constant), How much is your buying decision influenced if you receive a price drop notification or email from your favorite brand? Buying Decision

Source- IBM SPSS 21

Table shows a positive connection between Buying Decision and the independent factor Personalization (R-value being 0393). From the R squared value indicated in Table, it can be observed that 15.4% of the variation in the item Buying Decision can be easily illustrated and countered with the support of the predictor Personalization.

Table 15.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	47.983	1	47.983	45.554	.000[b]
	Residual	263.334	250	1.053		
	Total	311.317	251			

a. Dependent Variable: [I like to buy more often from a brand if I get an additional discount from it on my birthday or other occasion] Customized promotional Scheme

b. Predictors: (Constant), How much is your buying decision influenced if you receive a price drop notification or email from your favorite brand? Buying Decision

Source- IBM SPSS 21

As per the numerical figures indicated in Table 18, the value of F, which is 45.554, shows statistical significance as the p-value which is 0.000, lies within the 0.05 significance limit and thus endorses the overall fitness of the regression model

H5 - Promotional offers are correlated with customer satisfaction.

Table 16.

Correlations

		Customer Satisfaction	Promotional Offers
[I like visiting a store more often which provide extra facilities to their customers] Customer Satisfaction	Pearson Correlation	1	.425**
	Sig. (2-tailed)		.000
	N	252	252
[I like to participate in contests, quizzes, games in lieu of a free product or service or a discount]	Pearson Correlation	.425**	1
	Sig. (2-tailed)	.000	
	N	252	252

**. Correlation is significant at the 0.01 level (2-tailed).

Source- IBM SPSS 21

Table displays Pearson's correlation analysis between factors such as Promotional offers and Customer Satisfaction. The outcome value of the Analysis is positive, which indicates a positive relationship between them.

• *Promotional offers have a significant impact on Customer satisfaction.*

Table 16.

Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.425[a]	.180	.177	.93034

a. Predictors: (Constant), [I like to participate in contests, quizzes, games in lieu of a free product or service or a discount] Promotional Offers

Source- IBM SPSS 21

Table shows a positive connection between Customer Satisfaction and the independent factor Promotional Offers (R-value being 0.425). From the R squared value indicated in Table, it can be observed that 18.0% of the variation in the item Customer Satisfaction can be easily illustrated and countered with the support of the predictor Promotional offer.

Table 17.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	47.619	1	47.619	55.017	.000[b]
	Residual	216.381	250	.866		
	Total	264.000	251			

a.Dependent Variable: [I like visiting a store more often which provide extra facilities to their customers] Customer Satisfaction

b. Predictors: (Constant), [I like to participate in contests, quizzes, games in lieu of a free product or service or a discount] Promotional Offers

Source- IBM SPSS 21

As per the numerical figures indicated in Table, the value of F, which is 55.017, shows statistical significance as the p-value which is 0.000, lies within

the 0.05 significance limit and thus endorses the overall fitness of the regression model

RESULTS DERIVED FROM THE STUDY

Major findings have shown that there has been a positive impact of interactive marketing strategies on the respondents. Most respondents agreed that they used social media pages, blogs and websites of a brand for researching about a product, content about product, customer feedback before purchasing a product and agreed that play a major role in a regular person's buying behaviour.

Personalized brand communications via social media and email act as an interactive medium between a customer and fulfilment of his needs by providing them information regarding the relevant products and services and most respondents liked receiving such emails. In today's scenario it is highly evident that marketers target customers according to the actions. This helps marketer in targeted advertising according to the shopping preferences. Viral marketing (Lead generation) strategies used by marketers via customer's help lead to enhanced brand awareness.

If marketers consider interactive marketing strategies which involves customer participation, then most respondents preferred relevant Engaging content, Personalization, Targeted advertising methods, Enhanced User experience over traditional methods of marketing. It is also noticed that most of the respondents participated in Contests, Quizzes, giveaways, polls, and surveys hosted by a company. Thus, it can say these interactive methods of marketing were more influential than old methods and lead to better customer engagement and participation.

Most respondents agreed that they shared their personal information such as contact number, email id, address etc. with brands they shop from. This helps the marketer suggest them products/services according to their preferences.

Lastly, most of the respondents agreed that they liked to visit/buy from a brand or store where service quality was nice, and the staff were friendly, supportive, and interactive.

DATA PRIVACY AND ETHICAL CONSIDERATION

Data Privacy and ethical challenges in data science require a proactive and comprehensive approach to ensure that technological advancements are aligned with ethical principles and societal values, so that interactive

marketing may not get affected badly by data misleading or breach. A dynamic ethical landscape in data science, characterized by evolving standards and practices that are increasingly integral to data collection and analytical processes. Central to these findings is the recognition of consent and privacy as foundational elements in ethical data handling, alongside the need for adaptable and inclusive ethical frameworks to address the complexities introduced by big data (Okorie, Udeh, Adaga, & Oriekhoe, 2024).

Regular security assessments and audits provide organizations with a proactive approach to identifying and addressing security vulnerabilities, ensuring the ongoing protection of AI systems and the data they process. By staying vigilant and responsive to emerging threats, organizations can mitigate risks, enhance security controls, and maintain a robust security posture. Privacy by design and privacy by default principles ensure that privacy protections are integrated into the design and operation of AI systems from the outset, and individuals' privacy rights are automatically safeguarded. Regular security assessments and audits help identify vulnerabilities, assess compliance, and ensure ongoing security of AI systems to ensure no data breach (Devinani, 2024).

MARKETING IMPLEMENTATIONS OF THE STUDY

Interactive marketing is typically 2-12 times more effective than traditional direct marketing if used by marketers wisely. Marketers can use the study's recommendations to make their marketing tactics more effective and consumer centric. Marketers can use variety of media, such as photographs, text, video, and games, to create a multimedia presentation. Personalization - Make each user's ad experience unique. Customers' privacy should be respected by only contacting them if they sign up for a programme (Permission marketing).

The ability to track client behavior using customer database. Data research, consumer feedback, and employee brainstorming are all places where marketers might uncover triggers to improve their business. Simple, straightforward, and inexpensive web design tools may help even the tiniest and most localized businesses run websites or blogs and improve user experience and online presence.

Marketers can include a Compelling Offer - Take advantage of online advertising's targeting capabilities to provide customers with exceptional specials or offers. Make It Immersive - The more a buyer interacts with

advertising, the more likely they are to buy anything. Make your communications as engaging as possible by using online tools. Marketers can use Viral Marketing for Lead generation via making it simple to share and transmit marketing messages via the internet.

Marketer may use new innovative strategy is conversational marketing (Ramadas & Begam, 2023). The Hubspot a software company uses chatbot's prompts to allow users to customize their own experience on the site, ensuring that they quickly get the information they are looking for.

Another strategy is augmented reality shopping (Rejeb, Rejeb, & Treiblmaier, 2023), which is used by Lancôme brand. The strategy allows visitors to Lancome's Instagram page to virtually "try on" some of the brand's products before purchasing, giving them the opportunity to purchase with more confidence.

SOME SUCCESS STORIES (PRACTICAL IMPLICATION)

Dutch brewing company, Heineken, used an interactive video as a part of a Human Resource campaign to represent the enjoyable company culture. The video verify the personality of applicants and presents them to the company. In the video, the employer asks 12 questions the answers to which let applicants decide on the fitness of joining with Heineken. The interactive marketing campaign has gone viral and the company has seen a 300% increase in number of applicants (Wier, 2016).

Oreo cookies has created great impact because of its good taste and packaging. People at Oreo came up with innovative and unique idea for this brand. They formed a 360 degree interactive video driven by Virtual Reality. The 1 minute video lets viewers immerse themselves in the world of an animated Oreo factory. The campaign promoted "Filled Cupcake Flavored Oreo Cookies" and this was a great hit. The video got more than 3.2 Million views. The Google trends show how the interest in the new range of biscuits peaked (Saluja, 2017).

Another good example is Alexa, with an interactive audio ad on the Amazon Music ad-supported tier on an Alexa-enabled device. Here customers can simply ask "Alexa, "play Amitabh Bacchan song," while playing song you can do other activities like "send me more," or "remind me after one hour" — without disrupting their streaming audio content (Saluja, 2017).

4. Conclusions

The study aims to determine the elements that influence Interactive Marketing Tactics and how marketers' use of interactive marketing strategies influences customer purchasing behavior. It is observed from the above data analysis that the majority of respondents believe that interactive marketing methods have a favorable impact on their purchasing behavior. Marketers' attractive offers, quizzes, contests, snappy content, product/service information, digital adverts, and personalization services, among other things, not only engage customers but also have a substantial impact on their purchasing behavior. Customer satisfaction rises because of effective two-way communication, effective complaint resolution, and acceptable service quality.

There are a few essential points that can be used to conclude this research report based on the study's findings. Demographic factors like Age, income do have a significant impact on consumers buying decision. Interactive Promotional Schemes used by the marketers also encourage a customer to buy more from a brand. Marketers can use relationship marketing for giving and honoring promises, showing concern for the security of client transactions, delivering excellent services, demonstrating respect for customers, meeting customer commitments, and continually seeking to increase customer confidence a to improve consumer trust. Furthermore, good communication encourages customers to stick with a company. Engaging content used by marketer’s increase customer engagement and Participation thereby influencing their buying behavior. Satisfaction can also be cultivated through the provision of timely and accurate information. Buying Behavior and Customer satisfaction are also influenced by personalization services or complaint handling.

References

Adam, M.A., & Hussain, N. (2017), Impact of celebrity endorsement on consumers buying behavior, *British Journal of Marketing Studies*, 5(3), 79-121.

Ansari, A., & Mela, C.F. (2003), E-Customization, *Journal of Marketing Research*, 40(2), 131-145.

Aslam, T., Hamid, K., & Arshad, M.S. (2015), *The effects of interactive marketing, customer satisfaction and flashes on customer loyalty*, Euro Economica, 1(34).

Baheti, G., Raguvanshi, S., & Toshniwal, N. (2023), *A study showing impact of celebrity endorsement in advertisement on buying behavior of indian consumers*, Madhya-Bharti-Humanities and Social Sciences, 103-108.

Bhagyalakshmi, R., & Begam, M.G.S. (2023), *Exploring The Effects of Conversational Marketing and Artificial Intelligence on Customer Engagement - A Comprehensive Literature Review*, Journal of Propulsion Technology, 44(4), 4509-4517.

Bolton, R.N., Saxena, S., & Carey, W.P. (2009*), Interactive services: A framework, synthesis and research directions*, Journal of Interactive Marketing, 23(1), 91-104.

Deighton, J.A., & Kornfeld, L. (2009), *Interactivity's Unanticipated Consequences for Marketers and Marketing*, Journal of Interactive Marketing, 23(1), 4-10.

Devinani, S.K. (2024), *AI in Data Privacy and Security,* International Journal of Artificial Intelligence & Machine Learning (IJAIML), 3(1), 35-49.

Dushyenthan, M.T. (2012), *Interactive Marketing and Its Impact on Customer Satisfaction – The Study of Mobile Communication Service Providers in Jaffna Srilanka (A Comparative Study of Dialog and Mobitel)*, Global Journal of Management and Business Research, 12(14), 57-66.

Ganaie, T.A., & Bhat, M.A. (2023), *Impact of relationship marketing practices on customer loyalty in banks: an empirical investigation*, Journal of Services Research, 23(1), 108-132.

Iacobucci, D. (1998), *Interactive Marketing and the Meganet: Networks of Networks*, Journal of Interactive Marketing, 12(1), 5-16.

Jahanzaib, M., Niazi, A.K., Hamid, K., & Ghaffar, W. (2009), *Impact of Interactive Marketing on Customer Loyalty and the Moderation Effect of Customer Satisfaction*, Journal of Managerial Sciences, 10(3), 1-9.

Jain, R. (2020), *Analysis of Indian Consumers' Behaviour using Lifestyle Segmentation*, Journal of Business Thought, 10, 57-65.

Knoll, J., & Matthes, J. (2017), *The effectiveness of celebrity endorsements: a meta-analysis*, Journal of the Academy of Marketing Science, 45, 55-75.

Kraffta, M., Arden, C. M., & Verhoef, P. C. (2017), *Permission marketing and privacy concerns—Why do customers (not) grant permissions?*, Journal of Interactive Marketing, 39(1), 39-54.

Maney, K.L., & Soney, M. (2021), *A Study of the Impact of Lifestyle on Consumer Purchase Decision of Young Indians*, AIMS International Journal of Management, 15(2), 89-99.

Okorie, G.N., Udeh, C.A., Adaga, E.M., & Oriekhoe, O.D. (2024), *Ethical considerations in data collection and analysis: a review: investigating ethical practices and challenges in modern datacollection and analysis*, International Journal of Applied Research in Social Sciences, 6(1), 1-22.

Rejeb, A., Rejeb, K., & Treiblmaier, H. (2023), *How augmented reality impacts retail marketing: a state-of-the-art review from a consumer perspective*, Journal of Strategic Marketing, 31(3), 718-748.

Rodriguez, M., & Dixon, A.L. (2014), *A review of the interactive marketing literature in the context of personal selling and sales management: a research agenda*, Journal of Research in Interactive Marketing, 8(4), 294-308.

Saluja, A. (2017), *11 Interactive Marketing Examples from Popular Brands*, July 5, Retrieved from https://outgrow.co/blog/interactive-marketing-examples.

Shankar, V., & Malthouse, C.E. (2009), *A Peek into the Future of Interactive Marketing*, Journal of Interactive Marketing, 23(1), 1-3.

Sicilia, M., & Palazon, M. (2023), *Developing customer engagement through communication consistency and channel coordination*, Spanish Journal of Marketing-ESIC, 27(2), 241-260.

Wier, M.V. (2016)*, Heineken uses interactive video to attract jobseekers*, October 30, Retrieved from https://www.hrreporter.com: https://www.hrreporter.com/news/hr-news/heineken-uses-interactive-video-to-attract-jobseekers/315436.

WEBLIOGRAPHY

- https://www.researchgate.net/publication/303546571_A_Study_on_Factors_Influencing_Consumer_Engagement_in_Retail
- https://blog.apruve.com/5-proven-b2b-interactive-marketing-strategies-to-implement-asap?hs_amp=true
- https://www.ngdata.com/what-is-interactive-marketing/
- https://www.shortstack.com/blog/11-interactive-marketing-examples-that-inspire-engage-and-convert/
- https://www.academia.edu/9162214/The_growth_of_interactions_and_dialogs_in_interactive_marketing
- https://www.genroe.com/services/what-is-interactive-marketing#:~:text=Interactive%20marketing%20is%20a%20one,effective%20than%20normal%20direct%20marketing
- https://link.springer.com/article/10.1007/s11747-016-0503-8

- https://contentmarketinginstitute.com/2016/07/interactive-content-research/
- https://neilpatel.com/blog/interactive-content-is-where-the-action-is/
- https://www.ngdata.com
- hdl.handle.net

Gulzar Ali*, Basreen†, Said Zamin Shah‡

NEXUS BETWEEN EXCHANGE RATE AND CRUDE OIL PRICE: EVIDENCE FROM OIL PRODUCING AND EXPORTING COUNTRIES

Received: 18 April 2023 / Accepted: 28 december 2023

Abstract

This study examined the impact of persistent, continuous shocks and fluctuation in the exchange rate on oil price for major oil producing and exporting countries. The study employed the ARDL regression analysis for finding the impact of exchange rate on oil price, the bound and WALD test for nature of relation and Granger Causality approach for the causal relation. The study found the effective role of exchange rate fluctuation on oil price. The outcome of the bound and WALD tests shows that there is long-term correlation of exchange rate with price of oil. The granger causality approach found bi-causal relation running to and from exchange rate and oil price. Based on the findings, the study concluded that fluctuation in exchange rate has a considerable impact in changes in the price of oil and thus appreciation in exchange rate leads to an increase in the oil price internationally. Significant evidence shows that volatility in the exchange rate brings fluctuations in oil price that could damage the country's trade balance. Thus volatility in exchange rate can produce shocks that severely affect both exporting and importing oil countries. This volatility and shocks can also drastically affect the price level of oil that has economic impacts on various countries differently.

JEL CLASSIFICATION: F31, Q43, C32

KEYWORDS: OIL PRICE, EXCHANGE RATE, OIL PRODUCING, OIL EXPORTING COUNTRIES

* Assistant Professor, Department of Economics, Islamia College Peshawar, KPK, Pakistan. *E-mail*: gulzaricup@yahoo.com.
† MPhil Scholar, Department of Economics, Islamia College Peshawar, KPK, Pakistan.
‡ Assistant Professor, Department of Economics, Islamia College Peshawar, KPK, Pakistan.

1. Introduction

The use of energy especially of crude oil and petroleum products are the need of today especially in this advanced technological and industrial era. Due to this, the demand for energy sources and for oil and petroleum products especially increases day by day. Most of the countries worldwide and specifically developing countries have either limited or do not have enough resources and are not capable to meet the oil demand requirements, so solely depend on the imports of oil form oil producing and exporting countries. However, if there is an increase in the price of oil or devaluation in the exchange rate, it raises the revenue of oil exporting countries and has adversely affected the oil importing countries by putting extra pressure on the trade and balance of payment.

As the exports and imports of goods between the countries depends on the exchange rate. Exchange rate is determined as the relative relationship of domestic to foreign price, or as the comparative price of the consumption goods basket among the home and world traded countries (Bergstrand, 1991; Lizardo & Mollick, 2010). In both cases, it is estimated that if the price of domestic consumer goods rises relative to that of commercially exportable goods, the real exchange rate may appreciate due to the increase in price of tradable or commercial commodities. In this context, a rise in the exported goods prices can leads to an appreciation in exchange rate, either through the income or substitution effect, or both (Koranchelian, 2005; Habib & Kalamova, 2007). In fact, by substitution effect, the supply of non-traded goods may falls further raising their prices, and thus led to appreciation in the exchange rate. Moreover, the increase in non-traded commodities demand contributes to the escalation of relative prices by income effect. Thus the basic two hypotheses which determine these effects are that resources are attracted by commodity sector and the demand for non-traded goods rises with an increase in income. Thus both exert an upward push on the exchange rate for imports of energy products like oil and petroleum products.

Exchange rate fluctuations on the real activity have been the focal point in the literature. It is generally observed that from the demand side, the devaluation or depreciation can enhance local production by inspiring net exports factor (Agenor, 1991; Alhajji, 2004). From the demand side, other factors (i.e. inflation, income, currency fluctuation, demand for loanable funds etc.) may also influence exchange rate fluctuations. The inflationary impact of the currency depreciation reallocates income from labors to producers

(Bahmani-Oskooee & Mirzaie, 2000; Cheng, 2008). However, the likelihood of depreciation can reduce aggregate demand's consumption element. In view of the fact that the labors are assumed with higher marginal propensity to consume than producers, so the aggregate consumption reduces due to currency devaluation (Bodart et al., 2012).

The fluctuation in exchange rate is mostly from both supply and demand side. Due to increase in overall supply side of goods in the economy, the sources of connection on a macro level between economy and the exchange rate become more complex. As the currency devaluation increases the imported input's cost, it adds to the cost of production and thereby limiting the overall growth and aggregate supply (Wang, Wu & Yang, 2013).

However, if the decline in imports of aggregate supply is less than increase in overall aggregate demand to offset the output gap, then depreciation can lead to a decline in local production. In such situation, the depreciation or devaluation is known as contraction, or else, it may be depression (Kilian, 2009).

1.1 Scope and Significance of the study

Since the 1990s, the relationship and association between exchange rate and crude oil price volatility have gained the interest of economist, policy makers and researchers. All of the countries of the world are involved in the trade of oil. Some of the countries are the exports of oil while some are the importers. However, the worlds are wholly or partially dependent on the crude oil. Whenever fluctuation in oil price occurs, it may have both positive and negative economic impacts on the exports and imports of oil leads to consistent effect on growth of different countries. Despite of the fact the exchange rate fluctuation has varying effect on the supply and demand of oil, it also leads erratic effect on oil price, currency fluctuation, trade balance, balance of payment, foreign reserve, consumption effect and having effect on related durable and non-durable goods. Therefore, most of countries tries to bring stability in the exchange rate to get rid of its adverse effect that might hit the required balance.

It is a fact that most of the countries worldwide trade in US dollars. But from past two decades, the US dollars have experienced shocks in their value that also affects the value of local currencies of many countries. These volatility shocks in US dollars also effect exchange rate directly or indirectly affects foreign trade of all the countries

either that are exporter's countries or importers (Zhang et al., 2008). Thus in the short run those countries that are oil importing needs to purchase more US dollars that will reduce the uncertainty and fluctuation effect of exchange rate as well as will refrain from the appreciation effect. Moreover, by purchasing more US dollars the countries will become denominated assets in the short run with higher foreign income that may reduce the import burden while importing the oil from oil exporting countries. As in the long run, higher foreign income will transfer into higher expenditures of imported goods. It is generally believed that in the oil-producing countries, the decline in value of the currency is retrenchment due to demand effect, restricted due to the occurrence of prices in the dollar of oil exports, is more than counter balanced by the negative effects of supply. In the past decade, however, Iran has seen a speedy rise in exports of oil. The expansionary impact is evident with regard to the expected continued depreciation in the long run.

Recently from current decades oil price has experienced many severe financial shocks. The crude oil price has experienced the fluctuation in price level throughout the history and that also leads to shut down and unemployment in many oil exporters countries (Zhang et al., 2008). Besides the truth that many of oil exporting countries especially of Gulf countries facing different wars since few decades, but the continuous fluctuation in the oil price is also harshly affected economic conditions of many these developing countries. During Iraq war in mid-eighties, non-oil exports to total exports ratio rose so quickly, mainly due to public sector investment in "strategic" sectors, together with the petrochemical industry. Until nowadays, exports petrochemical from state-owned companies have a greater share of exports of non-oil products. An increase in the ratio of non-oil exports to total exports come out to be indifferent to oil price (Zhang 2013).

The scope and significance of this study as follows. First, the increase in oil price may leads to rise in disposable income of exporters of oil, resulting in an increase in demand of other goods, indeed particularly those which are distinguished by high income and demand elasticity. Second, in view of substitution effect, high oil prices influence energy prices of other commodities like gas, coal, and electricity. Third, because of the inflationary pressure connected with increasing oil prices, the demand for the related capital could increase and thus increases the cost of oil production that exerts upward pressure on oil prices.

Moreover, oil is a major input for manufacturing and transportation of many commodities. Thus, rise in oil prices will definitely bring increase the cost of production, therefore affecting the prices of other goods. Keeping in

view all these reasons, fluctuations in oil prices might affect the prices of other goods, and as a result, perform a major role in the production, exports, imports, terms of trade, exchange rate and growth of the countries.

1.2 Problem Statement

Most of the studies focused on the exchange rate effects on the oil importing countries. Oil production and export decisions are to some extent independent of exchange rate fluctuation, however, the supply of oil might cause further fluctuations in exchange rate. Aggregate supply could be reduced due to rising costs of imported inputs as a result of the depreciation of the local currency. The persistent and continuous shocks and fluctuations in the crude oil price and real exchange rate creates instability at macro level in most of the countries as majority of the countries are oil-importing countries. Moreover, the appreciation in exchange rate results rise in the price of oil for importing though it may have progressive effect for oil-exporting countries. The fluctuation in exchange rate and increase in oil price may raise the economic growth, employment, industrial sector production, and etc., in oil-exporting countries that direct or indirect affects the whole economic, social and political conditions.

The arrangement of demand and supply streams signify the dependence of oil exports on changes in the money supply, exchange rate, government expenditure, and private expenditure. In the short-run, competition is determined by temporary exchange rate variations and, so forth, the response of the producers towards the fluctuation in the comparative prices of tradable and non-tradable commodities. For instance, the high value of the currency temporarily reduces demand for exports, and may be cause temporary reduction in the imports of goods such as oil and petroleum products too. However, in short run inexpensive cost of imports might raise the production supply. While in long-term, the sustained improvement or appreciation in the exchange rate requires a continuous adjustment in production supplies. Keeping in view the comparative potency of the cost channel and competitiveness, producers might raise or reduce production supplies according to the ongoing volatility in exchange rate in the long term.

From the last two decades, the countries worldwide experienced a lot of financial shocks and other disasters like macro-economic instability, political instability, global wars, changing global partnering, Covid-19 etc. Due to these external shocks accompanied by some internal shocks of many countries the oil production are affected. Moreover, these shocks lead to greater uncertainty, volatility and fluctuation

in the exchange rate that leads to a definite adverse effect on oil-importing countries. However, this study is going to investigate some different, and investigating the effect of exchange rate fluctuation on oil-exporting countries.

1.3 Objectives of the Study

This research study testing the following objectives

i. To examine the impact of fluctuation in exchange rate on oil price in major Oil producing and exporting Countries
ii. To determine the nature of relationship (short or long run) between exchange rate and oil price for major Oil producing and exporting Countries
iii. To investigate the causal relationship of exchange rate and oil price for major Oil producing and exporting Countries

1.4 Research Hypotheses

The following hypotheses are to be empirically tested in this research study

i. There isn't any impact of fluctuation in exchange rate on oil price in major Oil producing and exporting Countries.
ii. There short-run relationship exists between exchange rate and oil price in major Oil producing and exporting Countries
iii. There isn't any causal relationship between exchange rate and oil price in major Oil producing and exporting Countries.

2. Review of Past Literature

The policy makers and economist believe that volatility in oil price can produce shocks that severely affect both exporting and importing oil countries.

This volatility and shocks can also drastically affect real exchange rate that has economic impacts on various countries differently. Though enough number of literature exists on the relationship between the oil price and exchange rate, but the finding of these studies have ambiguous results. Some of the studies had found the positive and significant effect of variations in oil price on exchange rate while some have found inverse impacts. Moreover, most of these studies focused on the oil-importing countries, while this study investigating the relationship of exchange rate and oil price in context of

founder oil-exporting (OPEC) countries. A brief summary some of the past studies are given below.

2.1 On the Relation of Oil Price & Exchange Rate

Different researchers, economists and policy makers had attempted to empirically examine the relationship of crude oil price and exchange rate. In this regard, (Akram, 2004) investigated the impact of fluctuation in oil price and volatility in exchange rate for Norwegian and found that these two factors have inverse relation with each other. Moreover, the study of (Huang & Guo, 2007; Hasanov, 2010; Lizardo & Mollick, 2010; Reboredo, 2012; Beckman & Czudaj, 2013; Ghosh, 2011; Turhan et al., 2013) had found the significant inverse effect of volatility in crude oil price and exchange rate, while examine the relation of these two important factor across the various nations.

The fluctuation in oil and petroleum products in relation to volatility in exchange rate, its possible role and effect on product prices in controlling the movements in prices of goods and oil products has remained the keen interest in the literature. In this regard, (Chen & Rogoff, 2003) studied and observed the strong co-integration relations between volatility in oil price and exchange rate in three OECD members countries (New Zealand, Australia & Canada), that leads to an effective impact on other commodities where primary commodities were the considerable portion of their exports. Likewise, (Cashin et al., 2004) also found significant relation between real exchange rates and product prices in the long run for one-third of 58 nations relying on either directly or indirectly on oil and petroleum products during the period 1980-2002.

The instabilities in oil prices could be a major feature to consider in interpreting the performance of real exchange rates, assuming the associations among the oil and goods markets (Farooq, 2008; Cheng, 2008; Groen & Pesenti, 2010; Makin, 2013). The overriding character of oil among goods markets curtains from its price affecting prices of other commodities and many sectors of the economy as well (Chen et al., 2008; Aizenman et al., 2012; Bodart et al., 2012). Similarly, (Baffes, 2007) concluded that traverse of oil price fluctuation to prices of other goods could be clarified from both supply and demand side, however, the demand side factors are more active than supply side factor in determination of commodity prices. The elasticity or flexibility in the exchange rate to prices of oil and essential commodities are lesser as it mostly involves the substitution effect (Tokarick, 2008). The

flexibility in oil price mostly depended on contribution of both tradable and non-tradable commodities (Cashin et al., 2004), and sometimes it may be even greater if the production of non-traded goods is more labor-intensive relative to that of export commodities (Chen & Rogoff, 2003).

Oil prices throughout history have great influence over world commodity prices due to its immense importance as a fuel for both consumption and production. Some studies concentrated on the exchange rates affiliated oil producing economies, fluctuation in currency, and thus oil price shock probably produces fluctuation in the exchange rate. Korhonen and Juurikkala (2009) found statistical significance effect of the oil price on the exchange rates in the process of estimation of real exchange rate equilibrium for the set of nine OPEC nations. Likewise, in the investigations of (Koranchelian, 2005; & Zalduendo, 2006) illustrated that oil prices have effective role in the fluctuation and determination of exchange rate equilibrium, studying the relation of these two important factor for Venezuela and Algeria. Besides, it has also been found that oil prices could be a key cause of real disorders in exchange rate and commodity prices (Zhou, 1995). Some of the past literature in this regard generally concentrates on industrialized nations with an emphasis on the special role of oil in exchange rate determination. Therefore exporters of the commodities acknowledged slight consideration (Chen and Chen, 2007).

There were some studies found that fluctuation in exchange rate especially in US dollars had greatly affected the oil price (Kandil & Mirzaie, 2002; and Lizardo & Mollick, 2010). Moreover, there were some studies that had found a dominant role of exchange rate and oil price in the foreign trade of developed, oil exporting and OPEC countries but have a partial role in the case of developing countries (Vincent & Bertrand, 2011; Chen & Chen, 2007; Nikbakht, 2000; Arize et al., 2000).

2.2 On the Causal Relation of Oil Price & Exchange Rate

The importance of oil consumption and the effect of oil price through which the international trade channel affected (exchange rate) remained the focused in the literature. Numerous researchers were of the view that there are dominant role of exchange rate in fluctuation of oil price internationally. However, most of the investigator found that there are strong relation between exchange rate and oil price. In this regard many of the studies investigated the causal relation between exchange

rate and oil price (Arize et al., 2000; Breitung & Candelon, 2006; Nikbakht, 2010; Benhmad, 2012; Fratzscher et al., 2013; Bal & Rath, 2015; Bouoiyour et al., 2015).

There are some studies that absorbed the causal relation of oil price and exchange rate in the OPEC and developed countries, and most of the studies found strong co-integration and causal relation between these two important factors. Some of the well-known studies in this regard were of (Basher et al., 2012; Benhmad, 2012; Nouira et al., 2019; Suliman & Abid, 2020; Bouri et al., 2020) had found causal short as well as the long term association of oil price and exchange rate especially for oil exporting and OPEC countries. However, there were also some studies found that didn't observed any causal relation between these two variables in their investigation. Some of the past studies in this regard were (Wang et al., 2013; Parvar, 2010; Habib and Kalamova; 2007) didn't found any significant effect of volatility of crude oil price on real exchange as well as any causal relation between crude oil price and exchange rate of different countries.

Benhmad (2012) investigated the causality relationship of exchange rate in terms of US dollar and oil price for higher valued currencies and found bivariate causal relation of exchange rate and oil price on each other. Benassy-Quere et al., (2007) observed the causal and co-integration relation of oil price and dollar for China from USD peg and energy-intensive growth during 1974-2004. Bal and Rath (2015) examined the causality relation of oil price and exchange rate for China and India and found non-linear causal relation between the studied factors for both China and India. Bouoiyour et al., (2015) attempted to examine the causality relation of changes in oil price changes and fluctuation in exchange rate for Russia. The empirical findings revealed that bivariate causality relation existed between oil price and exchange rate in Russia. Wheras, (Chen and Chen, 2007) investigated causal relation of exchange rate and oil price for G7 member's countries and found that a significant causal relation exits between oil price and exchange rate.

Shahbaz et al., (2013) and Tiwari et al., (2013) investigated the relation of oil price and exchange rate for Romania and found that both non-linear and linear causal relation running from exchange rate and oil price. Nusair and Kisswani (2015) examined the causal relationship of exchange rate and oil price for Japan, Indonesia, Korea, Philippines, Malaysia, Singapore, and Thailand and findings of the study revealed that bidirectional relationship existed in oil price and exchange rate for Thailand and Malaysia, whereas, the

unidirectional relationship from oil price to exchange rates for Philippines, Korea, Singapore and Indonesia. However, the study didn't found any causal relationship of exchange rate and oil price for Japan. Tiwari and Albulescu (2016) investigated the causal relationship of oil price and exchange rate and found strong causal relation between these two factors in the short run for India.

Some of the recent studies (Alsamara et al., 2017; Nouira et al., 2019; Kilian and Zhou, 2019; Suliman and Abid, 2020) inspected the causal causal link of Intermediate crude oil price and real effective exchange rate index in terms of US dollars for trading partners. The bivariate two-way causal relation of both variables on each other was detected and concluded that these two variables have influential effect on each other. The fluctuation in exchange rate was remained significant in changes in crude oil price in countries worldwide.

3. Methodogical Framework

The area of this study is the selected major oil producing and exporting countries that are mainly consist of Muslim countries located in Asia (Western Asia). Due to the production and exporting of an important natural resource and need of the world, some of these countries were considered the strong political and economic regions of the Middle East. But due to global wars, disasters and strategic changes, the influence of these major oil producing and exporting countries are also changing. OPEC was and has an oil export country and it exports oil to many countries. Moreover, the rapid fluctuation in international currencies (exchange rate) is also observed from the last decade. All these major changes in the global environment and exchange rate have severely affected the price in oil price. The changes in oil price and exchange rate leads to an increase in cost of production and transportation of oil that have an adversely affected economically, politically and socially the countries worldwide. Moreover, most of the institutions, industries and economic zones that are either directly or indirectly depended on oil have also affected.

3.1 Methodology of the Study

Now a day's most of the countries favors flexible exchange rate. Exchange rate depends and affected by a variety of variables that are infamously difficult to forecast or predict. However, the oil price depends upon the domestic and international demand for oil as well as available supply, cost and production of oil. Moreover, the oil price also depends upon the terms of trade and exchange rate. This research study aims to empirically evaluate the nexus of exchange rate and crude oil price in oil-exporting and producing countries.

For empirical examination the oil price (OP) is assumed as dependent variable whiles the exchange rate (ER), oil exports (OX) and Oil Production (OQ) as independent variables. The theoretical relations of the variable is expressed in the form of

$$OP = f(ER, OX, OQ) \tag{3.1}$$

The simple econometric model that expresses the relationship between dependent variable and explanatory variables is

$$OP_{it} = \alpha_0 + \alpha_1 ER_{it} + \alpha_2 OX_{it} + \alpha_3 \Delta OQ_{it} + \mu_t \tag{3.2}$$

In methodology, the ARDL Regression & co-integration regression technique is applied to examine the impact of fluctuation of exchange rate on oil price in major oil producing and exporting countries. The ARDL bound testing and WALD test is applied to investigate the objective & hypothesis 2nd that is nature (short or long) relation between the main studying variables. The Granger Causality test be apply for finding the causal relation between exchange arte and oil price and for empirical examination of objective and hypothesis 3rd of this study. For the regression analysis and regressors effects, the ARDL model is in the form of

$$\Delta OP_{it} = \alpha_0 + \sum_{t-1}^{n} \alpha_1 \Delta ER_{it} + \sum_{t-1}^{n} \alpha_2 \Delta OX_{it} + \sum_{t-1}^{n} \alpha_3 \Delta OQ_{it} + \mu_t \tag{3.3}$$

The above model with optimal number of lag will be in the form of

$$\Delta OP_{it} = \alpha_0 + \sum_{k-1}^{p} \alpha_1 \Delta ER_{it} + \sum_{K-1}^{p+1} \alpha_2 \Delta ER_{it} + \sum_{k-1}^{p} \alpha_3 \Delta OX_{it} + \sum_{K-1}^{p+1} \alpha_4 \Delta OX_{it} + \sum_{K-1}^{p} \alpha_5 \Delta OQ_{it} + \sum_{k-1}^{p+1} \alpha_6 \Delta OQ_{it} + \mu_{it} \tag{3.4}$$

In the above model (K-1) and (p+1) is the number of optimal lag that is to be regressed by applying ARDL as Vector Auto-Regressive (VAR) model.

In order to look at the causal relation of exchange rate, oil price and other important variables selected in this study, the Granger causality equations for analysis are

$$\Delta OP_{it} = \sum_{k=1}^{n} \beta_1 ER_{it} + \sum_{j=1}^{n} \beta_2 OX_{it} + \sum_{X=1}^{n} \beta_3 OQ_{it} + \mu_i \quad (3.5a)$$

$$\Delta ER_{it} = \sum_{k=1}^{n} \beta_1 OP_{it} + \sum_{j=1}^{n} \beta_2 OX_{it} + \sum_{X=1}^{n} \beta_3 OQ_{it} + \mu_i \quad (3.5b)$$

$$\Delta OX_{it} = \sum_{k=1}^{n} \beta_1 ER_{it} + \sum_{j=1}^{n} \beta_2 OP_{it} + \sum_{X=1}^{n} \beta_3 OQ_{it} + \mu_i \quad (3.5c)$$

$$\Delta OQ_{it} = \sum_{k=1}^{n} \beta_1 ER_{it} + \sum_{j=1}^{n} \beta_2 OX_{it} + \sum_{X=1}^{n} \beta_3 OP_{it} + \mu_i \quad (3.5d)$$

3.2 Data Description

The quarterly time series data are used and regressed to analyse the nexus between exchange rate and oil price for selected major oil-exporting and producing countries. For regression analysis, the time periods of the study is from 2000-2021.

The data are collected from various international sources includes the Global economy, World Economy, World Bank, World Development Index (WDI) and International Monetary Fund (IMF).

4. Analysis & Explanation of Results

Different techniques are applied to regress variables data for finding the nexus of oil price and exchange rate, the impact of fluctuation in exchange rate on oil price, the nature of relation short vs long between these two variables and the causal relation for major oil producing and exporting countries. For empirical investigations of the study objectives and hypotheses, the Histogram and Normality test will be applied to find the descriptive analysis and normality of the variables data. For findings the order of integration and unit root, the Augmented Dicky-Fuller and Phillips Perron (PP) unit tests are applied.

On the basis of unit root tests outcome, the Auto Regressive Distributed lag (ARDL) model is regressed to examine the nexus and impact of fluctuation in exchange rate on oil price and for empirical investigation of 1st objective. For nature of relation either short or long term, and for examination of 2nd objective, the ARDL bound and WALD tests are applied. For findings the co-integration, speed of adjustment and long run impact of independent variables including exchange rate on oil price, the ARDL co-integration and long form analysis are conceded.

The Granger Causality test is used to enquire the causal relation exchange rate and oil price as well as with other included variables. The stability and diagnostic tests for serial correlation, specification bias, auto-correlation and Hetroskasdacity are also applied.

4.1 Statistical Description of the Study

The Histogram and Jaque-Bera test are applied for descriptive statistical analysis, normality of the variables data and model. The summarize results obtained is given in below table (1).

Table 1. Normality Test and Statistical Description	
Mean	3.648634
Median	74.68719
Maximum	1232.736
Minimum	6.187348
Std. Dev.	543.7862
Skewness	0.256715
Kurtosis	1.736148
Jarque-Bera	0.587219
Probability	0.368214
Observations	41

Source: authors own calculations (2022).

The above table (1) shows that the probability value of Jarque-Bera test is (0.368214), above the significance level at (1%, 5% & 10%), guiding the normality of the variables data and model. The statistical description of the data shows that the mean value of the sample data is approximately four (3.648), near to zero. The average maximum value is approximately 1166. The Skewness value is positive and very close to zero. These statistics shows that overall data used is acceptable and fit for further analysis.

4.2 Unit Root Tests

It is commonly known as that mostly time series data suspects unit root, spurious relation, and serial correlation. This study also consists of time series data, therefore the Augmented Dicky-Fuller and Phillips Perron tests are applied to know the unit root, order of integration and spurious relation in the data. The t-stat values of both the tests are shown in the table (2).

Table 2. ADF & PP Tests Values

Variables	**ADF Test Values**		**PP Test Values**	
	At I(0)l	**At I(I)**	**At I(0)**	**At I(I)**
Oil Price (OP)	-3.757316	-4.562482	-3.938362	-5.429241
Exchange Rate (ER)	-1.136205	-3.684972	-1.297328	-4.609540
Oil Exports (OX)	-1.327618	-3.843943	-1.528763	-4.876406
Oil Production (OQ)	-3.475146	-4.786708	-3.862185	-5.295317

The results of unit root (ADF and PP) tests depicted in above table (2) revealed that the variables exchange rate and oil exports are non-stationary at I(0), whereas, oil price and oil production are stationary. For further stationarity of the variables, the PP and ADF tests are applied at 1st difference and the outcome of both tests confirms that the included variables are stationary at I(1). Further, the result didn't find any spurious relation, out liars and any other serious problem in the data.

4.3. Regression Analysis of the Variables

With reference to results of ADF test, the ARDL regression analysis is carried by regressing the oil price in relation with exchange rate alongside with the other independent variables that are oil exports and oil production for major oil producing and exporting countries to empirically analyse the impact of fluctuation in exchange rate on oil price as assumed of objective 1st of this study. The results of the variables regression obtained by estimators of each independent variable and their significant values (assumed in model in the form of t-stat and prob.) are shown in below table (3).

Table 3. ARDL Regression Analysis {Dependent Variable: LOG(OP)}

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(OP(-1))	0.168531	0.042935	3.925173	0.0002
LOG(ER)	0.424130	0.091845	4.617892	0.0000
LOG(OX)	0.236873	0.052203	4.537618	0.0000
LOG(OX(-1))	0.321794	0.112841	2.851729	0.0214
LOG(OQ)	0.113716	0.023982	4.741629	0.0000
LOG(OQ(-1))	0.136053	0.039186	3.471961	0.0016
C	0.268536	0.216867	1.238251	0.3418
R-squared	0.874706	Durbin-Watson stat		2.035404
Adjusted R-squared	0.856038	Prob(F-statistic)		0.000000

Economists showed a great deal of interest and attempted to investigate energy markets because of the current oil price shocks. Likewise, the ongoing increase in the global economic imbalances leads to great devotion of economic analysts in studying exchange rate issues. In spite of these concurrent proceedings, slight concentration has been given to investigate the relationship of oil prices and exchange rates for oil producing and exporting countries. This study examines the relation between these two important variables. The regression result obtained given in table (3) revealed that the model outcomes are stable, consistent and acceptable as the value of R^2, Adj. R^2, DW stat and Prob. F-stat. values are satisfactory and didn't shows any sort of problem.

Uncertainty and volatility in exchange rate and its possible effect on oil prices are complex phenomenon and policy makers should have full awareness of the foreign exchange and oil markets especially of domestic and international demand and supply of oil. It might be essential to execute some procedures that support firms to rely more on new energy sources in such way that changes in oil prices may not be the main cause of real exchange rate volatility. Besides that, some steps have to be implemented for the improvement of exporting firms. In addition encouraging energy efficiency instead of energy intensity may decrease costs of production. Due to some global shocks and financial crises the exchange rate and oil price affect severely that leads to an adverse effect on all countries especially on developing countries. The above result of ARDL analysis shows that there significant and positive impact of exchange rate on oil price in major selected oil producing and exporting countries. The result indicated that one percent fluctuation and volatility in exchange rate leads to approximately forty-two percent change in the oil price in the same direction. As oil is the most important factor and its demand and supply is not only on domestic but also on international way, that's why any sort of fluctuation in exchange rate will have definite effect on price especially during exports and imports of oil. The empirical findings of this study as shown in above table (3) are consistent with the theoretical as well as empirical literature (Hasanov, 2010; Ghosh, 2011; Novotny, 2012; Reboredo, 2012; Beckman & Czudaj, 2013; Turhan et al., 2013).

Further, the study also regressed the variables oil exports and oil production to examine its impact on oil price. As predicted the study found significant effect of oil production and oil exports via fluctuation in the exchange rate on

oil price. As the exports of a country are imports for other countries, so whenever, the appreciation in exchange rate occurs it make the imports expensive and brings increase in the oil price. The studies of (Momani, 2006; Habib & Kalamova, 2007; Jahan-Parivar & Mohammadi, 2008; Bjornland, 2008; Korhonen & Juurikkala, 2009; Adeniyi et al., 2012; Oluwatosin, 2012; Wang et al., 2013) also found the significant effect of oil exports via exchange rate in the variation of oil price for various countries.

Moreover, as the oil price rises due to fluctuation in the exchange rate, it become the motivating factor for exporting countries to earn more, so the oil production will be increase. This finding is consistent with the theoretical literature of the objective of producers and of supply law. In the past studies of (Aghion et al., 2006; Bodart et al., 2012) have also the same findings.

4.4. Nature of Relation between Exchange Rate & Oil Price

To examine the 2nd objective and long-run relation of oil price and the exchange rate for oil producing and exporting countries during 2000-20216, the ARDL bound and WALD tests are applied and the results of bound is given in table (4), whereas, that WALD test in table (5).

Table 4. ARDL Bounds Test

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k	I0 Bound (5%)	I1 Bound (5%)
F-statistic	5.257163	7	2.32	3.5

The F-stat. value of ARDL bound test is greater from the value of I(0) and I(1) bound at 5% significance level, shows that there is long run relation between oil price and exchange rate in oil producing and exporting countries. The outcome of bound test is consistent to the earlier studies of (Camarero et al., 2002; Joyce & Kamas, 2003; Nusair & Kisswani, 2015) which found the strong the association of oil price and exchange rate as well as significant effect of exchange rate on oil price in the long run.

For further testing and confirming the outcome of ARDL bound test, the Wald test is applied to examine the either there is any long run relation exits

between these two important variables and the result of WALD test is given in table (5).

Table 5. Wald Test Analysis

Null Hypothesis: C(2)=C(3)=C(4)=0

Test Statistic	Value	df	Probability
F-statistic	6.843723	(7, 30)	0.0000
Chi-square	49.75396	7	0.0000

The result of WALD test also shows the consistent outcome with bound test and indicates the long-run relation between the studied important factors in oil producing and exporting countries during 2000 to 2021 and thus rejecting the null hypothesis.

4.5 Co-integration & Long-Term Analysis

Most of the researchers and theories suggest confirming co-integration and co-integrating vector among the variables especially when some the variables show their stationarity at I(1) and posits the long term association. Therefore, in this study the ARDL co-integration test is run to check the co-integration especially between exchange rate and oil price and the results is shown in the table (6).

Table 6. ARDL Cointegrating & Long Run Analysis

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ER)	0.385235	0.112734	3.417182	0.0025
DLOG(OX)	0.216142	0.045605	4.739438	0.0000
DLOG(OQ)	0.137893	0.037759	3.651893	0.0014
CointEq(-1)	-0.537184	0.128626	-4.176316	0.0000
Cointeq = LOG(OP) - (0.4361*(ER) + 0.2367*LOG(OX) + 0.1936 *LOG(OQ)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ER)	0.436148	0.115745	3.768163	0.0016
LOG(OX)	0.236754	0.051826	4.568176	0.0000
LOG(OQ)	0.193605	0.051909	3.729676	0.0017
C	0.251602	0.203417	1.236873	0.3865

As from co-integration test results it is clear that has strong co-integration and co-integrating vector between oil price and exchange rate in oil producing and exporting countries during 2000-2021. Therefore for further analysis, the ARDL long run analysis is conducted to examine the effect of exchange rate on oil price.

It is well well-known from the theory that a country exporting oil may face appreciation in the exchange rate (fall in exchange rates) with an increase in oil prices and vice versa. In a comparison of countries with self-sufficiency in oil and one dependent on oil import, the earlier would carry an appreciation as the oil price rise relative to the other country other things being ceteris paribus. More commonly, the currencies of the countries that have the oil reserves to some extent appreciate comparative to countries that don't have oil reserves at all. In oil exporting countries the literature generally observed the correlation and long run association between exchange rate and oil price. Similarly, this study also found significant effect of exchange rate fluctuation

in oil price variation and consistent results to earlier studies of (Chaodhuri & Daniel, 1998; Bahmani-Oskooee & Mirzaie, 2000; Breitung & Candelon, 2006). From, the outcome it can be stated, a rise in oil prices is absorbed towards an appreciation of the exchange rate.

4.6 Diagnostic and Stability Analysis

There are some important assumptions of regression analysis. If these assumptions are violated then it gives wrong and biased results. To check the reliability of the above results and models different diagnostic and stability analysis test were applied. They are discussed one by one below in details.

One of the assumptions of regression analysis, that random term or error term must be independent of each other and didn't serially correlated with each other or past values (i.e. U ≠ Uj). If it did, it gives wrong regression analysis and biased results. To check the serial correlation in the regression model applied in this study, we applied Busch-Godfrey Serial Correlation LM test and in table (4.7) the results is given.

Table 7. Correlation Test Results

F-statistic	0.372816	Prob. F(2,7)	0.6572
Obs*R-squared	0.532717	Prob. Chi-Square(2)	0.7075

The results of Busch-Godfreyserial correlation LM test show that the model we regressed for empirical analysis of this study is free from serial correlation proving that random or error term is independent of each other. Secondly, the results of the test drawn in the table (7) also show that the model does not contain any sign of spurious relation and auto-correlation.

There is also one of the assumptions that variance of the error term as well as in explanatory variables must be constant. If the variance between the two or more random term or between the two or more explanatory variables is not constant, then it makes the standard error large that make the overall model and estimator value of the variables insignificant. For this purpose, we applied Breusch-Pagan-Godfrey Heteroskedasticity test and the results of the test are drawn in below table (8).

Table 8. Heteroskedasticity Test Results

F-statistic	2.321200	Prob. F(2,9)	0.1538
Obs*R-squared	4.083505	Prob. Chi-Square(2)	0.1298
Scaled explained SS	2.014789	Prob. Chi-Square(2)	0.3652

The results in above table show that the model didn't suffer from Heteroskedasticity and the variance among the random term variables are constant as the probability and Chi-square are more than 5%.

4.7 Causality Analysis

To examine the causal relation between oil price and the exchange rate in oil producing and exporting countries and for testing of 3rd objective of the study, the Pair-Wise Granger Causality test is applied and in table (4.9) the outcome is given.

Table 9. Causality Regression Results

Variables	*OP*	*ER*	*OX*	*OQ*
OP	---	0.0012	0.0255	0.0267
ER	0.0416	---	-0.0018	0.1749
OX	0.0316	-0.0174	---	0.0482
OQ	0.0054	0.2715	0.0372	---

The result of causality test shown in above table (9) indicates that there is a bi-variate causal relation between oil price and exchange rate in oil producing and exporting countries. This means that both exchange rate and oil price are strongly dependent on each other. Fluctuation in one variable will affect the other macroeconomic variable. The finding of this study regarding the causal relation between these two important variables is consistent to the earlier literature of (Breitung & Candelon, 2006; Benhmad, 2012; Tiwari & Albulescu, 2016; Nouira et al., 2019). Further, the study also found bi-causal relation of oil production and oil exports with oil price.Further, the study didn't found any causal relation between exchange rate and oil production, however, found bi-directional relation between oil exports and exchange arte

and is consistent with the theoretical and empirical literature of (Habib & Kalamova, 2007; Korhonen & Juurikkala, 2009; Wang et al., 2013; Beckmann & Czudaj, 2013).

However, our focused relation in this study is that of exchange rate and oil price and the results of the study obtained for Granger causality test for causal relation found significant and successful bi-directional relation between oil price and exchange rate for the period of 2000-2021, proving that these two variables are strongly connected with each other in case of major oil producing and oil exporting countries. Furthermore, on the contrary to the reverse causality, it is assumed that fluctuations in both the exchange rate and oil prices may be responsive to any other concurrent factors. One of these factors may be the monetary policy. Since oil is a durable good, its supply and price will be sensitive to not only the present monetary policy but also anticipated future. Similarly, determine the exchange rate determination is also affected by both present and projected monetary policy. So, one should suppose the determination of both oil prices and exchange rates together.

5.1 Conclusion

The aim of this study is to examine the impact, nature of relation and causal association of oil prices and exchange rate for major oil producing and exporting countries during 2000-2021. For this, the study employed various techniques in the methodology. For findings the impact of fluctuation in exchange rate in oil price that is 1st objective of the study, the ARDL short run analysis was carried. For analyzing the nature of relation and satisfying the 2nd objective, the ARDL bound and WALD tests are applied. For investigating the causal relation and for 3rd objective of this study, the Granger Causality approach is regressed.

The ARDL regression analysis for the impact of fluctuation in exchange rate shows that variation in the exchange rate leads to changes in the oil price in oil producing and exporting countries during the studied period of time. The factors and elements that establish the real exchange rate and cost of energy consist the real price of oil that let these countries to compose estimates of the cost accounts for exporting companies for future production (Vincent and Bertrand, 2011). Foreign trade volumes of developing countries are greatly affected by energy costs and currency exchange policies, therefore, the fluctuation in exchange rate has been the main concern and have dominance

effect in the macroeconomic indicators for developing countries by fluctuations in prices of oil.

Regressing for 2nd objective and nature of relation, the outcome of the ARDL bound and co-integration tests indicated the long-term association of exchange rate and the price of oil. Moreover, the WALD test also identifies the long run relation between oil price and the exchange rate for the study of period analysis. The ARDL long form indicated the long term significant association of exchange rate and oil price.

Another objective (3rd) of study was regarding the causal relation and the study found bi-variate relation running from and to exchange rate and oil price. The correlation of oil price and exchange rate may be complicated more than that shows by the trade effects. A number of transmission ways can support this causality relation between these two important factors. Firstly, as oil denominated in US dollars, depreciation of dollar may direct to a rise in oil demand from economies of currencies other than the dollar, which in return could cause a rise in the prices of oil. Second, if in case the oil-producing economies have targeted revenue from exports in their currency to finance the deficit in their government budget, and then with the depreciated dollar they may cut oil supplies in order to raise the price to attain their goal through export earnings. A third reason might be, investors probably would increase demand for merchandise when the dollar depreciates as hedge evade inflation. This may lead to increasing trend in oil prices.

5.2 Limitation of the Study

As the current study was done at aggregate level, it would be better if a detail study is conducted at disaggregate level.

Further, there is also need of the study that tests the application of Marshall linear theorem that will add to literature.

References

Agenor, P.R. (1991), *Output, Devaluation, and the Real Exchange Rate in Developing Countrie,* Weltwirtschaftliches Archive, 127, 18-41.

Aizenman, J., Edwards, S. & Riera-Crichton, D. (2012), *Adjustment Patterns to Commodity Terms of Trade Shocks: The Role of Exchange Rate*

and International Reserves Policies, Journal of International Money and Finance 31, 1990-2016.

Akram, Q.F. (2004), *Oil Prices and Exchange Rates: Norwegian Evidence*, Econometrics Journal, 7(2), 476-504.

Alhajji, A.F. (2004), *The Impact of Dollar Devaluation on the World Oil Industry: Do Exchange Rates Matter?* Journal of International Money and Finance, 17, 299-316.

Alsamara, M., Mrabet, Z., & Dombrecht, M. (2017), *Asymmetric Responses of Money Demand to Oil Price Shocks in Saudi Arabia: A non-linear ARDL approach*, Applied Economics, 49(37), 3758-3769.

Arize, A.C., Osang, T., & Slottje, D.J. (2000), *Exchange-Rate Volatility and Foreign Trade: Evidence from Thirteen LDC's*, Journal of Business & Economic Statistics, 5(2), 10-17.

Baffes, J. (2007), *Oil Spills on Other Commodities*, Resources Policy, 32, 126-134.

Bahmani-Oskooee, M., & Mirzaie, A. (2000), *The Long-run Effects of Depreciation of the Dollar on Sectoral Output*, International Economic Journal, 14, 51-61.

Bal, D.P., & Rath, B.N. (2015), *Nonlinear Causality between Crude Oil Price and Exchange Rate: A Comparative Study of China and India*, Energy Economics, 51, 149-156.

Basher, S.A., Haug, A.A., & Sadorsky, P. (2012), *Oil prices, exchange rates and emerging stock markets*, Energy Economics, 34(1), 227-240.

Beckmann, J., & Czudaj, R. (2013), *Oil Prices and Effective Dollar Exchange Rates*, International Review of Economics and Finance, 27(C), 621-636.

Benassy-Quere, E., Mignon, V., & Penot, A. (2007), *China and the relationship between the Oil Price and the Dollar*, Energy Policy, 35(11), 5795-5805.

Benhmad, F. (2012), *Modelling nonlinear Granger Causality between the Oil price and U.S. dollar: A Wavelet Based Approach*, Economic Modelling, 29(15), 1505-1514.

Bergstrand, J.H. (1991), *Structural Determinants of Real Exchange Rates and National Price Levels: Some Empirical Evidence*, American Economic Review, 81(1), 325-334.

Bodart, V., Candelon, B., & Carpantier, J.F. (2012), *Real Exchanges Rates in Commodity Producing Countries: A Reappraisal*, Journal of International Money and Finance, 31, 1482-1502.

Bouoiyour, J., Selmi, R., Tiwari, A.K., & Shahbaz, M. (2015), *The nexus between oil price and Russia's real exchange rate: Better paths via unconditional vs conditional analysis*, Energy Economics, 51, 54-66.

Bouri, E., Kachacha, I. & Roubaud, D. (2020), *Oil market conditions and sovereign risk in MENA oil exporters and importers*, Energy Policy, 137, 111-127.

Breitung, J., & Candelon, B. (2006), *Testing for Short and Long-run Causality: A Frequency Domain Approach*, Journal of Econometrics 12, 363−378.

Camarero, M., Ordez, J., & Tamarit, C. (2002), *An analysis of the transmission mechanism of monetary policy in Spain using a structural cointegrated VAR approach*, Applied Economics, 34, 2201- 2212.

Cashin, P., Cespedes, L. & Sahay, R. (2004), *Commodity Currencies and the Real Exchange Rate*, Journal of Development Economics 75, 239-268.

Chaodhuri, K., & Daniel, C. (1998), *Long-Run Equilibrium Real Exchanger Rates and Oil Prices*, Economic Letters, 58(2), 231 - 238.

Chen, S.S., & Chen, H.C. (2007), *Oil Prices and Real Exchange Rates*, Energy Economics, 29(3), 390-404.

Chen, Y.C., & Rogoff, K. (2003), *Commodity Currencies*, Journal of International Economics, 60, 133-160.

Cheng, K. C. (2008), *Dollar Depreciation and Commodity Prices.* International Monetary Fund (IMF) Working Paper No. 23, Pp. 72-75.

Farooq, A. (2008), Commodity *Prices, Interest Rates, and the Dollar*, Norges Bank Working Paper No. 2008/12.

Fratzscher, M., Schneider, D. & Van-Robays, I. (2013), *Oil Prices, Exchange Rates and Asset Prices*, CESifo Working Paper Series No. 4264.

Ghosh, S. (2011), *Examining Crude Oil Price-Exchange Rate Nexus for India during the Period of Extreme Oil Price Volatility*, Applied Energy, 88(5), 1886-1889.

Groen, J., & Pesenti, P.A. (2010), *Commodity Prices, Commodity Currencies and Global Economic Developments*, NBER Working Papers no. 15743.

Habib, M.M., & Kalamova, M.M. (2007), *Are there Oil Currencies? The real Exchange Rate of Oil Exporting Countries*, European Central Bank Working Paper Series No. 839.

Hasanov, F. (2010), *The Impact of Real Oil Price on Real Effective Exchange Rate: the Case of Azerbaijan*, DIW Berlin, Discussion Paper No. 1041.

Huang, Y., & Guo, F. (2007), *The Role of Oil Price Shocks on China's Real Exchange Rate*, China Economic Review, 18(4), 403-416.

Joyce, J., & Kamas, L. (2003), *Real and Nominal Determinants of Real Exchange Rates in Latin America: Short-run Dynamics and Long-run Equilibrium*, The Journal of Development Studies, 39(6), 155-182.

Kandil, M., & Mirzaie, A. (2002), *Exchange Rate Fluctuations and Disaggregated Economic Activity in the US: Theory and Evidence*. Journal of International Money and Finance, 21, 1-31.

Kilian, L. (2009), *Not all Oil Shocks are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market*. American Economic Review, 99(3), 1053-1069.

Kilian, L., & Zhou, X. (2019), *Oil prices, exchange rates and interest rates*, CESifo Working Paper Series, No. 7484.

Koranchelian, T. (2005), *The Equilibrium Real Exchange Rate in a Commodity Exporting Country: Algeria's Experience*, IMF Working Paper No. 05/135.

Korhonen, I., & Juurikkala, T. (2009), *Equilibrium Exchange Rates in Oil Exporting Countries*, Journal of Economics and Finance, 33, 71-79.

Lizardo, R.A., & Mollick, A.V. (2010), *Oil Price Fluctuations and U.S. Dollar Exchange Rates*, Energy Economics, 32(2), 399-408.

Makin, A. (2013), *Commodity Prices and the Macro-economy: An Extended Dependent Economy Approach*, Journal of Asian Economics, 24, 80-88.

Nikbakht, L. (2010), *Oil Prices and Exchange Rates: the Case of OPEC*, Business Intelligence Journal, 3(1), 83-92.

Nouira, R., Hadj, A.T., & Rault, C. (2019), *Oil Price Fluctuations and Exchange Rate Dynamics in the MENA Region: Evidence from non-causality-in-variance and asymmetric non-causality tests*, The Quarterly Review of Economics and Finance, 73, 159-171.

Novotny, F. (2012), *The Link between the Brent Crude Oil Price and the US Dollar Exchange Rate*, Prague Economic Papers, 2, 220-232.

Nusair, S.A., & Kisswani, K.M. (2015), *Asian Real Exchange Rates and Oil Prices: A co-integration Analysis under Structural Breaks*, Bulletin of Economic Research, 67(1), 1-25

Reboredo, J.C. (2012), *Modelling Oil Price and Exchange Rate Co-Movements*, Journal of Policy Modeling, 34(3), 419-440.

Suliman, M.H., & Abid, M. (2020), *The impacts of oil price on exchange rates: Evidence from Saudi Arabia*, Energy Exploration & Exploitation 38(5), 2037-2058.

Tiwari, A.K., & Albulescu, C.T. (2016), *Oil Price and Exchange Rate in India: Fresh evidence from continuous wavelet approach and asymmetric, multi-horizon Granger-causality tests*, Applied Energy, 179, 272-283

Tiwari, A.K., Mutascu, M.I., & Albulescu, C.T. (2013), *The Influence of the International Oil Prices on the Real Effective Exchange Rate in Romania in a Wavelet Transform Framework*, Energy Economics, 13, 34-47.

Turhan, I., Hacihasanoglu, E., & Soytas, U. (2013), *Oil Prices and Emerging Market Exchange Rates*, Emerging Markets Finance and Trade, 49(S1), 21-36.

Wang, Y., Wu, C., & Yang, L. (2013), *Oil Price Shocks and Stock Market Activities: Evidence from Oil-Importing and Oil-Exporting Countries*, Journal of Comparative Economics, 41(4), 1220-1239.

Zalduendo, J. (2006), *Determinants of Venezuela"s Equilibrium Real Exchange Rate*, IMF Working Paper No. 06/74.

Zhang, Y. (2013), *The Link between the Price of Oil and the Value of the US Dollar*, International Journal of Energy Economics and Policy, 3(4), 341-351.

Zhang, Y., Fan, Y., Tsai, H., & Wei, Y. (2008), *Spillover Effect of US Dollar Exchange Rate on Oil Prices*, Journal of Policy Modelling, 30 (6), 973-991.

Zhou, S. (1995), *The Response of Real Exchange Rates to Various Economic Shocks*, Southern Economic Journal, 61 (4), 936-954.

G. & L. E. R., Vol. 28 No. 1, 2024

Piera Cascioli[*], Dario D'Ingiullo[†], Donatella Furia[‡], Marialisa Mazzocchitti[§]
Davide Quaglione[**]

DOES THE REGIONAL WELL-BEING AFFECT NEET PHENOMENON? EVIDENCE FROM ITALY

Received: 10 January 2023 / Accepted: 28 September 2023

Abstract

GDP has been the most widely used measure index to explain the factors contributing to economic and social growth. However, it seems to be a limited measure as it fails to provide images about the decline in people's lives, such as unemployment, health, safety and social interactions. For this reason, following the line of research that deals with how the quality of life affects economic growth, the objective of the present work is to Study how the effects of the indicators of well-being attenuate the phenomenon of those who cannot engaged in education, employment or training (NEET). Focusing on the Italian regions, we implement a Principal Component Analysis (PCA), in which we have extracted synthetic indicators for each of the dimensions of well-being under consideration, and the SYS-GMM procedure. The main findings reveal that, among the regional indicators of well-being, the pillars associated with culture and leisure, the environment, the provision of public services, health status, personal safety, and social relations contribute to reducing the phenomenon of NEET in Italy.

JEL CLASSIFICATION: I31, J13, R23

KEYWORDS: NEET, REGIONAL WELL-BEING, UNEMPLOYMENT

1. Introduction

[*] University of Chieti-Pescara. *Email address*: piera.cascioli@unich.it.
[†] University of Chieti-Pescara. *Email address*: dario.dingiullo@unich.it.
[‡] University of Chieti-Pescara. *Email address*: donatella.furia@unich.it.
[§] University of Chieti-Pescara. *Email address*: m.mazzocchitti@unich.it
[**] University of Chieti-Pescara. *Email address*: davide.quaglione@unich.it.

The term 'NEET' is intended to describe young people who are not in education, employment or training'.

According to the existing literature, the NEET indicator is intended to indicate two different conditions, namely unemployment, understood as the active behaviour of job seekers, and inactivity, indicating the lack of effort to change the status of unoccupied and unoccupied in education or training (Caroleo et al., 2020).

The effects on the Neets of GDP (Bruno et al., 2014; Drakaki et al., 2014; Quintano et al., 2018; Vancea & Utzet, 2018; 6. Rodriguez-Modroño, 2019), unemployment (Bell & Blanchflower, 2010), school dropout (Pastore, 2014) and third level of education (Kotroyannos et al., 2015; De Luca et al., 2020) are known in literature. In particular GDP has been the most used measuring index to explain the factors contributing to social and economic growth. However, it appears to be a limited measure (Michalos, 2008; Larraz Iribas & Pavia 2010; Costanza et al., 2009; Fleurbaey & Beyond, 2009; Stiglitz et al., 2009; UNDP, 2010; OECD, 2011) as it fails to provide images about people's dimensions of life, such as unemployment, health, safety and social interactions (Sarra & Nissi, 2020).

An important part of the empirical literature has focused its studies on factors influencing welfare indicators, including culture and leisure (Grossi et al., 2012; Konlaan et al., 2000; Hyppa et al., 2006; Bygren, 2009); employment and essential public services (Cersosimo & Nisticò, 2013); environment (Khan et al., 2020); health (Diener & Chan, 2011; Dolan et al., 2008); personal safety (OECD, 2013); research and innovation (Annoni & Dijkstra, 2013; Annoni & Kozovska, 2010; Hong et al. 2012; Huggins & Davies, 2006; McCann & Oxley, 2012); social relations (Schwab & Porter, 2008). In this wake of thought, recent studies have deepened the theme with reference to the Italian regions (Sarra & Nissi, 2020; Ferrara & Nisticò, 2015).

A further innovative strand that is gaining ground in recent years is the one that sees the relationship between some indicators of well-being and the NEET phenomenon. A mechanical and alienating work, tends to make men dissatisfied, as well as lack of employment both academically and at work. Some authors, in fact, taking inspiration from an indigenous paradigm, sumak kawsay[1], that defines the necessary pillars for a better quality of life, have found that within the working environment, Well-being is fundamental as it makes individuals dynamic, contributing to their personal growth (González-

[1] It's neologism in Quechua created in the 1990s by socialist-indigenous organizations.

Díaz et al., 2021).

Other research, examining the self-reported subjective well-being of young people, within 24, European countries that do not have a job, education or training, noted that the welfare of young NEETs will be higher in contexts where the availability of social protection is greater and that inequalities in welfare between neet and non neet groups will be reduced to a minimum in contexts where school transitions-prolonged working towards adulthood are supported by social norms (Jongbloed & Giret, 2022).

Lőrinc et al. (2020) believe that unfulfilled support needs, lack of career advice and socio-economic disadvantage can lead to school disengagement, dropout and finally, NEET. Since, in the long term, this issue not only generates high social costs, but can also undermine future job opportunities, earnings, psychosocial well-being and the health of individuals, some economists have tried to prevent the spread of the phenomenon, underline the importance of funding in education and support services, together with changes in socio-economic deprivation policies and in the labour market.

In light of previous studies, in order to contribute to the literature on the topic, the aim of the following paper is to investigate the relationship between well-being indicators and NEETs.

2. Method and data

Through the following econometric dynamic model applied to panel data, we examine the extent to which the regional socio-economic well-being alleviate or not the NEET phenomenon at the Italian regional level. In particular, we estimate the following equation:

$$\mathrm{NEET}_{i,t} = \beta_0 + \beta_1 RWBI_{i,t} + \gamma_n \sum_{j=1}^{J} X_{\mathrm{ni,t}} + \mu_i + \eta_t + \varepsilon_{i,t} \qquad (1)$$

In Equation [1], the dependent variable (NEETi,t) is the share of NEET aged 15-29 over the respective population in the same age class[2]. The study covers 20 regions observed during a period of 17 years (2004-2020). Regional well-being indicators (RWBI), instead, represent our key regressors and are extracted from ISTAT dataset and in particular: "Aspects of daily life" dataset, BES indicators related to the report on equitable and sustainable well-being

[2] NEET are defined as young individuals who are not in employment, education or training.

and DPS dataset related to territorial indicators for development policies, elaborated. More specifically, according to Ferrara and Nisticò (2015), being a large database (see table 1) we implement a Principal Component Analysis (PCA), technique commonly used for reducing the dimensionality of our dataset while preserving as much as possible of the information contained in the original data, minimizing information loss. Through the PCA we have extracted the synthetic indicators for each of the dimensions of well being examined.

Table 1. Well-being dimensions

Indicator	Definitions
Culture and free time	It summarizes a set of activities carried out in the cultural and free time fields including: attending theater, cinema, music, sporting events, etc.; read books and newspapers; to practice sports or not.
Social relations	It summarizes the degree of satisfaction with friends and family relationships, social participation and interest in voluntary.
Research and innovation	It summarizes referable including public spending on R&D, workers in the R&D sector, propensity to patent and ability to export.
Environment	It summarizes variables related to environmental protection, including electricity produced from renewable sources, use of fertilizers in agriculture, urban waste produced, population density and protected areas.
Employment	It summarizes variables referable to the labor market such as employment rate, long-term unemployment, irregular employment, youth unemployment, persons with temporary jobs for at least 5 years, employment rate of women aged 25–49.
Health	It summarizes health variables including life expectancy at birth, infant mortality, overweight and obesity, sedentary lifestyle and adequate nutrition.
Material living conditions	It summarizes variables including disposable income per capita, income inequality, risk of poverty, severe housing deprivation, difficulty making ends meet, low work intensity and overburdening of the cost of housing.
Personal security	It summarizes variables such as numbers of burglaries, pickpocketings, robberiese and perception of crime risk.
Essential public services	It summarizes variables such as difficulties in accessing some services, Irregularities in the distribution of water and electricity, satisfaction with mobility services, use of public transport, number of general practitioners.

Source: ISTAT database.

Furthermore, the wide socio-economic differences among the Italian regions lead us to consider a set of well-established structural characteristics ($Xn_{i,t}$). In particular, we control for the, gross domestic product (GDP) per capita[3], the unemployment rate ($ur_{i,t}$), the school dropout rate ($dropout_{i,t}$)[4], and the population with a tertiary education (graduates)[5].

The GDP per capita, besides capturing the overall level of development, can be considered a proxy of wages (Etzo, 2011). We expect a negative coefficient associated to this variable since it should be negatively correlated with NEET phenomenon. The unemployment rate is included to take into account the degree of efficiency of labour market. According to the economic theory the sign of its coefficient is expected to be negative as well (Bradley et al., 2020). Furthermore, according to a well-established literature a higher dropout rate can be associated to a larger share of NEET, and this is due to the fact that leaving school or other forms of training prematurely increases the risk of becoming NEET (Giret et al., 2020). Finally, since the human capital has been considered as a factor able to shape NEET status, we included the share of tertiary educated over the total population among the control variables the adult population education level. Each regression also control for a full set of time dummies η_t and for the regional time-invariant characteristics μ_i, while $\varepsilon_{i,t}$ represents the idiosyncratic error term.

The adoption of a dynamic panel data approach prompted us to discard a priori static estimators such as fixed- or random-effects models. In contexts characterized by "small T, large N" (as in our case), static panel approaches lead to biased estimations of the coefficient associated to the lagged dependent variable (Nickell, 1981). Furthermore, the endogeneity issues that stem from the reverse causality between the regional well-being indicators and the share of NEET could bias the estimates as well. For these reasons, we opt for a System Generalized Method of Moments (SYS-GMM) estimator developed by Blundell & Bond (1998) which is able to address several endogeneity issues related to: the inclusion of a lagged dependent variable, the reverse causality, and the time-invariant individual characteristics.

The validity of moment conditions is tested through the Hansen's J test of

[3] Gross domestic product at current market price (euro per inhabitants).

[4] People (aged 18-24) with at most the middle school certificate, who have not completed a professional training course (2 or more years) recognized by the Region and who do not attend school courses or are involved in training activities (% over the respective population aged 18-24).

[5] Number of graduates as a percentage of provincial population.

overidentifying restrictions (Hansen, 1982), while the absence of second-order autocorrelation is con-trolled by implementing the Arellano and Bond test (Arellano & Bond, 1991).

3. Results

In Table 2, we report the SYS-GMM estimation results. First of all, the positive and statistically significant coefficient associated to the initial share of NEET indicates a persistence of this phenomenon over time. This means that region characterized by a higher weight of NEET tend to register an increase of this share in the following periods. Many regional well-being indicators, instead, seem to alleviate this phenomenon. In particular, we find that pillars associated to the culture and free time, the environment, the public services endowment, the health condition, the personal security, and social relations play a crucial role in reducing the risk of becoming NEET. In the light of the increasing awareness about the role of quality of life elements, the statistical significance of these pillars highlights important socio-economic factors that should be strengthened in order to reduce the share of NEET.

Yet, the results, besides revealing original elements associated to the well-being pillars, also indicate an important role associated to the consolidated economic determinants of NEET. More specifically, by looking at the control variables we can observe that the labour market characteristics (unemployment rate) and the dropout rate are always positive and statistically significant confirming that both the lower probability to find a job and the premature school leaving increase the regional base of NEET. On the contrary, a higher level of wage proxied by the GDP per capita seems to produce beneficial consequences by reducing the NEET phenomenon. Finally, we do find statistically significant evidence concerning the human capital endowment.

Table 2. Estimation results for all the Italian provinces.

	SYS-GMM	SYS-GMM	SYS-GMM	SYS-GMM	SYS-GMM
Dependent	Neet	Neet	Neet	Neet	Neet
variable	(1)	(2)	(3)	(4)	(5)
$neet_{i,t-1}$	0.4834***	0.4184***	0.4606***	0.7222***	0.6747***
	(0.0831)	(0.116)	(0.0928)	(0.1346)	(0.1253)
ur	0.2757***	0.1451**	0.2902***	0.2054***	0.2220***
	(0.0635)	(0.072)	(0.0529)	(0.0781)	(0.0573)
GDP	-0.1360**	0.11	0.0237	-0.2315**	-0.2816**
	(0.0567)	(0.0829)	(0.078)	(0.1012)	(0.1349)
dropout	0.1005***	0.0782**	0.1206***	0.1236***	0.1145**
	(0.023)	(0.0322)	(0.0215)	(0.0303)	(0.0451)
graduates	-0.0457	0.0986**	-0.0019	0.0024	-0.0273
	(0.0379)	(0.0461)	(0.041)	(0.0372)	(0.0489)
culture	-0.0492***				
	(0.0127)				
labour		0.1807***			
		(0.0456)			
environment			-0.0685***		
			(0.0228)		
public services				-0.0895***	
				(0.0271)	
health					-0.1046**
					(0.0505)
constant	2.1999***	-0.2104	0.4258	2.4029**	3.1318**
	(0.6135)	(0.8015)	(0.8315)	(1.0626)	(1.4574)
Observations	320	320	320	320	320
Provinces	103	103	103	103	103
Time effects	Yes	Yes	Yes	Yes	Yes
Provincial effects	Yes	Yes	Yes	Yes	Yes
Arellano-Bond (1)	0.000	0.000	0.000	0.000	0.000
Arellano-Bond (2)	0.727	0.143	0.868	0.588	0.548
Hansen's J test	0.469	0.584	0.49	0.47	0.494

Source: our elaborations. ISTAT data.
Note: *statistically significant at the 10%; **statistically significant at 5%. *** statistically significant at 1%. Standard errors clustered by provinces are given in parenthesis. Except for the regional well-being indicators, all the other variables are expressed in logarithm.

Table 2. (continued)

	SYS-GMM	SYS-GMM	SYS-GMM	SYS-GMM
Dependent variable	Neet	Neet	Neet	Neet
	(6)	(7)	(8)	(9)
$neet_{i,t-1}$	0.6680***	0.2720***	0.4104***	0.5760***
	(0.057)	(0.0613)	(0.1101)	(0.1167)
ur	0.1742***	0.4674***	0.3818***	0.2258***
	(0.0565)	(0.0361)	-0.0725	-0.0841
GDP	0.0505	-0.0623	-0.1625**	0.0521
	(0.0663)	(0.0727)	-0.0717	-0.0895
dropout	0.0737*	0.0998***	0.0898***	0.0895***
	(0.0383)	(0.0291)	-0.0257	-0.0258
graduates	0.0632*	0.0276	-0.0075	0.0181
	(0.0354)	(0.038)	-0.0404	-0.0376
living conditions	0.0516			
	(0.0358)			
personal security		-0.0254***		
		(0.0083)		
R&D			0.0396***	
			(0.0153)	
social relations				-0.0575*
				(0.0325)
constant	-0.2837	1.4418	2.3686***	-0.0429
	(0.5261)	(0.8801)	(0.8798)	(0.9722)
Observations	320	320	320	320
Provinces	103	103	103	103
Time effects	Yes	Yes	Yes	Yes
Provincial effects	Yes	Yes	Yes	Yes
Arellano-Bond (1)	0.000	0.000	0.000	0.000
Arellano-Bond (2)	0.2739	0.4251	0.6761	0.4217
Hansen's J test	0.47	0.302	0.441	0.389

Source: our elaborations. ISTAT data.
Note: *statistically significant at the 10%; **statistically significant at 5%. *** statistically significant at 1%. Standard errors clustered by provinces are given in parenthesis. Except for the regional well-being indicators, all the other variables are expressed in logarithm.

4. Conclusions

During the past few decades, the economic literature has shown a growing interest towards the NEET phenomenon by exploring the different channels through which individuals are incentivized to actively find a job or prosecute with their formation. Among these factors, while a considerable attention has been paid on the role played by economic factor *strictu sensu* such as the unemployment rate, the income level or the dropout, lower consideration has been posed on institutional, environmental, and cultural elements.

By using a SYS-GMM procedure to account for: the endogeneity of the lagged dependent, the reverse causality, and provincial characteristics, this paper provides an original contribution to the literature by investigating within a comprehensive empirical framework the role associated to the consolidated determinants of the NEET phenomenon and to the less explored ones related to the welfare sphere. In particular, this study, focusing on the Italian regions, analyses the extent to which the several well-being pillars could have an effect in alleviating the weight of NEET.

Interesting novel evidence emerge. In particular, the main findings reveal that, among the regional well-being indicators, the pillars associated to the culture and free time, the environment, the public services endowment, the health condition, the personal security, and social relations contribute to reduce the NEET phenomenon in Italy. Among the economic determinants, the labour market inefficiencies as well as the dropout rate represent worsening conditions for young people, while higher level of income per capita stimulates individuals to find a job or to educate

References

Annoni, P., & Dijkstra, L. (2013), *EU Regional Competitiveness Index. RCI 2013*, Luxembourg: Publications Office of the European Union, http://europa.eu/.

Annoni, P., & Kozovska, K. (2010), *EU Regional Competitiveness Index 2010*, http://www.jrc.ec.europa.eu/.

Arellano, M., & Bond, S. (1991), *Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations*, The Review of Economic Studies, 58(2), 277-297.

Bell, D.N.F., & Blanchflower, D.G. (2010), *Youth unemployment: Déjà Vu?*, IZA discussion paper, 4705 Bonn.

Blundell, R., & Bond, S. (1998), *Initial conditions and moment restrictions in dynamic panel data models*, Journal of Econometrics, 87(1), 115-143.

Bradley, S., Migali, G., Navarro Paniagua, M. (2020), *Spatial variations and clustering in the rates of youth unemployment and NEET: A comparative analysis of Italy, Spain, and the UK*, Journal of Regional Science, 60(5), 1074-1107.

Bruno, G.S.F., Marelli, E., Signorelli, M. (2014), *The rise of NEET and youth unemployment in EU regions after the crisis*, Comparative Economic Studies, https://doi.org/10.1057/ces.2014.27.

Bygren, L.O., Johansson, S., Konlaan, B., Grjibovski, A.M., Wilkinson, A.V., Sjöström, M. (2009), *Attending cultural events and cancer mortality: a Swedish Cohort Study*, Art Health, 1(1), 64-73.

Caroleo, F.E., Rocca, A., Mazzocchi, P., Quintano, C. (2020), *Being NEET in Europe before and after the economic crisis: an analysis of the micro and macro determinants*, Social Indicators Research, 149(3), 991-1024.

Cersosimo, D., & Nisticò, R. (2013), *Un Paese Disuguale*, Stato Mercato, 98, 265-299.

Costanza, R., Hart, M., Costanza, R., Hart, M., Talberth, J., Posner, S. (2009), *Beyond GDP: The need for new measures of progress*, Technical report, Boston University Creative Services.

De Luca, G., Mazzocchi, P., Quintano, C., Rocca, A. (2020), *Going behind the high rates of NEETs in Italy and Spain: The role of early school leavers*, Social Indicators Research, 151(1), 345-363.

Diener, E., & Chan, M.Y. (2011), *Happy people live longer: subjective well-being contributes to health and longevity*, Applied Psychology: Health and Well-Being, 3(1), 1-43.

Dolan, P., Peasgood, T., White, M. (2008), *Do we really know what makes us happy? A review of the economic literature on the factors associated with subjective well-being*, Journal of economic psychology, 29(1), 94-122.

Drakaki, M., Papadakis, N., Kyridis, A., Papargyris, A. (2014), *Who's the Greek Neet? Neets' profile in Greece: parameters, trends and common characteristics of a heterogeneous group*, International Journal of Humanities and Social Science, 4(6), 240-254.

Etzo, I. (2011), *The determinants of the recent interregional migration flows in Italy: A panel data analysis*, Journal of Regional Science, 51(5), 948-966.

Ferrara, A.R., & Nisticò, R. (2015), *Regional well-being indicators and dispersion from a multidimensional perspective: evidence from Italy*, The Annals of Regional Science, 55(2), 373-420.

Fleurbaey, M. (2009), *Beyond GDP: the quest for a measure of social welfare*, Journal of Economic literature, 47(4), 1029-1075.

Giret, J.F., Guégnard, C., Joseph, O. (2020), *School-to-work transition in France: the role of education in escaping long-term NEET trajectories*, International Journal of Lifelong Education, 39(5-6), 428-444.

González-Díaz, R.R., Acevedo-Duque, Á., Salazar-Sepúlveda, G., Castillo, D. (2021), *Contributions of subjective well-being and good living to the contemporary development of the notion of sustainable human development*, Sustainability, 13(6), 3298.

Grossi, E., Tavano Blessi, G., Sacco, P.L., Buscema, M. (2012), *The interaction between culture, health and psychological well-being: data mining from the Italian culture and well-being project*, Journal of Happiness Studies, 13(1), 129-148.

Hansen, L.P. (1982), *Large sample properties of generalized method of moments estimators*, Econometrica: Journal of the Econometric Society, 50(4), 1029-1054.

Hong, S., Oxley, L., McCann, P. (2012), *A survey of the innovation surveys*, Journal of economic surveys, 26(3), 420-444.

Huggins R., & Davies, W. (2006), *European Competitiveness Index 2006–07*, http://www.cforic.org/downloads.

Hyppa, M.T., Maki, J., Impivaara, O., Aromaa, A. (2006), *Leisure participation predicts survival: a population based study in Finland*, Health Promotion International, 21(1), 5-12.

Jongbloed, J., & Giret, J.F. (2022), *Quality of life of NEET youth in comparative perspective: subjective well-being during the transition to adulthood*, Journal of Youth Studies, 25(3), 321-343.

Khan, A., Chenggang, Y., Bano, S., Hussain, J. (2020), *The empirical relationship between environmental degradation, economic growth, and social well-being in Belt and Road Initiative countries*, Environmental Science and Pollution Research, 27(24), 30800-30814.

Konlaan, B.B., Bygren, L.O., Johansson, S. (2000), *Visiting the cinema, concerts, museums or art exhibitions as determinant of survival: a Swedish fourteen-year cohort follow-up*, Scandinavian Journal of Public Health, 28(3), 174-178.

Kotroyannos, D., Lavdas, K., Drakaki, M. (2015), *An individuality in parenthesis? Social vulnerability, youth and the welfare state in crisis: On the case of NEETs, In Greece, within the European context*, Studies in Social Sciences and Humanities, 3, 268-279.

Larraz Iribas, B., & Pavia, J.M. (2010), *Classifying regions for European development funding*, European Urban and Regional Studies, 17(1), 99-106.

Lőrinc, M., Ryan, L., D'Angelo, A., Kaye, N. (2020), *De-individualising the 'NEET problem': An ecological systems analysis*, European Educational Research Journal, 19(5), 412-427.

McCann, P, & Oxley, L. (2012), *Innovation, entrepreneurship, geography and growth*, Journal of Economic Surveys, 26(3), 373-376.

Michalos, A.C. (2008), *Education, happiness and wellbeing*, Social Indicators Research, 87(3), 347-366.

Nickell, S. (1981), *Biases in dynamic models with fixed effects*, Econometrica: Journal of the econometric society, 49(6), 1417-1426.

OECD (2011), *How's life? Measuring well-being*, OECD Publishing, Paris.

OECD (2013), *How's life? Measuring well-being*, http://www.oecd.org, OECD Publishing, Paris.

Pastore, F. (2014), *The youth experience gap*, Springer Book Series, Berlin.

Quintano, C., Mazzocchi, P., Rocca, A. (2018), *The determinants of Italian NEETs and the effects of the economic crisis*, Genus, 74(1), 1-24.

Rodriguez-Modroño, P. (2019), *Youth unemployment, NEETs and structural inequality in Spain*, International Journal of Manpower, 40(3), 433-448.

Sarra, A., & Nissi, E. (2020), *A spatial composite indicator for human and ecosystem well-being in the Italian urban areas*, Social Indicators Research, 148(2), 353-377.

Schwab, K., & Porter, M.E. (2008), *The global competitiveness report 2008-2009*, http://www.weforum.org/pdf/GCR08/GCR08.pdf, World Economic Forum, Geneva.

Stiglitz, J., Sen, A., Fitoussi, J.P. (2009), *Report by the commission on the measurement of economic performance and social progress*, Technical report, French Commission on the Measurement of Economic Performance and Social Progress.

UNDP (2010), *United Nations Development Programme, human development report*, Oxford University Press, New York.

Vancea, M., & Utzet, M. (2018), *School-to-work transition: the case of Spanish NEETs*, Journal of Youth Studies, 21(7), 869-887.