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CONTENTS

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Issues of Food Pricing Policy in Pakistan and the Way Forward

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Price control policies are implemented to support farmers and ensure affordability for consumers but often lead to market distortions and inefficiencies. The present study aims to investigate the role of food pricing policy in Pakistan. In each district, on the behalf of Deputy Commissioner Office (DCO), market committees (MC) fix retail prices of fruits and vegetables daily. We collected data on 11 fruits and vegetables from four mega cities (Islamabad/ Rawalpindi, Lahore, Faisalabad, and Multan) for 10 consecutive days. It is observed that the difference between farm gate prices and DCO prices varies between 6.2 percent to 20.3 percent which is not insufficient to cover the different costs (transportation cost from mandi to retail shop, losses of wastage, opportunity cost of the retailers' labour and profit margins) of retailers. Our comparison of prevailing retail prices with the retail prices reported by PBS further demonstrates that PBS under-reported the retail prices to curb the inflationary effect.

The government procures 70-80 percent of the market surplus to maintain prices close to the minimum support price (MSP) and the government is spending about Rs.130 billion each year to achieve this single objective. However, retail prices increase more than double that of MSP and the benefit of the increase in prices goes to flour mills and traders. Our analysis for the year 2021-22 reveals that government footprints in wheat marketing are equal to Rs. 131 billion. If this cost had been passed on to the consumers in the form of increased prices (under the assumption that procuring, and handling will take place under the private sector), then it would have increased the retail prices by 28 percent. Hence, retail prices would be Rs. 70.3/kg in contrast to the government's desired price of Rs. 55/kg (MSP). If we add up another additional profit of Rs.10/kg to incentivise the private sector, then prices will increase to Rs. 80.3/kg but the wheat prices will increase to Rs.110/kg. This implies that an extra profit of Rs. 30/kg is earned by the flour mills and other value chain actors. This could be diverted to consumers by adopting a free market mechanism. In case of wheat shortage, the retail price of imported wheat in the private sector would be Rs.94.3/kg (after adding transportation cost, loading, and unloading charges, and Rs.10/kg profit in the private sector) which is still lower than retail price of Rs.110/kg during 2021-22. Based on the study's findings, it is recommended that the government need to minimise its footprints and allow market forces to determine retail prices. However, it should continue to play its regulatory role to assure equal access to all actors in the market to ensure fair market practices.

1. INTRODUCTION

Governments in under-developing countries often facilitate farmers by setting price floors in agricultural markets. Price controls on agriculture products are government-mandated to manage affordability (either for producers or consumers) and economic

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stability for a certain period (Mankiw, 2020). Government-imposed price controls may disturb the balance between supply and demand established through market transactions. This may lead to the creation of excess demand (or shortage) in the case of price ceilings or excess supply (or surplus) in the case of price floors (Barkley, (2019). Also, the Government's regulatory policies cause prices to deviate from marginal costs (Murphy et. al., 2019). If not managed adequately through other measures like imports, exports, and subsidies, such surplus and shortage can lead to several problems such as smuggling, hoarding, and deterioration of the quality of agro products (De Soto & Diaz, 2002 & Murphy, et al. 2019). Price controls can often lead to losses for domestic producers, especially if prices are set too low, which often leads to low investment by producers and a drop in quality (Newfarmer and Pierola, 2015). If profit margins rely on subsidies to local companies to counterbalance price controls, this may discourage foreign investment in these industries by increasing the country risk premium that multinational corporations must assume. (Dimson, et al. 2003 & Teravaninthorn & Raballand, 2009). Moreover, such controls are costly to the government exchequer, burden administration, and detract bureaucrats from their more critical functions (Helm, 2006). The heavy cost involved in managing the surpluses and shortages may suck up resources from other important development projects and may crowd out the financial institutions (Maimbo and Gallegos, 2014).

Although price controls are occasionally employed as a tool for social policy, they can depress investment and growth, exacerbate poverty, cause governments to incur significant budgetary burdens, and make it more difficult to execute monetary policy effectively (Guenette, 2020). Regimes of price control may also favour the subsidised sector in resource distribution. In lower-income countries, price controls are more common in the agricultural sector complemented by input subsidies (particularly for fertiliser). However, such measures may ultimately have a negative impact on productivity, worsen wealth inequality (Goyal and Nash, 2017), and might result in inefficient use of subsidised inputs (Jayne, et. al. 2016). Price controls may also have a negative impact on the incentives to embrace new technologies that could increase productivity. Empirical research indicates a substantial correlation between increased firm-level productivity and market-oriented structural changes, such as the elimination of price controls and the accompanying subsidies (Kouame and Tapsoba, 2019). Price restrictions might be replaced with enlarged and more carefully targeted social safety nets, together with changes to promote competition and a stable regulatory environment, to be more pro-poor and pro-growth (Guenette, 2020). Some argue that such a transition may overlook the potential drawbacks. Critics point out that removing price restrictions without adequate safeguards could exacerbate income inequality and lead to food insecurity for vulnerable populations. Additionally, there are concerns about the feasibility and effectiveness of implementing comprehensive social safety nets, especially in developing countries with limited resources and institutional capacity (Gustafson, 2013 & Cingno, 2015). Therefore, the debate surrounding the replacement of price restrictions with social safety nets involves weighing the potential benefits against the risks and challenges associated with such a policy shift.

Price control is supported by the argument that consumers cannot be left at the mercy of the market for the availability of food even if markets perfectly respond to supply and demand situations. However, it has been shown by several studies that such price control fails to control and instead, in some cases, exacerbate food crises when they occur

(Weitzman, 1991 & Winkler, 2015). Furthermore, price regulations that skew consumer behaviour toward price-controlled commodities can result in persistent shortages of those goods, the emergence of parallel markets with higher prices, and a shift away from those goods in favour of substitutes of inferior quality (Fengler, 2012). Similarly, it is argued that producers cannot be entirely left on market forces because bumper crops and resulting low prices may discourage investment in agriculture which may be detrimental to the long-run sustainability of the sector. However, it has been shown that such price control more often dampens agriculture commodity prices, thus discouraging investment in the agriculture sector. Producers of goods with price controls could move to black markets, which have high transaction costs but no regulations (Murphy, et al. 2019). Similarly, in some situations, producers may encouraged to shift their production activities towards the informal sector to avoid regulations (De Soto and Diaz, 2002). Throughout Pakistan's history, instances of price regulation for commodities like sugar, wheat, oil, and drugs have often led to unintended consequences (Jamal, 2021). In many cases, attempts to impose price ceilings have resulted in artificial hoarding of stock or the emergence of informal markets where these products are sold at higher rates. For instance, over the past decade, the government implemented price controls on medicines to ensure access to affordable medication for low-income populations. However, this control was inconsistent and resulted in rent-seeking behaviour. In 2015, reports of shortages of tuberculosis medicines surfaced, prompting some individuals to hoard supplies and sell them on the black market at prices up to 50 times the original cost. Consequently, the absence of essential medicine or significantly higher costs disproportionately affects the poorest individuals, who rely on public health facilities for access to medication (Atif, et al. 2017 & Dewani, 2019). In 2023, despite intervention by the Economic Coordination Committee (ECC), sugar prices remained uncontrollable, leading traders to engage in hoarding to capitalise on the high prices. This situation also fueled the growth of the black market for sugar. Additionally, the smuggling of sugar to Afghanistan further exacerbated the problem (The Express Tribune, 2023). On the other hand, markets may not perform perfectly everywhere and all the time, providing the basis for market interventions primarily through price control (Mankiw, 2020). The free market mechanism fails due to asymptotic price information, primarily to producers, lack of necessary infrastructure to effectively participate in markets like farm-market roads, storage, etc., and poor bargaining powers of the producers mainly due to the lack of farmers' access to formal credit institutions. Cartelisation by corporates and traders may also lead to market failure leading to a lower price for producers. Thus, upward price control is argued to be necessary to protect producers from the exploitation of market agents and their cartelisation. However, it is not clear how price control can stop such exploitations. Market failure occurs when economic outcomes deviate from what economists consider optimal and are typically inefficient economically (Bator, 1958 & Cunningham, 2011).

Moreover, due to the sudden increase in supply during the short-harvest period of agriculture commodities, the market glut and price drop at this point do not actually represent the yearly supply and demand situation. Still, such a drop in prices damages producers of the commodity. It is argued that if farmers are not protected against this peak-season drop in prices, they may get discouraged and leave agriculture production altogether. One of the reason of it is “Cobweb Phenomenon” (Poitras, 2022). However, alternative means of reducing the impacts of market gluts and price reduction at peak-

season may also be evaluated. It is worth mentioning here that not only the producers suffer but the consumers too as it is alleged that the middleman creates extravagant profits at the expense of social welfare, moral principles, and efficiency by taking advantage of both the poor consumer and the impoverished farmer (Tribune, 2021). The function of these intermediates in the marketing chain is quite intricate. They make the rules and are the most influential players. By taking advantage of the market's severe conditions, middlemen are able to sometimes make at least a profit of 50-60 percent(Olsson, et al. 2013 & Ashfaq, 2017).

The initial step in evaluating and making apparent the effects of price controls is having the capacity to model them. This is crucial for participating in the debate over whether they should be removed or adjusted to keep the social advantages and reduce their economic costs. Even if it is agreed that controlled prices are less effective than deregulated prices with subsidies for the poor, moving to deregulated prices first necessitates an awareness of the distortions brought on by current price regulations (Murphy, et al. 2019). To solve market failures, many components of economic efficiency require regulations but instead of utilising imprecise aggregate estimates of the entire burden, a disaggregated strategy that concentrates on when, where, and how to regulate is more suited to addressing the primary efficiency challenges (Helm, 2006).

In Pakistan, agriculture commodities are controlled through several legal instruments such as the Price Control and Prevention of Profiteering and Hoarding Act 1977 and Essential Commodities Act 1955, etc., involving national, provincial, and local level government institutions. Recently a new act has been approved namely Punjab Agriculture Marketing Regulatory Authority Act 2020 (PAMRA Act) to bring regulatory reforms in agriculture markets which has a long history of government footsteps marked with lack of transparency, unfair treatment to producers, and welfare losses to consumers.[1] The upward price controls are fixed to benefit the producers and the downward control to help the consumers. However, the impacts of such controls could be multidimensional and do not remain limited to these two points. They may impact producers' and consumers' prices and demand and supply, cropping patterns, product quality, investment in the food and agriculture sectors, incomes of various stakeholders, and trade at international levels (Fengler, 2012; Winkler, 2015 & Murphy, et al. 2019). For example, wheat price support in Pakistan discourages the cultivation of edible crops such as rapeseed and mustard. As a consequence, Pakistan annually spends a significant amount of foreign exchange, approximately US$4.5 billion (as in FY21) on importing edible oil, particularly palm oil and soybean-related imports (SBP, 2022). Mostly, the government does not consider these multidimensional impacts while implementing upward or downward price controls.

Empirical literature addresses the issue of pricing policy in Pakistan, primarily highlighting the costs of subsidies, conducting comparisons with other countries, and discussing market reforms. For instance, Rana (2020) examines the rationalisation of wheat markets in Pakistan and proposes strategies for establishing a sustainable wheat market, such as reforming the governance structure and implementing liberalisation measures. Shahzad, et al. (2019) investigated the wheat price support policy in Pakistan and highlighted the significant burden it places on the government exchequer. They noted that

[1]https://blogs.worldbank.org/endpovertyinsouthasia/modernizing-punjabs-farming-benefit-farmers-and-consumers

the cost of minimum support price (MSP) is higher than the neighbouring countries. Moreover, the study suggests that input subsidy is more beneficial for stakeholders. However, the study does not comprehensively calculate the entirety of government intervention costs, i.e. retail price hikes, and the resultant losses for both farmers and the government. Haque, et al. (2011) propose that the reforms are needed to promote competitive and vibrant agriculture markets at the domestic level along with a strong legal framework to support the complex needs of the diverse markets. The study also emphasises reducing government involvement to encourage private sector competitiveness and economic growth. Barrett & Mutambatsere (2008) & Reardon & Timmer (2007) further support the need for agricultural market reforms in developing nations to enhance efficiency.

However, transitioning away from government involvement in markets for the sake of reform necessitates careful planning, advocating for the gradual adoption of market-led approaches coupled with robust monitoring and buffer stock management (Ahmad, et al. 2005). Dorosh & Salam (2008) stress the importance of the private sector in improving the functionality of the wheat market, asserting that promoting private sector involvement in wheat trade can lead to enhanced price stability. They highlight that private-sector imports can bolster supply and contribute to stabilising market prices. Azeem, et al. (2012) provide contrasting evidence, suggesting that wheat support prices can result in lower retail prices, implying that wheat price support policy could be used to alter inflation.

Understanding the welfare implications of wheat price and trade policies in Pakistan involves examining their effects on different exchequers within the wheat flour value chain. Alonso & Swinnen (2016) assess these impacts for the period 2000 to 2003 and their analysis reveals that wheat policies primarily favour flour consumers and traders over farmers, with minimal effects on flour millers. This highlights the nuanced impact of policies within both producer and consumer segments, offering insights for economic and political analyses and the design of policies targeting vulnerable groups within value chains. Minimising fiscal subsidies is crucial to ensure the equitable distribution of benefits across the wheat-flour value chain (Dorosh & Salam, 2007).

The existing literature provides a comprehensive overview of various aspects related to pricing policies and market reforms in the context of wheat and other food items in Pakistan. However, there is a notable research gap in the quantitative analysis of price control mechanisms at multiple levels (national, provincial, and local) for major food items or commodities. While studies have discussed the implications of government interventions and market-led approaches, there remains a need for empirical evidence to evaluate the effectiveness of existing pricing mechanisms in stabilising prices over the long term. Additionally, there is limited research on suggesting efficient pricing mechanisms that can enhance the welfare of various stakeholders, including consumers, producers, and governments, at each administrative level. Therefore, this study aims to fill this research gap by conducting a detailed analysis of price control mechanisms and proposing evidence-based recommendations for improving pricing policies to achieve long-term price stability and enhance the welfare of stakeholders across different levels of governance in Pakistan's food markets. In the light of above discussion, the present study aims to analyse the impacts of food pricing policies and evaluate the price control mechanisms in Pakistan, both qualitatively and quantitatively. More specifically, the objectives of the study are to:

Analyse price control mechanisms at the national, provincial, and local levels for major food items/commodities and review the regulatory framework under which price controls are implemented.

Provide quantitative evidence of effective pricing mechanisms that can stabilise prices in the long term and suggest an efficient pricing mechanism that may enhance the welfare of various stakeholders (consumers, producers, and governments at each level).

To achieve the above objectives, the study is based on the literature review, collection, and analysis of primary and secondary data to produce qualitative and quantitative evidence. This study holds significance in revealing discrepancies among farm gate prices, DCO prices, and actual market prices. Also, it sheds light on inefficiencies in current food pricing policies, while proposing potential alternatives, especially in the case of wheat. The significance of the study also extends to understanding how upward and downward price fixation affects the utility of different stakeholders.

2. RESEARCH METHODS

Theories of the free market mechanism advocate for minimal government intervention in economic activities, emphasising the efficiency of market forces in allocating resources. According to classical economists such as Adam Smith, the invisible hand of the market, driven by self-interest and competition, guides economic actors to make optimal decisions that benefit society as a whole (Smith, 1776). This perspective suggests that markets tend towards equilibrium, where supply and demand balance naturally, leading to efficient resource allocation (Friedman, 1962). Neoclassical economists further developed this theory, arguing that competitive markets maximise social welfare by efficiently allocating resources and producing goods and services at the lowest possible cost (Arrow & Debreu, 1954). The free market theory asserts that government intervention, such as price controls or regulations, distorts market signals, leading to inefficiencies and unintended consequences (Friedrich, 1945). Proponents of this theory argue that allowing market forces to operate freely fosters innovation, fosters competition, and ultimately promotes economic growth and prosperity (Mankiw, 2020).

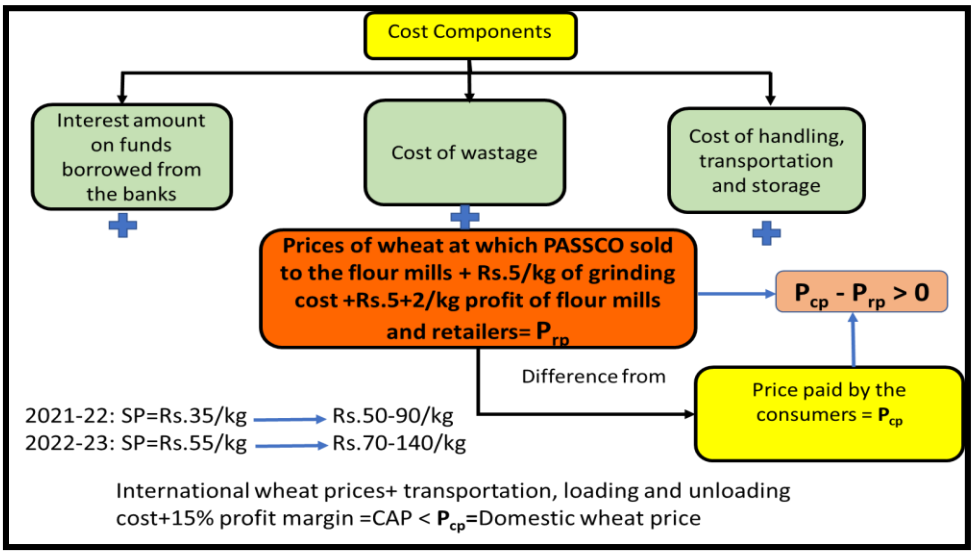
Keeping these theoretical channels in mind, the study intends to explore the mechanism and efficiency of price control in fruits and vegetable markets and wheat markets of Pakistan. This study is based on conducting a comprehensive review of federal and provincial acts related to markets. This provides a deeper understanding of the regulations governing these markets. Further, the research team visited various markets to document whether market committees and markets themselves are functioning according to the constitution or not.

The quantitative evidence of effective pricing mechanisms is explored within two key markets: the fruits & vegetables market and the wheat market. These sectors are significant areas of government intervention due to their critical role in food security and economic stability. Consequently, analysing these markets is essential for suggesting efficient pricing mechanisms that can improve the welfare of all stakeholders. Furthermore, we collected data for 6 vegetables and 5 fruits for 10 consecutive days at four levels (i.e., farm gate, DCO, retail and PBS level) from 4 mega cities (Lahore, Faisalabad, Multan and the twin city of Rawalpindi-Islamabad).

The mean value approach is used in data analysis which is a fundamental method of understanding basics. This approach gives single representative value to summarise data, and for making comparisons. (Newbold, et al. 2013). These comparisons also helps to derive important inferences. In this study, P_{ifg}, P_{idc} and P_{ir} are respectively, the average farm gate, DCO, and retail prices of i-th commodity. If $P_{ir} - P_{ifg} > P_{idc} - P_{ifg,}$ then this implies that DCO prices are neither implemented nor followed by retailers. This implies that fixing DCO prices is an attempt to distort the competitive market and such distortions may lead to promote a lemon market of fruits and vegetables which may affect the welfare of consumers.

To comprehensively analyse the wheat price dynamics and to assess the implications of government interference in the wheat market, the conceptual framework elaborated in Figure 1 is used in the study. It encompasses various cost elements, including interest amount on funds borrowed from the bank to procure wheat from the farmers at the support prices, cost of wastage, cost of handling, and cost of transportation and storage. The retail price is determined by aggregating these cost components along with grinding expenses and the profit margins of flour mills. The government invests a substantial amount of financial resources by announcing support prices to the farmer and the objective of this intervention is to offer prices close to the support prices to the consumers to maintain the minimum level of calorie intake. Now the question comes, whether the government can succeed in offering prices close to the support prices to the consumers but the answer is no. Rather, prices paid by the consumers are almost double the support price announced by the government. This implies that the government failed to achieve the objective of intervention through support prices. We have discussed the market-based alternative options that can lead to offering lower prices to the consumers which will ultimately improve the consumers' welfare and reduce the financial burden of the government.

Fig. 1. Conceptual Framework for Analysing the Cost of Government Interference in the Wheat Market



3. LEGAL UMBRELLA FOR GOVERNMENTS TO REGULATE PRICES OF ESSENTIAL COMMODITIES

In Pakistan, there is an established regulatory system for pricing. The "Price Control and Prevention of Profiteering and Hoarding Act, 1977" is a federal law that provides provision to federal and provincial governments to regulate prices, sales, distribution, transportation, movement across provinces, and holding of stocks of "essential commodities". The Food Stuff Control Act of 1958, the Registration of Godowns Act of 2014, the Sindh Essential Commodities Price Control and Prevention of Profiteering and Hoarding Act of 2005, the Punjab Agricultural Produce Markets Ordinance of 1978, Punjab Agriculture Marketing Regulatory Authority Act 2020 (PAMRA act) and other provincial laws also exist that allow federal and provincial governments to regulate the prices of essential commodities.

The Deputy commissioners have been given power under section 4 of Price Control and Prevention of Profiteering and Hoarding Act, 1977, and section 3(2) (b) of the Food Stuff Control Act of 1958 to direct the sale prices of essential items[2] in their district. They have to follow the government price policy for wheat flour, vegetable ghee, and sugar. Prices of chicken and eggs are followed by Additional Director Livestock daily. The charge for fixing prices of fruits and vegetables daily is imparted to the concerned Market Committee (MC) by the DC office[3]. Market Committees are formed under the Agricultural Produce Markets Ordinance of 1978 which is now working under PAMRA since 2020.[4] MC is a self-sustained cooperate body that has to deposit 10 percent of its revenue annually to the government fund which could later be utilised for loaning. Their income source is mainly the collection from Agricultural Produce Markets (APMs) under the licensing fee, the market fee (Rs. 2/Quintal), etc. Members of MC calculate the average price of each item based on different auctions taking place in Mundi (market). Based on the average auction price of each item, MC decides prices at the wholesale and retail levels by giving 3 percent and 10 percent profit margins to wholesalers and retailers, respectively. For perishable items like tomatoes and bananas profit, the margin so given is slightly higher (15 percent).[5,6]

4. FRUITS AND VEGETABLES PRICING POLICY IN PAKISTAN

The efficacy of the judicial and institutional frameworks for marketing agricultural products has a considerable impact on whether or not the farmers receive a fair price for their produce. Unfortunately, the institutional framework is insufficient, and the legal framework is antiquated and restrictive in Pakistan. These frameworks, which were created many years ago, have not changed to reflect the reality. As a result, farmers are taken advantage of in a market that is completely rigged. This is nothing less than "state coercion" because the law limits bulk sales and purchases to places that have been officially sanctioned and licensed (Rana, 2018).

[2] Pulses, basin, mutton, beef, milk, yoghurt, naan, roti.

[3] Market committee maintains record of auction registers, auction deeds, the detailed record of all items arrived, etc.

[4] PAMRA limits the working of MC to mandis only, the control of rest of the notified markets in the district will be under the PAMRA as soon as it will hire the workforce for this purpose.

[5] It is not according to some act rather these are the SOPs as directed by DC.

[6] The information is gathered from various market committees working under their respective duputy commissioners.

To analyse the actual prevailing prices of fruits and vegetables, the price data of 5 fruits and 6 vegetables have been collected at the farm gate level, DCO level, and retail level[7] for 10 consecutive days from four mega cities (Lahore, Faisalabad, Multan and twin city of Rawalpindi-Islamabad). The data is collected in October 2022, and the 10 days are selected keeping in view the normal period of price. The duration of the survey is considered normal because the seasonal fruits and vegetables observe moderate prices as compared to the high prices at the start of the season. In our sample, we selected two retailers from each segment of the market covering high, medium, and low-income groups of consumers. Hence, for each commodity, we have minimum and maximum retail prices which allowed us to estimate the minimum and maximum difference of prices between DCO prices (official retail prices) and prevailing retail prices. For the same 10 days, we also collected the retail prices of these commodities reported by the Pakistan Bureau of Statistics (PBS) to cross-verify, if PBS prices reflect the true market situation.

The Market Committee (MC) of each district/tehsil announces official retail prices of fruits and vegetables daily on the behalf of DCO office to protect the consumers from exploitation by retailers but in reality, DCO prices do not prevail in the market. There is significant variation between DCO prices and actual or prevailing retail prices in different cities (Appendix I). We took the average of minimum and maximum prices after pooling the data of all cities and the results are reported in Table 1. Upon comparison of farm gate prices with DCO prices, the difference varies between 6.2 percent in pears to 20.3 percent in Bananas (Table 1). This implies that the price margin given to the retailers through DCO prices varies between 6.2 percent to 20.3 percent which has to cover the transportation cost from Mundi to the retail shop, loss of wastage (during transportation and sale), the opportunity cost of the retailers' labour and profit margins of retailers. Since these small price margins allocated by the MC to the retailers are not sufficient to cover the above-mentioned costs incurred by the retailers, so-DCO prices do not prevail in the market.

The comparison of farm gate prices with the prevailing retail prices reveals that the minimum difference varies between 20 percent in potatoes to 126.2 percent in Guava, while the maximum difference varies between 24.6 percent in potatoes to 1148.8 percent Guava (Table 1). The percentage differences for certain items are observed even more than 100 percent between the farm gate and prevailing retail prices. This implies that on the one hand, the prices set by MC are not competitive enough to be followed in the market while on the other hand, it exposes the weak implementation and monitoring mechanism of the price regulatory department. Even if the monitoring process is tightened, it does not work because prices announced by MC cannot cover all the costs incurred by the retailers. This large difference between prices fixed by MC on the behalf of DCO office and actual prevailing prices indicates three things, i) DCO prices do not cover the actual cost incurred by the retailers ii) each market determines its price for each product based on supply and demand mechanism, iii) difference in prices across markets might be referred to the quality difference.

[7] In order to have a representative retail price, the price data is taken from low income, medium income and high income markets.

Table 1

Prices Comparison of Fruits and Vegetables

Commodity List	Farm Gate Price	DCO Price	Retail Prices (PBS)			Retail Prices (Market)			% diff between farm gate P and DCO P	% diff between farm gate P and Retail P (Market)	
			Average	Minimum	Maximum	Average	Minimum	Maximum		Minimum difference	Maximum difference
Onion (Kg)	115	128	136	95	200	153	150	168	11.6	30.4	46.1
Potato (Kg)	65	75	68	43	100	80	78	81	11.5	20.0	24.6
Tomato (Kg)	184	202	210	165	280	268	238	303	10.9	29.3	64.7
Cucumber (Kg)	49	56	–	–	–	105	98	116	11.4	100.0	136.7
Peas (Kg)	283	304	–	–	–	376	351	402	7.4	24.0	42.0
Cauliflower (Kg)	99	107	–	–	–	157	146	169	8.1	47.5	70.7
Apple (Kg)	181	203	–	–	–	234	234	248	12.2	29.3	37.0
Grapes (Kg)	277	298	–	–	–	381	364	398	7.6	31.4	43.7
Banana (Dozen)	79	95	91	60	190	126	133	135	20.3	68.4	70.9
Pear (Kg)	145	154	–	–	–	307	292	317	6.2	101.4	118.6
Guava (Kg)	84	92	–	–	–	200	190	209	9.5	126.2	148.8

Note: Implies that the prices are not reported by PBS, PBS reports prices of goods fall under the essential commodity list only.

Another comparison of actual retail prices with the retail prices reported by PBS is also presented in Table 1. Surprisingly, our analysis reveals that PBS reports lower retail prices of all commodities compared to actual prices that prevailed in the market. Especially, the minimum prices are significantly less than the prices we collected from the markets dealing with the poorest of society. The average prevailing retail price of onion and potato in the market is around 13 percent higher than the retail price reported by PBS. Similarly, for tomatoes and bananas, the average retail price in the market is 28 percent and 38 percent higher, respectively than the retail prices reported by PBS. Hence, for policy formulation, the historical data of PBS may be misleading.

The legal framework of Pakistan is "archaic and restrictive," making it insufficient and inappropriate for the efficient functioning of markets (Rana, 2018). Moreover, these price controls end up with no real benefits to the consumers (WTO, 2019). The price difference at DCO and retail level reported in Table 1, indicates that the objective of protecting consumers from the exploitation of retailers by fixing prices by MC has failed to achieve its objectives. Moreover, the implementation of a restrictive price control policy promotes the lemons market and eliminates quality.

It is important to note that the price of a product depends on various factors including quality of the product, outlook of the product, type of packing, quality of sale point, distance from the mandi, and the type of customers, etc. Hence, fixing prices of fruits and vegetables at the district or tehsil level by the MC will promote lemons and eliminate high-quality products from the market. Hence, let the market work freely and prices be decided based on supply and demand at the retail level. The market institution should play its role not by controlling prices but by ensuring quality. We observed that retail markets are operating very competitively and prices are determined based on competition among retailers and supply and demand situation—a large variation of prices across markets is evidence.

Price controls are still among the most widely used forms of government intervention to stop price increases, although economic research adequately demonstrates that they always fail, no matter how well-intentioned they may be. Hence, the government should let the market work and only intervene when it is inevitable under extreme circumstances.

5. WHEAT PRICING MECHANISM

5.1. Historic Analysis of Wheat Pricing in Pakistan

Wheat is a staple food crop in Pakistan. The government is very sensitive about its prices because it is one of the prime sources of calorie intake, especially for the poor. To assure the supply side and to maintain the low prices of wheat, the government announces the minimum support price (MSP) of wheat each year. To implement the support prices, the government procures 70-80 percent of the market surplus.

The Government of Pakistan actively interferes in the marketing and pricing of wheat with the dual objectives of preserving enough incentives for producers and ensuring supplies of wheat flour to consumers at reasonable rates (Khan, et al. 2003). The current wheat pricing policy is based on a system of purchasing wheat and releasing it at rates that are publicly regulated. This marketing and storage of wheat involves large expenses to the public coffers as well (Aamir et al., 2019). Wheat is procured through Pakistan Agricultural Storage and Corporation (PASSCO) at the Federal level and by provincial food authorities at the provincial level whereas the Ministry of National Food Security and Research proposes the support price for wheat which is approved by the Economic Coordination Committee (ECC).

The support prices of wheat for the last five years (from 2017-18 to 2021-22) are reported in Table 2, which shows a substantial rise over time as an attempt to cover the cost of production faced by wheat growers. By making its comparison to the average retail prices, it is obvious that in all five years' retail prices are higher than the prices set by the government. The minimum prices represent the prices during April-May while the maximum prices represent the prices during the month of November-December as shown in Table 2. The retail prices are taken from the Pakistan Bureau of Statistics (PBS) which we observe are significantly lower than prevailing market prices of wheat in all years. For example, during 2019-20 maximum price of wheat was Rs. 65/kg between October and March, and similarly, in 2020-21 and 2021-22, the wheat prices crossed Rs. 80/kg and Rs. 100/kg respectively during the same period. This indicates that the retail price increased to slightly less than double the procurement price. This reveals that it is hard to develop some policies based on PBS prices because these prices do not indicate prevailing market prices during peak times. For example in 2021-22 from November to March PBS was reporting wheat prices of Rs. 87/kg while retail prices of wheat were varying between Rs. 100/kg and Rs. 110/kg. In the same year, Pakistan imported wheat from Russia at the rate of Rs. 87/kg which was significantly lower than the prevailing retail price. It is important to note that Rs. 87/kg also includes the cost of transportation and the cost of loading and unloading. If we assume that PBS prices are true prices then there is no incentive for the private sector to import wheat but if retail prices of wheat are more than Rs.100/kg, then there is a huge incentive for the private sector to import wheat and sell it in the local market at a lesser price than the existing retail price.

If we compare the weekly prices of wheat and wheat flour reported by PBS, then it also reflects that PBS is underreporting the wheat prices. The difference between wheat and wheat flour prices varies between Rs. 24 to Rs. 27/kg which is not possible (Figure 1) because to convert the wheat to wheat flour costs only Rs. 3-5 per kg. Moreover, it is well reported in the media and also our observation demonstrates that from January to March in the year of 2022-23, prices were more than Rs.110/kg, even in the district of Mansehra it was reported as Rs.158/kg (PAR Research Bulletin, 2023) while the PBS continues to report prices below Rs. 90/kg.

Table 2

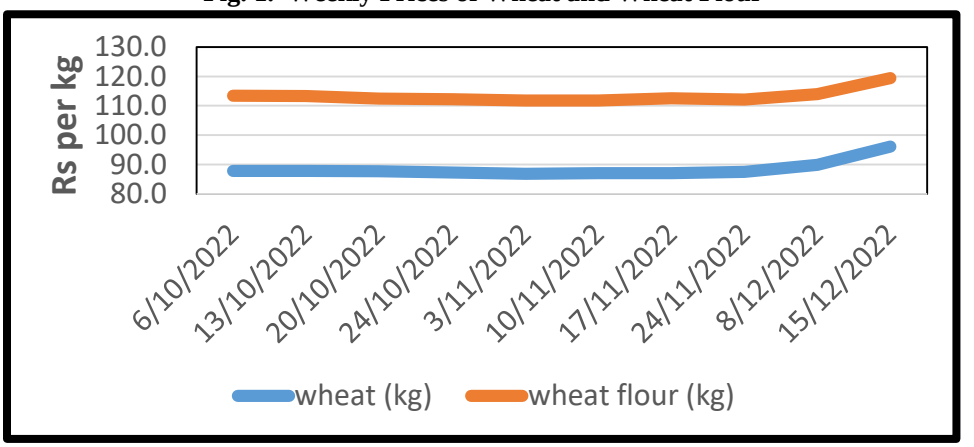
Historic Prices of Wheat at Various Levels

Year	Support Price (Rs. /kg)	International Price (Rs. /kg)	Average Retail Price (Rs. /kg)	Minimum Retail Price (Rs. /kg)	Maximum Retail Price (Rs. /kg)
2017-18	32.5	27.4	33.9	32.6	35.1
2018-19	32.5	33.6	39.5	34.7	44.3
2019-20	35	40.3	48.5	41.3	55.7
2020-21	45	51.9	56.4	51.7	61.1
2021-22	55	87.5	73.7	60.4	86.9

Data Source: AMIS, GoP (2022a) and Macrotrends.[8]

It implies that government interference in the wheat market through support price creates inefficiencies and the wheat subsidy does not or rarely leave benefit to the end users. Rather prices continue to increase to almost 80-90 percent than the support price fixed by the Government. But if we consider the PBS prices are true retailed prices, then the increase is only between 20-40 percent. Moreover, the benefit of price increases is neither enjoyed by the farmers nor the Government, rather it has gone into the pockets of the traders (Abedullah, 2020). If we compare the maximum prevailing prices of wheat in Pakistan with the international prices, it reveals that prices in Pakistan have increased than international prices. Under such circumstances, the government can stop intervening in wheat marketing because it costs about Rs.150-200 billion each year to the government. Rather government can let the private sector engage in wheat marketing where market forces will determine the prices based on the supply and demand mechanism.

Fig. 1. Weekly Prices of Wheat and Wheat Flour



[8] https://www.macrotrends.net/2534/wheat-prices-historical-chart-data#:~:text=The%20current%20price%20of%20wheat,2022%20is%20%249.1784%20per%20bushel

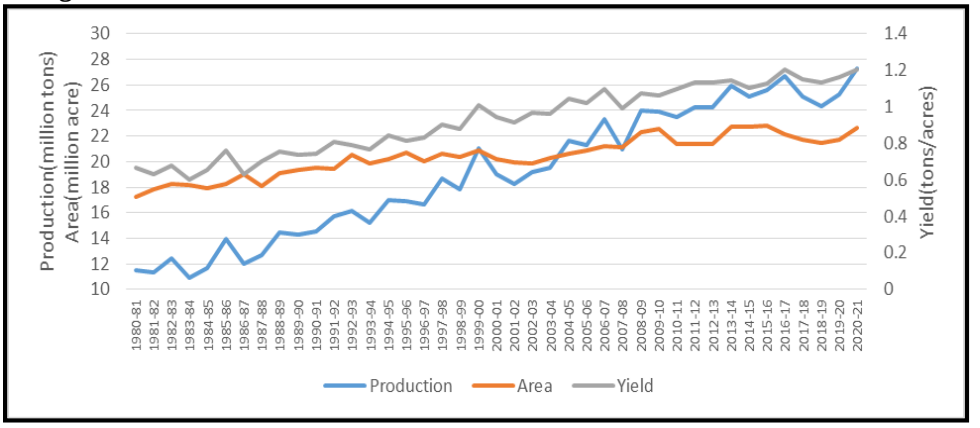
However, the government can maintain a certain amount of wheat as a buffer stock to meet any unforeseen demand and supply mismatch that may create a grain shortage and price hike. The government needs to decide the extreme limits of prices where it will become compulsory to intervene in the market under certain circumstances. For example, if prices increase more than 15-20 percent to international prices then the government may start to release the buffer stock and meanwhile can allow the import of wheat. Similarly, if prices decline from certain limits then the government may intervene by purchasing the surplus of supply to maintain certain prices and t benefit the farmers and to protect the private sector.

5.2. A Detailed Analysis of the Wheat Economy in Pakistan

Wheat is the main staple crop of Pakistan and hence essential in terms of food security of the country. Approximately, it is grown by 80 percent of farmers in the Rabi season on about 22.7 million acres, which constitutes around 40 percent of the total cultivated land (GoP, 2021). Punjab plays a major role in wheat production by allocating 16.14 million acres (71.5 percent), followed by Sindh, KPK, and Balochistan with almost the same trends in production also (AMIS, 2020). Additionally, wheat constitutes 37 percent of the protein and energy in the diet. Wheat, a staple food, probably accounts for 72 percent of Pakistan's food supply. Per capita, wheat consumption in Pakistan (124 kg/annum) is the highest in the world.

Wheat production has increased significantly from 11 million tons to 27 million tons over the last four decades (1981-2021), whereas the area under wheat cultivation has increased from 17.2 million acres to 22.7 million acres (Figure 2). The yield was increased by more than 80 percent during the period at an annual average growth of about 2 percent while area was increased at about 0.77 percent per annum. This indicates that advancements in technology (high-yield seed) and improved management practices played a significant role in raising wheat production and highlighting the significance of agricultural research in enhancing Pakistan's food security position. Although wheat production is continuously increasing with fluctuations, the pace is quite slow. However, wheat production growth higher than population growth is imperative to guarantee domestic food security but the high volatility of wheat prices has made it more difficult for the government to meet this objective.

Fig. 2. National Production, Area, and Yield Trend for Wheat from 1980-2021



Data Source: GoP (2021).

5.3. Wheat Production Targets and Support Prices

Before the Rabi season, the government of Pakistan sets the minimum support price and production targets for wheat. The Federal Committee on Agriculture (FCA) has set a target for Rabi (2022-23) wheat production of 28.4 million tons from 22.98 million acres The target for Punjab is set at 21 million tons, for Sindh 4 million tons, for KPK 1.8 million tons and for Baluchistan 1.57 million tons. Ministry of National Food Security and Research had set the minimum support price of wheat equal to Rs. 2200/40kg (Rs. 55/kg) for Rabi (2020-21). For the current Rabi season (2022-23), the National Assembly Standing Committee on NFS&R has proposed to set the minimum support prices (MSP) of wheat not less than Rs.3000/40kg (Rs.75/kg). The proposal is endorsed by the Provincial cabinet of Punjab and KPK but Sindh cabinet is proposing a price equivalent to Rs.4000/40kg (Rs.100/kg). The MSP at Rs.3000/40kg will give a profit margin of 20 percent to growers by keeping the cost of production under consideration (Shahzad, 2022). Fixing MSP at Rs.100/kg would discourage the private sector from getting involved in purchasing wheat from farmers because the international wheat price is expected to remain lower. The international wheat price in 2021-22 is Rs.76.1/kg (Macrotrends, 2022). Under the assumption, if the international price remains the same and after adding transportation, loading, and unloading charges, the retail price of imported wheat is around Rs.84.3/kg which is higher than the MSP of Rs.75/kg. Hence, fixing the MSP price of wheat at Rs.75/kg will motivate the private sector to participate in the wheat purchasing process from farmers.

5.4. Wheat Marketing

Wheat marketing is a multistep process that starts from the sale of wheat grains from farmers' fields till it reaches the consumers in the form of wheat flour. Three modes of supply lead from the farm; village dealer, Pakistan Agricultural Storage and Services Corporation (PASSCO), and the local consumers. Apart from wheat used for exports, the rest is sold to the flour mills for processing. After milling, the processed wheat (wheat flour) is supplied to various wholesale markets and retailers which makes it convenient for the local consumer to buy from. A large part of this supply chain is managed by PASSCO, which supplies wheat locally and internationally.

Farmers also sell wheat directly to private dealers (district/village brokers or Beoparis). Many farmers sell their wheat to middlemen like village shopkeepers and village brokers rather than selling it straight to public procurement centers. Wheat is procured from growers and delivered to millers and wholesalers by village brokers (Beoparis) and commission agents (Arhtis) (Khan, 2014).

Following the 18th Amendment, it is now the responsibility of the provincial governments to buy wheat from farmers at MSP and to release it to flour mills at a set price. At the provincial and district levels, wheat prices and movements are controlled. Farmers retain about 60 percent of Pakistan's annual wheat harvest for home consumption and seed purposes. To achieve the goal of food security, the government procures about 25-30 percent of total wheat production, leaving the remaining 10-15 percent for the private sector to purchase (Abedullah, 2021). Provincial authorities should purchase wheat following the demand. However, it involves finance and risk of post-harvest losses due to which provincial governments are reluctant to spare and allocate resources to secure wheat

to fulfill their annual demands. Finally, the burden of maintaining stock for the whole year is taken by the federal government.

5.5. Situation Analysis

The wheat production in 2021-2022 declined to 26.4 million tons against the set target of 28.9 million tons and production was 3.9 percent less than that of the last year 27.464 million tons (GoP, 2022b). Wheat production declined below the set targets due to a shortfall in irrigation water and drought conditions at the sowing stage, lesser fertilisers off-take due to the unavailability of urea in the market, and the prevalence of heat waves in March/April.

Pakistan's wheat production of 26.4 million tons in 2021-22 was insufficient to cover the local demand and to maintain strategic reserves (GoP, 2022b). Moreover, millers also negotiated to produce a lower extraction ratio of 65:35, i.e. 65 percent wheat flour and 35 percent byproducts instead of 80:20. This seriously led to the decline in the supply of wheat flour in the market. This also aggravates the supply-demand situation of wheat flour and pushes the prices upward.

The Ukraine-Russian war also generated signals for the speculators to hoard wheat in the international market which led to a boost in the prices in the international market. Pakistan is included among the countries having the highest population growth rate in the world. This implies that increasing future demands have to be filled either through domestic production or imports. In addition to this, an increasingly politically unstable Afghanistan may impact Pakistan's local wheat demand situation because Afghanistan imports almost all of its domestic wheat/flour demand from Pakistan, which forces Pakistan to import more wheat than its demands to maintain the strategic reserves.

To fill the expected gap between supply and demand during 2021-22, the government decided to import 3 million tons to cover the risk of price hikes and to maintain its reserves. However, any wheat crisis calls for smart solutions on sustainable agricultural practices through the free market mechanism.

5.6. Costs to the National Exchequer for the Interference in Wheat Market

The cost of wheat to the government includes the support price, procurement, storage, and provision of grains to flour mills at subsidised rates. The government needs Rs.471 billion to buy 8.57 million tons of wheat[9] at an MSP of Rs.55/kg. The government would be required to pay interest of Rs. 46.3 billion if it borrows the needed amount from banks for a year at the current interest rate of 15.7 percent and intended to repay the principal in monthly installments over ten months by selling wheat to flour mills. Besides this, the Government would require additional financial resources of Rs.85.0 billion for handling, transportation, and storage costs incurred by the PASSCO at the rate of Rs.9.92/kg[10]. This implies that the Government would require total financial resources of Rs.131 billion (=85+46) to interfere in the wheat market to maintain the retail price close

[9]1.27 million tons purchased by federal govt., 4.5 million tons by Punjab govt., 1.4 million tons by Sindh govt. and 1.4 million tons by KPK govt evaluated at the support price of year 2021-22 (*The Express Tribune*, 2022a; *The Express Tribune*, 2022b; Dawn, 2022; GoP, 2022c)

[10]This rate is adopted from Darosh (2012) after inclusion of inflationary factor, according to Darosh (2012) it was

to the minimum support price of Rs.55/kg. This suggests that the interference made by the government is erroneous. Such government market involvement is not only expensive, but it also deters the private sector from playing an active role in the buying and selling of wheat. The private sector cannot continue if the government strictly controls the wheat market by providing stock to flour mills in exchange for keeping prices at a minimum level since there will be no incentive left to participate in wheat marketing. If the government stops meddling in the wheat market and permits the private sector to participate then the cost to the national exchequer (Rs. 131 billion) would have been passed on to consumers in the form of increased prices. This would result in a 28 percent increase in wheat retail prices (Rs. 70.3/kg) in contrast to the government's desired price of Rs. 55/kg (Table 3).

If we add up another additional profit of Rs.10/kg to benefit the private sector, then prices will increase to Rs. 80.3/kg but current prices of wheat are Rs.110/kg, implying that extra profit of Rs. 30/kg is being earned by the flour mills and other stakeholders involved in the value chain. This demonstrates that government involvement in wheat marketing fails to offer low prices to consumers by fixing MSPs. This has been continuously happening for the last five years. Hence, the government's involvement in wheat marketing is not only costing the government in terms of interest rate but also the cost of wastage during storage. Moreover, it also restricts private sector involvement. As a result, PASSCO is facing a debt of more than Rs.700 billion (Suleri, 2022). This implies that government involvement in wheat marketing is not a sustainable policy. Government involvement creates market inefficiency that costs the farmers, the government itself, and the consumers in terms of low prices to the farmers, interest rate to the government, and cost of wastage and high prices to the consumers. Finally, it also causes significant price volatility.

Table 3

Retail Prices of Wheat Purchased from Different Sources

Prices paid by/to	Unit Price (Rs./kg)	Cost of Storage, Handling and Transportation (Rs./kg)	Cost of Freight, Storage, and Local Transportation	Prices at Retail level (Rs./kg)
Price Paid by the Government to Farmers	55	15.3		70.3
The Price Paid by the Government for Imported Wheat	82.4		8.2	90.6
Existing International Prices	76.1		8.2	84.3

Data Source: AMIS, Pakistan Bureau of Statistics (PBS) and Macro trends.

Despite recent indications of a wheat shortfall beginning at harvest time (March–April 2022), the private sector was prohibited from importing wheat because the private sector needed permission from ECC, which caused prices to continue to rise due to the supply-demand mechanism. On the other side, the government procrastinates the option to import wheat timely. This is how the consumers suffer by paying higher prices. The private sector would have placed import orders considerably earlier and the price of wheat would not have risen vertically if they were free to choose when and how much to import. So, instead of the current historically high level of prices, prices would have stabilised at far lower levels. Additionally, delays in imports sent out signals to the world market that Pakistan is experiencing a severe wheat shortage and is expected to import a significant

amount of wheat to bridge the supply and demand gap. This led to an increase in international prices at a higher rate as compared to the usual scenario.

5.7. Recent Import and Comparison with Open Market Scenario

The government decided to import 0.3 million tons of wheat from Russia between the beginning of November 2022 and January 15, 2023, as part of a government-to-government agreement. This time, the government did not allow the private sector to import wheat (ECC, 2022).

The public sector purchase of 0.3 million tons of wheat from Russia at the rate of US$372/ton (Abid, 2022) is equivalent to Rs.82.4/kg. If we add Rs.8.2/kg freight and other transportation charges (equal to 10 percent of the wheat price) to arrive wheat at the buyer's premise, the retail price of wheat would become Rs.90.6/kg. If the private sector had imported the wheat, then after adding the transportation, loading, and unloading costs the price would become Rs. 84.3/kg which is Rs.6.3/kg cheaper than the imported wheat by the government. After adding the profit of Rs.10/kg for the private sector, the retail price would be Rs.94.3/kg, slightly higher than the situation if imported under the government umbrella but it will allow to save the expenditure born by the government. Moreover, due to the competitive market situation (when there is more than one supplier), the prevailing price would be Rs.94.3/kg but now under the situation when the government imported wheat, the prevailing price is expected to continue which is in the range of Rs.110-120/kg.

However, due to imperfect competition and the limited space given to the private sector to participate in wheat marketing, the market's current retail prices are falling between Rs. 110-120 per kg. This implies that after reaching the imported wheat in the local markets, prices should decline by about Rs.20/kg but since there is no competition due to the limited role of the private sector—there are rare chance of price decline. The high price of wheat in the range of Rs.110-120 /kg is expected to prevail in the local market which is about 22 percent higher than that of the competitive market situation of Rs.94.3/kg.

This straightforward research offers empirical proof that, in the absence of government intervention in the free market mechanism, retail prices would not have risen to Rs. 110–120/kg but rather would have reached a maximum price close to Rs. 95/kg. In addition, the government can save Rs.131 billion annually that would otherwise be spent on the purchase, handling, shipping, and storage of wheat in order to maintain floor pricing.

5.8. Future Strategy

The government has been actively influencing the wheat market on a year-to-year basis by setting a support price and releasing inventories, but prices for wheat flour have not been found stabilised. Instead, prices are rising at a rate that is nearly twice as high as the government-announced minimum support price. Furthermore, neither the farmers nor the government are benefiting from the price increase; instead, it has gone directly into the wallets of the traders. As economists, we are confident that the free market system prevents the traders from making such enormous profits. In the case of free-market mechanisation, before developing the wheat crises, the private sector would have started to import wheat (because international prices are substantially lower than domestic prices) to gain profit, which may drive down the price. The government should remove all the limitations on the

sale of wheat, allowing the private sector to buy it from farmers. The private sector can either supply it to the flour mills or small grinder units or directly to consumers. Farmers can also take part in wheat marketing and stockpile their produce following their expectations for wheat prices in the future. They can also provide wheat directly to the market at ongoing rates. If before the next harvest of wheat crop, local prices begin to rise more than 20 percent the international prices, then the private sector will automatically be motivated to import wheat from the international market due to emerging economic incentives. It would ultimately eliminate the wheat crisis and allow consumers to enjoy low prices.

However, the government should have the right to intervene in wheat marketing under extreme circumstances to stabilise the prices. In case the price falls 20 percent below the international price, then the government should intervene by opening the export to stabilise the prices. Similarly, if wheat prices start to increase more than 20 percent of the international prices, then the government should intervene by releasing the buffer stock or by allowing import from the international market to maintain the prices with limits. We are proposing a limit of 20 percent because it will allow us to shoulder the burden of the transportation, loading, and unloading costs. And it will generate a reasonable profit for the exporter/importer.

6. CONCLUSION

The Food Stuff Control Act of 1958, the "Price Control and Prevention of Profiteering and Hoarding Act, of 1977", and registration of the Godowns Act of 2014 are federal laws that allow the government to intervene in essential commodity markets. Similarly, the Sindh Essential Commodities Price Control and Prevention of Profiteering and Hoarding Act of 2005, the Punjab Agricultural Produce Markets Ordinance of 1978, the Punjab Agriculture Marketing Regulatory Authority Act 2020 (PAMRA Act) and other provincial laws also provide such provisions to governments to intervene in free market mechanism. The present study aims to analyse the impacts of food pricing policies and to evaluate the price control mechanisms in Pakistan, both qualitatively and quantitatively.

To investigate whether DCO prices are followed and implemented in their true spirit, we collected the price data on 11 fruits and vegetables at three different levels for 10 consecutive days from four megacities. Our comparison of farm gate prices with DCO prices reveals that DCO prices are not followed at the retail level. The difference between farm gate and DCO price varies between 6.2 percent to 20.3 percent which has to cover the transportation cost from mandi to retail shop, losses of wastage during transportation and sale, the opportunity cost of the retailers' labour, and profit margins of retailers. It is not possible to cover these wide ranges of costs with small margins given to retailers—DCO prices are not followed by retailers. The comparison of farm gate prices (auction prices) with the prevailing retail prices reveals that the minimum difference varies between 20.0 percent in potatoes to 126.2 percent in Guava, while the maximum difference varies between 24.6 percent in potatoes to 148.8 percent in Guava. In the majority of the food items difference is more than 30 percent between farm gate and prevailing retail prices—significantly higher than offered through DCO prices. It is observed that prevailing retail prices are determined through the supply-demand mechanism. Moreover, there is high competition among retailers and there is negligible probability that retailers can exploit the

consumers by charging high prices. The strict implementation of DCO prices will promote the lemon market, i.e. market of low-quality products. Hence, it is strongly suggested that the government should reduce its footprints and let the market forces decide retail prices. Our investigation further reveals that average retail prices reported by PBS are close to DCO prices—raising the question of the reliability of PBS price data for policy-making purposes.

Wheat is a politically sensitive crop in Pakistan because it is the single largest source of starch and energy. To ensure low prices of wheat government heavily intervened in the wheat market by procuring 70 to 80 percent of the marketable surplus at the minimum support price (MSP). It has been calculated that during the year 2021-2022, the government procured 8.57 million tons of wheat and it cost Rs.131 billion and objective was to maintain the retail price close to the minimum support price (Rs.55/kg). Government involvement creates market inefficiency that costs the farmers and government itself and the consumers. Farmers suffer from low prices because in open competition they would have received higher prices than what is offered by the government in terms of MSP. The government paid a cost of Rs.131 billion from tax collection which went to the pocket of flour mills or the middleman. Finally, consumers suffer from the high price of wheat because in the presence of a free market mechanism (where a large number of suppliers and a large number of importers compete with each other) price would not have increased more than Rs. 95/kg. However, the prices of wheat increased in the range of Rs. 110–120/kg, mainly because of market inefficiency. Reducing the government footprint would also help to save Rs.131 billion annually which could help to increase the budget for agriculture R&D.

The government should have completely withdrawn her hand from interfering in wheat marketing. However, the government should continue to play its role as regulator. For example, if the price of wheat increases more than 20 percent from the international price then the government should allow the private sector to import wheat from the international market and similarly, if prices decline 20 percent below the international prices then government allow the private sector to export wheat. We are proposing a limit of 20 percent based on the fact that it can cover the transportation, loading, and unloading costs and can also generate a reasonable profit both for the exporter and importer. It will help to provide more space for the private sector to play its role in wheat marketing and will lessen the economic burden on the government.

APPENDIX-I

Table 1-AI

Prices of Fruits and Vegetables from Lahore

Commodity list	Farm Gate Price	DCO Price	Retail Price			% diff between farmgate P and DCO P	% diff between DCO P and Retail P	
			Average	Mini-mum	Maxi-mum		Maxi-mum diff	Mini-mum diff
Onion (Kg)	110	117	177	174	179	6.2	58.2	62.7
Potato (Kg)	67	72	80	79	83	6.4	17.4	22.4
Tomato (Kg)	190	207	281	255	292	8.8	33.8	53.5
Cucumber (Kg)	41	44	140	140	140	7.3	238.3	238.3
Peas (Kg)	307	327	421	418	421	6.5	36.1	37.2
Cauliflower (Kg)	90	95	194	193	195	5.7	114.4	116.3
Apple (kala kolu) (Kg)	211	221	238	236	248	4.8	12.2	17.7
Grapes (sundar khawni) (Kg)	279	289	381	380	383	3.9	36.3	37.5
Banana (grade 1) (Dozen)	80	101	176	176	176	25.9	120.4	120.4
Pear (Kg)	175	182	364	364	364	3.6	107.5	107.5
Guava (Kg)	87	93	208	205	208	7.0	134.5	138.3

Table 2-AI

Prices of Fruits and Vegetables from Multan

Commodity list	Farm Gate Price	DCO Price	Retail Price			% diff between farmgate P and DCO P	% diff between DCO P and Retail P	
			Average	Mini-mum	Maxi-mum		Maxi-mum diff	Mini-mum diff
Onion (Kg)	117	134	140	128	148	14.5	9.4	26.8
Potato (Kg)	67	78	73	70	83	16.3	3.8	22.8
Tomato (Kg)	190	205	252	238	286	8.0	25.4	50.4
Cucumber (Kg)	52	61	104	91	114	16.6	73.3	117.8
Peas (Kg)	283	302	353	324	380	6.8	14.6	34.3
Cauliflower (Kg)	102	108	130	112	158	5.4	9.0	54.6
Apple (kala kolu) (Kg)	188	206	207	200	218	9.9	6.5	15.8
Grapes (sundar khawni) (Kg)	266	294	323	308	338	10.3	15.5	27.1
Banana (grade 1) (Dozen)	81	93	85	82	90	14.8	1.2	11.1
Pear (Kg)		154	291	262	310			
Guava (Kg)			176	158	190			

Table 3-AI

Prices of Fruits and Vegetables from Faisalabad

Commodity List	Farm Gate Price	DCO Price	Retail Price			% diff between farmgate P and DCO P	% diff between DCO P and Retail P	
			Average	Maxi-mum	Mini-mum		Maxi-mum diff	Mini-mum diff
Onion (Kg)	117	134	140	148	140	14.53	10.70	4.48
Potato (Kg)	67	78	73	83	80	16.31	5.62	2.00
Tomato (Kg)	190	205	252	286	238	8.05	39.16	16.10
Cucumber (Kg)	52	61	104	114	91	16.62	86.72	48.56
Peas (Kg)	283	302	353	380	324	6.82	25.71	7.29
Cauliflower (Kg)	102	108	130	158	112	5.44	46.60	3.40
Apple (kala kolu) (Kg)	188	206	207	218	210	9.89	5.36	1.73
Grapes (sundar khawni) (Kg)	266	294	323	338	308	10.31	15.19	4.74
Banana (grade 1) (Dozen)	81	93	85	100	95	14.81	7.53	2.15
Pear (Kg)		154	291	310	262		100.74	69.87
Guava (Kg)			176	190	158			

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Evidence of Turkey Falling into the Middle Income Trap

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There are now two distinct bodies of study that explain why middle-income nations fall behind high-income countries using political and economic characteristics. It is generally accepted that it is difficult to distinguish between these two categories of literature, even if both produce results that should be treated seriously. Nonetheless, this analysis suggests that MIT's Convergence Hypothesis—one of the main outcomes of the Neo-Classical development model—is not actually achieved in reality, based on the literature that contains economic data. As a departure from the Convergence Hypothesis, an attempt was made to identify the similarities in the economic reasons of MIT through a survey of the literature. Research indicates that the financial and economic liberalisation processes brought forth by globalisation have negative effects on middle-income nations. This study attempts to identify the types of causal interactions that contribute to the Turkish economy's middle-income trap by reviewing relevant literature. With technological developments, differences between countries are deepening. The results of this study showed that the Turkish economy was stuck in the Middle Income Trap because of insufficient capital and was unable to boost the level of national income above a particular threshold. However, this analysis also suggests that technological advancements, alongside strategic capital allocation, could potentially offer a pathway for middle-income nations to overcome the middle-income trap. The study highlights the need for further research into how middle-income nations can leverage technological developments and optimise capital allocation to achieve economic convergence with high-income countries.

JEL Classifications: F21, F43, F44, E22.
Keywords: Middle Income Trap (MIT), Convergence Hypothesis, Capital Movements, Economic Growth.

1. INTRODUCTION

Conditions of economic growth have been a phenomenon explored since the inception of economic theory. Particularly during the 18th to 20th centuries, when deterministic thinking prevailed, growth theories were developed based on the assumption of a linear growth process for each country. Although Marxism had a different systematic approach, it too did not object to a linear economic growth/development process and foresaw deterministic outcomes. The Socialist countries that emerged with the 1917

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Bolshevik Revolution experienced economic growth processes to an extent unforeseen by their adversaries, drawing the attention of mainstream economics. Thus, in the mid-20th century, under the title of "Development Economics," while implicitly acknowledging that economic growth processes were not linear, suggestions began to be made, especially for developing country categories, on how they could achieve linear growth processes implicitly. One of the most well-known of these suggestions is presented in Rostow's work titled "Stages of Economic Growth." This work, self-described as "non-socialist," focused on providing a roadmap for developing countries to achieve the growth process. During this period, a highly intensive working environment emerged in development economics, and views on how developing countries could rise to the category of developed countries were put forward, provided they did not conflict with liberal economics.

Under this "non-conflicting" condition, Development and Growth Theories reached their peak from the beginning to the end of the third quarter of the 20th century. The most well-known Development Theories and Growth Theories emerged during this period. On one hand, Rostow (1960) attempted to explain the stages of economic growth and how economies showing non-linear (or interrupted) growth could capture the linear process; on the other hand, Solow (1956) presented the Neo-Classical Growth model, which provides the strongest explanation for the linear process of economic growth.

The common feature of these two studies (and indeed this period of thought) is their acknowledgment, whether explicit or implicit, that "growth processes may not be linear." Two points of Solow's Growth Theory are noteworthy. Firstly, the assumption it relies on regarding the historical contingency of technological progress, and secondly, the Convergence Hypothesis as a result of the theory. The assumption of contingency had completely disappeared from the agenda by the last quarter of the 20th century, with the acceptance through Internal Growth Theories that technological progress is predictable and even a variable that can be directed.

The Convergence Hypothesis, however, still maintains its place at the center of theoretical debates. This is because economic growth processes that still do not resemble each other are observed in practice. Although neo-classical explanations are attempted for these, the debates continue. In this study, attention is drawn to the contradiction/discrepancy between the convergence hypothesis and the middle-income trap phenomenon, attempting to critically examine both concepts.

This paper focuses on a critical examination of the "convergence hypothesis" in economic growth theory. The convergence hypothesis suggests that developing economies, under certain conditions, will eventually catch up to the economic level of developed economies. The authors challenge this notion by analysing the concept of the "middle-income trap," a phenomenon where developing countries stall in their growth and struggle to transition to a developed state. By investigating the contradiction between these two seemingly opposing ideas, the article aims to contribute to the ongoing debate on the applicability of linear growth models to developing economies. The research is particularly relevant to policymakers and development economists seeking to understand the complexities of economic growth in different contexts.

In this paper breaks new ground by bringing together the convergence hypothesis and the middle-income trap for a critical analysis. This approach allows for a deeper understanding of the limitations of linear growth models in explaining real-world economic

development. The article's innovation lies in its attempt to reconcile these seemingly contradictory concepts and shed light on the factors that might hinder developing economies from achieving sustained growth. By examining this tension, the article offers valuable insights for developing more nuanced and realistic theories of economic growth. It highlights the need to consider historical contingencies and path dependencies that may prevent a one-size-fits-all approach to development.

2. CONVERGENCE HYPOTHESIS

The Convergence Hypothesis, which originated with Solow (1956) and was further developed by Cass (1965) and Kopmans (1965), postulates that, in neo-classical growth models, the rate of growth per capita tends to be inversely proportional to the initial level of output or income. As a result, poorer economies grow faster than richer economies when economic preferences are similar (Barro & Sala-i-Martin, 1992). This is one of the fundamental conclusions of Solow's Economic Growth Theory. This hypothesis, which predicts that the rapid growth of economies defined as poor will lead to the closing of the gap with rich countries over time, is defined as the Convergence Hypothesis (Abramovitz, 1986). The conditions for the convergence of income inequalities between economies constitute the main focus of the Convergence literature, depending on factors such as openness, whether there is mutual interaction in income inequality between developed and developing economies, and externalities in economic growth processes (Sala-i-Martin, 1996).

The first empirical study on the hypothesis was conducted by Baumol (1986), who concluded that there was a strong convergence relationship. However, empirical studies have begun to increase since the 1980s, and these studies reveal different results and causal relationships. Alongside studies providing evidence that the hypothesis is consistent and successful (Staehr, 2015; Barro, & Sala-i-Martin, 1992; Barro, 2016; Krause, & Szymanski, 2019; Lee, 2019; Roy, Kessler, & Subramanian, 2016, etc.), there are also studies presenting evidence that the hypothesis fails to deliver the expected results (Korotayev, & Zinkina, 2014; Staehr, 2015; Ha, & Lee, 2016; Ito, 2017; Jankowska, Nagengast, & Perea, 2012, etc.). Moreover, each empirical group is essentially seeking the reasons for success or failure in the unique conditions of country examples. Empirical studies belonging to both groups of views converge on the common ground that some countries are successful while others are not. Therefore, the success or failure of any economy gains meaning within the specific conditions of that country. Nevertheless, failure also shows some common reasons. For example, Lee (2019) shows that "convergence successes" typically have high levels of working-age population, strong human capital, an efficient legal system, inexpensive investment products, and a propensity to safeguard large levels of high-tech patents and exports.

A brief review of the literature highlights empirical findings attempting to explain success and/or failure in the convergence hypothesis: Trade structure (Aiyar et al., 2013); Demographic structural deficiencies (Ha & Lee, 2016); Structural reforms (Ito, 2017); Manufacturing industry (Krause & Szymanski, 2019) and effects of factor productivity (Jankowska, Nagengast, & Perea, 2012); Role of human capital (Lee, 2019); Competence regarding competition conditions (Krause & Szymanski, 2019); Role of institutions (Aiyar, et al. 2013), etc.

Additionally, studies that demonstrate the tendency of income gaps between high- and middle-income countries to narrow also show a number of contradictory findings about convergence, such as widening income gaps between low- and middle-income countries (Korotayev & Zinkina, 2014).

In conclusion, suggestions are made for certain theoretical adjustments regarding the convergence hypothesis and particularly for better understanding low-income countries (Korotayev & Zinkina, 2014). Because of deficiencies in the definition and theoretical framework construction, studies covering different countries and combinations of different country groups can often produce very different results about the validity of the hypothesis. Contributions to the theoretical structure of the hypothesis should enhance its explanatory power between high-middle income countries and middle-low income countries.

3. MIDDLE-INCOME TRAP

By the 1980s, some common points began to emerge in studies on economic growth and Convergence. Although some developing countries experienced some economic growth (or entered the process of economic growth), evidence started to emerge indicating that this process got stuck at a certain point. These economies, although they could achieve high growth rates as predicted by the convergence hypothesis, were observed to get trapped at a critical income level, a phenomenon known as the Middle-Income Trap (Aiyar, et al. 2013).

Historical studies even confirmed that there were numerous examples of countries that had successfully transitioned from the "developing country" category to the "developed country" category. Barro (2016) lists economies that have shown this success as Chile, Hong Kong, Ireland, Malaysia, Poland, Singapore, South Korea, and Taiwan. The "failed economies," on the other hand, have fallen into the Middle-Income Trap, creating a new category of economies (Lee, 2019).

The term Middle-Income Trap was first coined by Gill & Kharas (2007). In this pioneering work, three stages of middle-income countries are identified. According to this, "As countries specialise in production and employment, diversification will slow down and then reverse; second, the importance of investment will diminish, and innovation will accelerate; third, education systems will shift from equipping workers with skills to adapt to new technologies to preparing them to shape new products and processes. These will be observable outcomes associated with successful strategic changes as countries move towards middle-income status." Thus, a process moving towards the importance of human capital alongside economic variables is identified.

According to the World Bank classification based on income levels, per capita income levels that form the basis for the classification of countries according to their income levels are determined as follows. It should be noted that these classifications are flexible and may vary from year to year. Because the income level limitations for each year are determined according to the per capita income level of the USA. When determining the middle income level, 20 percent of the US national income per capita is accepted as the middle income limit.

Table 1

Classification of Countries According to İncome Levels by the World Bank

	Low Income	Low-Middle Income	Middle Income	High Income
2022	1.085 lower than	1.086-4.255 between	4.256-13.205 between	13.205 Higher than
2023	1.135 lower than	1.136-4.465 between	4.466-13.845 between	13.845 Higher than

Source: World Bank (2023). *Note.* Values are in US Dollars.

Empirical studies are often limited to models constructed among a limited number of variables, and as such, they can only identify the effects of the variables they contain and their causality. Moreover, choices of countries and country groups also influence the results. Indeed, economies in the developing country category contain natural drawbacks in many areas compared to advanced economies. There are inadequacies in variables for economics as well as non-economic factors such as education, democracy, legal infrastructure, government depth, separation of powers, and entrepreneurial confidence; capital accumulation, savings capacity, stability in macroeconomic policies, inconsistencies in economic policy preferences are among them. Furthermore, Fernandez, Ley, & Steel (2001) emphasise the inadequacy of statistical and econometric methods used in research and indicate the need for new approaches.

The literature on the middle-income trap can primarily be divided into two main categories: those that approach the concept politically and those that approach it economically. Indeed, there are even studies that prefer to treat the concept solely as a political one. However, in this study, works that consider the concept as a political one have been excluded, and the framework has been focused solely on economic perspective studies.

Within this main framework, results obtained from empirical studies reveal a wide range of different reasons for the Middle-Income Trap. However, when empirical studies are considered, it can be said that the empirical results are clustered in some clusters. Accordingly, the causes of the middle-income trap are:

Dollarisation created by the disorder in the trade composition (Rose, 2000, Engel & Rose, 2000, Frankel & Rose, 2002, Alesina, et al. 2002, Tenreyro & Barro, 2002); Technological, R&D deficiencies, innovation failures, and human capital deficiencies (Agenor, Canuto, & Jelenic, 2012; Caldentey, 2012; Cherif, & Hasanov, 2019; Doner, & Schneider, 2016; Eichengreen, Park, & Shin, 2013; Klingler-Vidra, & Wade, 2020; Krause, & Szymanski, 2019), and education policies sustained as the cause of human capital deficiencies (Wang, Li, Abbey, & Rozelle, 2018); Slowdown in growth accompanied by a decrease in productivity (Agenor, 2017); Macro-economic policy failures and structural problems as both a cause and a consequence of this (Hartwell, 2013). The vulnerability to economic and financial crises created by these structural problems (Cerra, & Saxena, 2008; Staehr, 2015); Failure to institutionalise and infrastructure deficiencies (Pruchnik & Zowezak, 2017; Aghion & Bircan, 2017; Staehr, 2015); Insufficiency of necessary government interventions due to political reasons and adoption of demand-focused growth policies (Barendra, 2019; Cai, 2012b; Doner, & Schneider, 2019; Easterly, & Levine, 1997; Lin, 2017), and the reconsideration of the current growth strategy (Bulman, Eden, & Nguyen, 2017); Failure of manufacturing competitiveness (Bresser-Pereira & Araújo, & Costa-Peres, 2020; Andreoni & Tregenna, 2020; Larson, Loayza, & Woolcock, 2016;

Wade, 2016); Structural government regulations aimed at reforming labour markets and protecting property rights (Agenor & Cauntoi 2012); Inequalities created by organisational deficiencies in labour markets by dividing social groups (Doner & Schneider, 2016); Increasing total factor productivity, expanding human capital accumulation, deepening system and government function reforms (Cai, 2012a); Failure of government initiatives due to the insufficiency of broad-based improvements in industries and the inability to focus on vertical industry policies that encourage innovation and knowledge (Caldentey, 2012); Improvement of education and research capacity, liberalisation of the financial system, and establishment of a more transparent and accountable political system (Huang, 2016); Inability to achieve broad-based innovation due to the lack of domestic productivity capabilities, exacerbation of domestic innovation difficulties over time due to the interaction of international factors with local factors, and inadequacy of collaboration between the government and private sector actors in innovation capabilities (Kang & Paus, 2019); Over-reliance on foreign capital and investments due to capital insufficiency (Raj-Reichert, 2019); Macroeconomic stability and financial development issues (Han & Wei, 2017).

It can be seen that the selected literature summarises the reasons for the middle-income trap in four main frames: 1. Human capital; 2. Government failures; 3. Sectoral and competition deficiencies; 4. Capital and savings deficiencies. In short, falling into the middle-income trap is a deviation from the assumed linear growth process and can be considered as evidence of the inadequacy of the convergence hypothesis.

4. THE MIDDLE-INCOME TRAP AND TURKEY

In the literature on the middle-income trap, studies related to Turkey have been conducted parallel to the findings provided above. However, it cannot be said that there are enough studies on Turkey. Although there are no comparative studies, empirical studies conducted specifically on a single country, taking the chronic problems of that country as independent variables, can provide a strong explanatory series of results. For instance, when the Turkish economy is considered, it is necessary to focus on the relationship between the chronic problem of the trade deficit and the middle-income trap. Unfortunately, only one study could be identified in this regard (Sarıgül, Apak & Koyuncu, 2021). When the YÖK database is examined, there are only 19 doctoral theses addressing the middle-income trap, with the first thesis completed in 2014 and 10 doctoral theses completed between 2021-2023. Looking at the variable selections of doctoral theses, it is observed that only one doctoral thesis has been completed focusing on Human Capital, Innovation, R&D, and High Technology issues each. In short, it can be said that there are very limited studies on Turkey and even more limited studies investigating the relationships with the chronic problems mentioned above.

This study has limitations in addressing general or specific variables. Therefore, a different form of indicator is being attempted. The global total GDP of the world economy; the GDP of the United States and Turkey; and their per capita levels are considered for these three variables. The current and proportional differences between these 6 variables are also calculated. The variables are in US Dollars and cover annual data from 1960 to 2022. The dataset was obtained from the World Bank Data system and has been organised for this study, and necessary calculations have been made.

Data Source: The data was obtained from the World Bank Data system (2023). The World Bank Open Data (2023) is a repository of economic, social, and demographic data. It provides free and open access to information about countries, indicators, and topics. Data Type: The data is numerical and includes the following variables: Global total GDP of the world economy; GDP of the United States and Turkey; Per capita GDP levels for these three countries.

Data Format: The data is likely in a tabular format, with rows representing years and columns representing the different variables.

Data Size: The data covers annual data from 1960 to 2022, which means there are 63 data points for each variable.

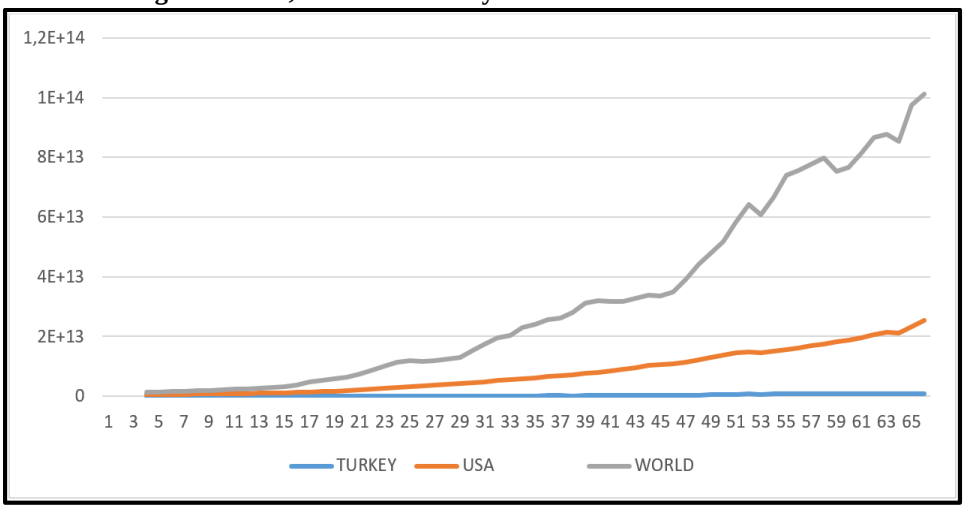
Data Preprocessing: The data was likely cleaned and organised for this study. This may have involved handling missing values, ensuring consistency in units, and calculating additional variables such as current and proportional differences.

Here are some additional details that could be included in the technical passages, depending on the availability of information in the "Data" section of the article: Specific indicators: The World Bank Open Data (2023) repository contains a vast amount of data on various topics. The specific indicators used in this study could be mentioned by name or code. For example, the indicator for "Global total GDP" might be "GDP (current US$)".

Currency conversion: If the original data was in a different currency, it was likely converted to US dollars for this study. The method of conversion (e.g., average exchange rate for each year) could be mentioned.

Firstly, Figure 1 shows the trends of GDP variables for the world, Turkey, and the United States. Despite fluctuations, it can be seen that the world economy, after the first 20 years of the 62-year period considered, especially showed a significant rise, particularly in the 1980s. The US economy is relatively stable and follows a trajectory consistent with the growth trend in the world economy. However, the GDP variable for Turkey does not show a growth associated with both the world and the US. In this regard, it shows a clear deviation from the Convergence Hypothesis.

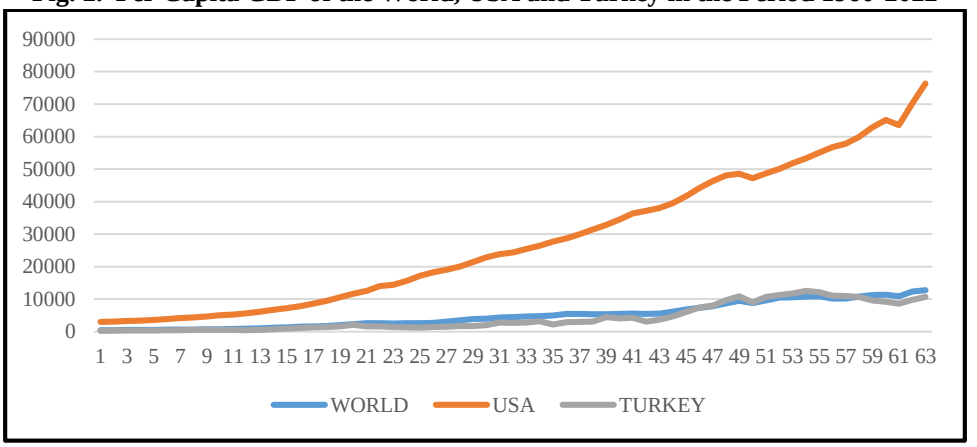
Fig. 1. World, USA and Turkey GDP in the Period 1960-2022



Data: World Bank Data (2023).

When looking at Figure 2, it can be observed that the Per Capita GDP (PCGDP) of the Turkish economy is closely related to the global level and follows approximately the same average trajectory. However, the PCGDP value for the United States diverges significantly from both the global and Turkish PCGDP, showing a much larger and distinct difference. The main reason for this divergence can be attributed to the technological advancements centered around US companies contributing to the US economy, particularly since the 1980s.

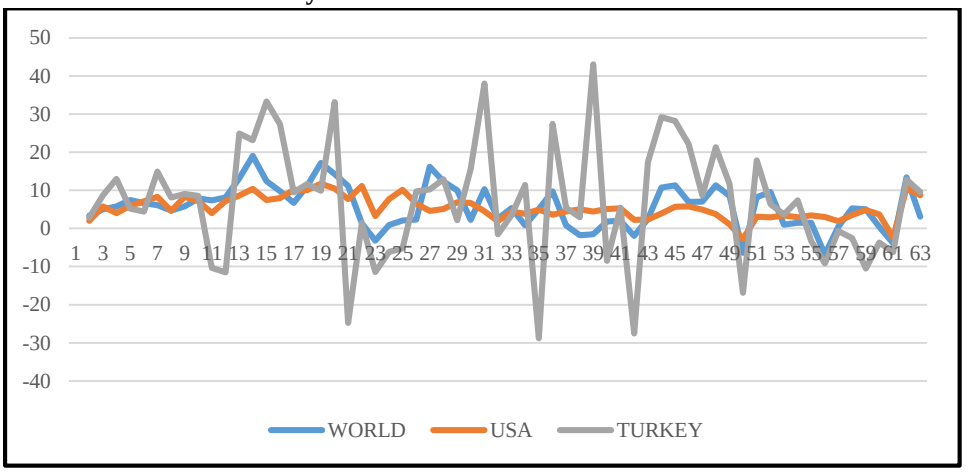
Fig. 2. Per Capita GDP of the World, USA and Turkey in the Period 1960-2022



Data: World Bank Data (2023).

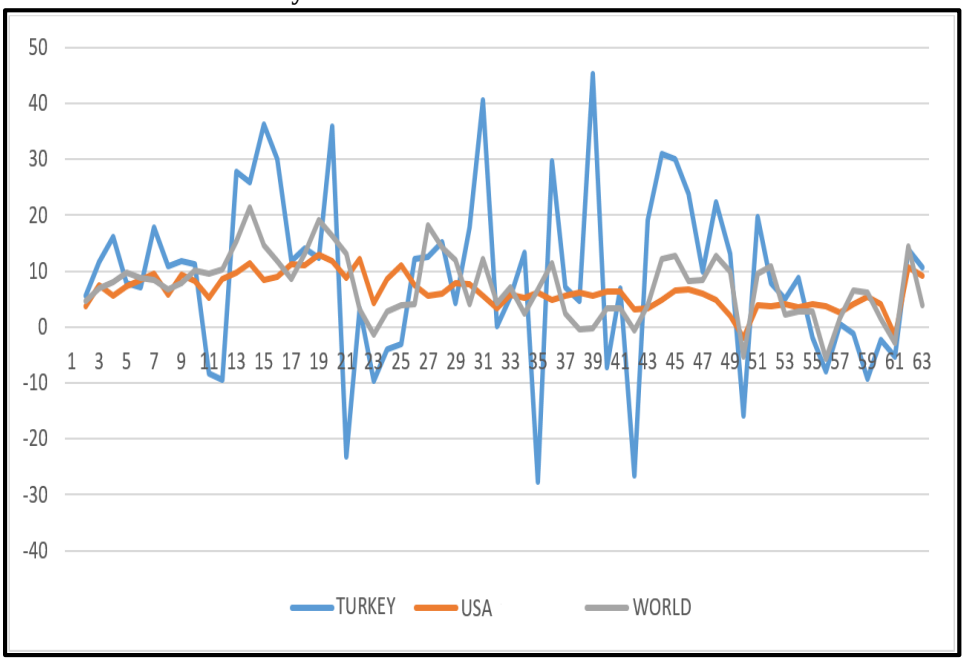
Figure 3, which illusOtrates the series of proportional changes between the years in Per Capita GDP (PCGDP) for the world, the US, and Turkey, suggests that the Turkish economy is much more unstable compared to the other two variables. A similar situation can be observed in the figure created from the series of annual proportional changes in GDP shown in Figure 4.

Fig. 3. Proportional Change in GDP Per Capita in the World, USA and Turkey in the Period 1960-2022



Data: World Bank Data (2023).

Fig. 4. Proportional Change in GDP of the World, USA and Türkiye in the Period 1960-2022



Data: World Bank Data (2023).

The correlation relationships between the variables used in the creation of Figures 1-4 are shown in Table 2 and Table 3.

Table 2

Correlations of World, USA and Turkey GDP and GDP Proportional Change Variables in the Period of 1960-2022

	GDP		GDP Proportional Change	
	USA	World	USA	World
Turkey	0.948672	0.972352	0.27844	0.486277
USA		0.992573		0.55679

Data: World Bank Data (2023).

Table 3

Correlations of Per Capita GDP and Per Capita GDP Proportional Change Variables in the World, USA and Turkey in the Period of 1960-2022

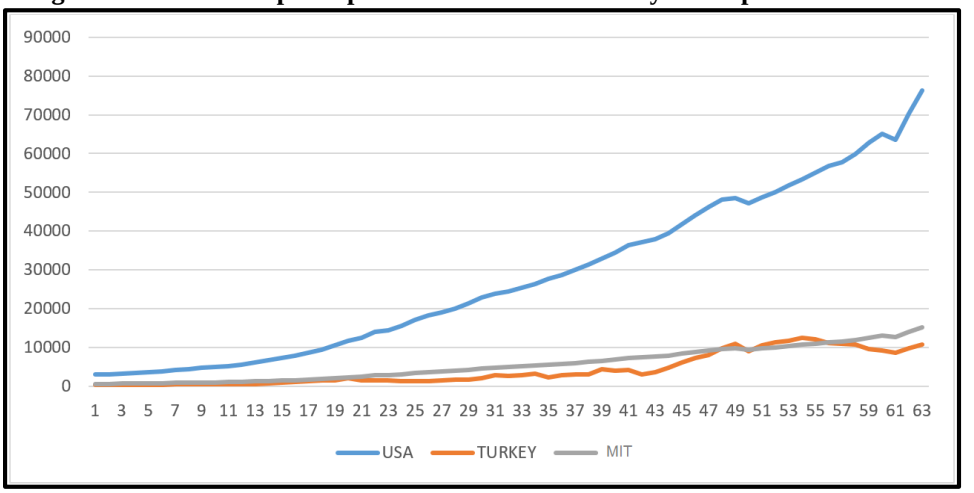
	GDP		GDP Proportional Change	
	USA	World	USA	World
Turkey	0.931393	0.961601	0.257115	0.481432
USA		0.990445		0.535418

Data: World Bank Data (2023).

In Table 2, there is a stronger correlation between the Turkey GDP variable and the World GDP variable (0.972352) compared to the correlation with the USA GDP variable (0.948672). The correlation between USA and World (0.992573) is much stronger than Turkey's correlation relationships. However, in the Proportional Change columns shown in Table 2, it can be observed that Turkey has a very weak correlation (0.27844) with USA. The correlation between World GDP and USA GDP is very strong (0.9487) and positive, indicating that these economies tend to move in the same direction. This is likely due to factors like globalisation and international trade. When the global economy expands, it creates opportunities for export-oriented economies like the US to grow. Conversely, a contraction in the global economy can dampen US growth. The correlation between World GDP Proportional Change and USA GDP Proportional Change is moderate (0.2784) and positive. While there is a tendency for changes in world GDP to be reflected in the US, the association is weaker than for GDP levels themselves. This suggests that US GDP growth can be influenced by factors beyond just global economic conditions. These factors might include domestic policies, technological advancements, and resource availability. The correlation between USA GDP Proportional Change and itself (0.5568) is likely high, indicating a positive association between past and present growth rates in the US economy. In other words, periods of strong economic growth tend to be followed by continued growth, and periods of weak growth tend to be followed by sluggish economic performance. This persistence can be due to factors like consumer and business confidence, which can influence investment and spending decisions.

Table 3, which shows the calculated values for the variables of Per Capita GDP, demonstrates similar levels of correlation relationships, albeit with minor differences. The correlation between World Per Capita GDP and USA Per Capita GDP is very strong (0.9314) and positive, indicating that these economies tend to move in the same direction when it comes to individual wealth. This suggests a potential for convergence in living standards across developed nations through factors like international trade and knowledge transfer. The correlation between World Per Capita GDP Proportional Change and USA Per Capita GDP Proportional Change is moderate (0.2571) and positive. Similar to Table 2, while changes in world per capita income tend to be reflected in the US, the association is weaker than for per capita GDP levels themselves. This suggests that factors specific to the US economy, like domestic policies and productivity changes, can also influence US per capita income growth. The correlation between USA Per Capita GDP Proportional Change and itself (0.5354) is likely high, indicating a positive association between past and present growth rates in US per capita income. In other words, periods of strong economic growth that translate to rising per capita income tend to be followed by continued growth, and periods of weak growth tend to be followed by sluggish gains in per capita income. This persistence can be due to factors like consumer and business confidence, which can influence investment and spending decisions that ultimately affect productivity and growth.

Fig. 5. GDP and MIT per capita in the USA and Turkey in the period 1960-2022

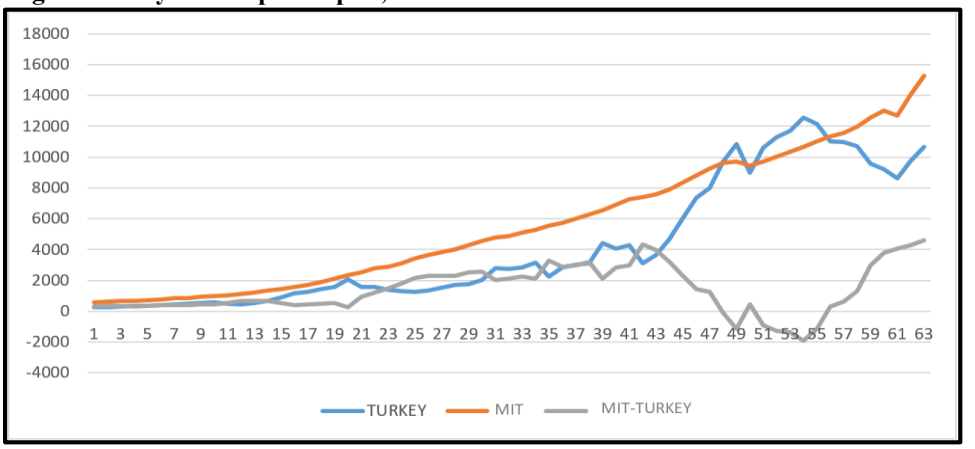


Data: World Bank Data (2023).

By definition, the Middle-Income Trap (MIT) is defined as 20 percent of the USA per capita GDP value. Figure 5, which shows the MIT series calculated based on these 20 percent values over the years along with the Turkey and USA per capita GDP variables, indicates that Turkey is in the Middle-Income Trap. Moreover, there is no Convergence; on the contrary, there is a Divergence, and the USA and Turkey per capita GDP variables are significantly diverging from each other.

Figure 6 presents the series of proportional changes in the MIT variable. The residual proportional to the MIT boundary continues steadily. However, in 2007, it exceeded the MIT boundary, and with the 2008 Global Financial Crisis, although it fell below the MIT boundary again, it exceeded the MIT boundary again starting from 2010 until 2016. However, in the recent period after 2016, it has fallen below the MIT boundary again.

Fig. 6. Turkey's GDP per Capita, MIT and MIT Difference in the Period 1960-2022



Data: World Bank Data (2023).

5. CONCLUSION

In conclusion, the persistent struggle of the Turkish economy to surpass the middle-income trap (MIT) exposes a complex challenge. While the 2007-2016 period offered a glimpse of potential, achieving sustained economic growth requires a multifaceted approach that goes beyond simply replicating past development models. The global economic landscape has shifted dramatically, and the dominance of technology companies among the world's largest firms in 2023 underscores this reality. This trend signifies a rapidly rising "MIT boundary," making it increasingly difficult for middle-income countries to leapfrog without significant investments in research and development (R&D), human capital development, and fostering a domestic environment that nurtures technological innovation.

The path forward for Turkey demands a strategic two-pronged approach:

(1) Strategic Capital Allocation: This necessitates a shift from generalised capital allocation towards targeted investments in high-technology sectors and critically, in domestic production capabilities for technological consumer goods. Public-private partnerships, along with supportive policies that incentivise R&D and domestic production, are crucial for success. Additionally, investments in infrastructure that facilitates technological advancements, such as high-speed internet and robust data security systems, should be prioritised.

(2) Human Capital Development: A move away from a generalised education system towards a targeted approach that prioritises high-quality education and training programmes specifically tailored to the needs of a technology-driven economy is essential. This includes a strong focus on Science, Technology, Engineering, and Mathematics (STEM) fields, fostering a culture of lifelong learning, and encouraging critical thinking and problem-solving skills. Additionally, promoting collaboration between academia and industry can ensure that educational programmes remain aligned with the evolving demands of the job market.

The benefits of successfully navigating this path are substantial. By strategically allocating capital to fuel domestic technological capabilities and nurturing a highly skilled workforce, Turkey can unlock its true potential. This approach will not only position the country to break through the MIT boundary but also achieve sustainable economic growth fueled by a competitive, knowledge-based economy. Furthermore, fostering a domestic environment that encourages innovation can attract foreign investment and create high-value jobs, leading to a more prosperous and equitable society.

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Understanding the Role of Income in Personal Happiness: A Comprehensive PSM Analysis in the United States

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This study examines the relationship between income and individual happiness in the United States using propensity score matching (PSM) analysis. Results reveal that income has a significant impact on individual happiness, with higher income levels associated with increased happiness. The research uses the General Social Survey (GSS) 2022, which marks the beginning of a shift to a mixed-mode survey, incorporating the delivery of both face-to-face and online questions. Employing the general principle of core hypotheses, the analysis aims to understand the causal relationship between income and happiness. The results suggest that improving income could be an effective strategy for increasing individuals' levels of happiness. The study underlines the importance of considering income as a factor that promotes individual well-being and happiness.

JEL Classification: D31, I31

Keywords: Individual Happiness, Income, Propensity Score Matching (PSM), United States, GSS 2022

1. INTRODUCTION

Happiness, a key aspect of individual well-being, has been widely studied in the US context, particularly in relation to income. Notable research has associated higher income with a reduction in daily sadness, as demonstrated by the results of Stevenson & Wolfers (2008). However, the impact on daily happiness appears to be negligible, suggesting that while increased income may alleviate some emotional distress, it may not contribute significantly to overall happiness.

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Authors' Note: For the purposes of this document, it is essential to state that I have no conflicts of interest to disclose. As a professional concerned with integrity and ethics, I am committed to providing objective and impartial information without any influence or bias from external sources. My sole objective is to present the facts in a transparent manner and to provide recommendations or analyses based on objective criteria and thorough research. I am fully aware of the importance of maintaining an appropriate distance from any potential conflict of interest in order to guarantee the credibility and reliability of the information presented.

Furthermore, research has shown a significant link between income and suicide rates, with lower rates observed among people who do not pay income tax compared to their tax-paying counterparts (Deaton & Stone, 2014). This raises interesting questions about the psychological implications of tax obligations and the potential role of financial burdens in influencing mental wellbeing. Nevertheless, the influence of income on overall happiness shows a diminishing effect, particularly above a baseline threshold (Easterlin, 2005). This means that the pursuit of additional income may not significantly improve the overall sense of happiness or life satisfaction once basic needs are met. Furthermore, the impact of external conditions, such as income, on happiness is relatively small compared to the influence of individual thoughts and behaviours (Lyubomirsky et al., 2005). With these considerations in mind, this article explores the relationship between income and individual happiness in the United States, using data from the General Social Survey (GSS) 2022. To assess this impact, the study adopts an econometric modeling approach, employing, in particular, the exact matching method. This method was chosen to create a balanced control group, facilitating a fair comparison between individuals with different levels of happiness while taking into account potential selection bias.

The rationale for using this methodology is rooted in seminal work on propensity score matching, in particular the studies of Rosenbaum & Rubin (1983). The article highlights the relevance of this approach in answering a crucial question: how do individuals' happiness levels differ according to their income levels? The aim of adopting this method is to ensure a rigorous comparison, to control for selection bias, and to provide information on the nuanced relationship between income and happiness.

This article is structured to provide an in-depth analysis of the relationship between income and happiness. Section 2 presents a comprehensive review of the existing literature, highlighting previous research on the topic. Section 3 then presents the data used for this study, together with stylised facts about income and happiness. Section 4 describes the methodology used for this analysis, including the choice of matching method. Section 5 focuses on the balance check after matching, which ensures the validity of the comparison between the two groups. Section 6 presents and discusses the study's findings in detail. Finally, the article concludes with Section 7, which summarises the main findings of the study, suggests avenues for future research, and offers recommendations for public policy and interventions aimed at improving individual well-being.

2. LITERATURE REVIEW

In the United States, a higher income is associated with a decrease in daily sadness but has no impact on daily happiness (Stevenson & Wolfers, 2008). The initial observation suggests that in the United States, a higher income is linked to a decrease in daily sadness (Stevenson & Wolfers, 2008). This association could be attributed to the alleviation of financial stressors and the increased ability to meet one's basic needs, which contributes to a more stable emotional state. Similarly, Clark, et al. (2017) provided evidence from survey data in the US, Australia, Great Britain, and Indonesia. They found that social relationships and mental and physical health are key determinants of happiness. These adult factors affecting happiness are in turn influenced by the child's developmental pattern; the best predictor of an adult's life satisfaction is their emotional health as a child.

In another line of research, Paul (2022) examined the effects of happiness on income and income inequality. Using data from an Australian HILDA survey (2001–2014), Paul (2022) hypothesised that happiness impacts individuals' ability to generate income, both directly by boosting work efficiency and indirectly by affecting their time allocation for paid work. Its findings demonstrate that happiness has a positive and significant effect on income generation and helps to reduce inequality. However, for another panel, FitzRoy & Nolan (2022) used a large sample of data from the British Household Panel Survey and Understanding Society, covering the period from 1996 to 2017. They applied regression techniques to examine the relative importance of income rank, relative income, and household income as predictors of happiness and life satisfaction. Their results show that all three factors are important, but their importance varies between different sub-groups. This in-depth analysis has led to a better understanding of the factors that influence happiness and life satisfaction. Similarly, D'Ambrosio, et al. (2020) added a further perspective by examining the relationship between money and happiness. They found that permanent income and wealth are better predictors of life satisfaction than current income and wealth. Moreover, they found that the impacts of these factors vary along the distribution of well-being.

Easterlin (2023) studied how people assess their income situation in relation to the state of the economy. He found that when the economy is expanding and incomes are generally rising, people tend to assess their own income by comparing it with that of others, a phenomenon he calls 'social comparison'. However, during a recession, when incomes fall, people tend to evaluate their income by comparing it with their previous maximum income. Easterlin (2023) also discovered an asymmetry in the way happiness responds to changes in income. When income rises, changes in income have, on average, no effect on happiness. However, when income falls below its previous peak, happiness decreases and increases with it. These results suggest that the way in which people evaluate their income, and therefore their happiness, depends on the state of the economy. Their findings suggest that the way people evaluate their income, and therefore their happiness, depends on the state of the economy. However, it's crucial to note that the correlation with daily happiness appears to be non-existent.

Research shows that individuals have lower suicide rates or are "happy" when they do not pay income taxes compared to those who do (Deaton & Stone, 2014). The passage highlights a notable finding that individuals who do not pay income taxes exhibit lower suicide rates or report being "happy" compared to those who pay taxation (Deaton & Stone, 2014). This raises intriguing questions about the psychological and emotional implications of tax obligations. The financial burden associated with income taxes may play a role in individuals' mental well-being.

However, the impact of income on overall happiness is relatively weak, especially when income surpasses a basic minimum (Easterlin, 2005). Despite the positive correlation between higher income and reduced daily sadness, the passage suggests that the impact of income on overall happiness is relatively weak, particularly when income exceeds a basic minimum (Easterlin, 2005). This aligns with research indicating that, beyond a certain threshold, the pursuit of additional income may not significantly contribute to an individual's overall sense of happiness or life satisfaction. In this context, Munir & Nazuk (2019) used a binary logistic regression framework to model the happiness index when

converted to a dichotomous level. They collected primary data from various Pakistani regions (rural and urban) through a survey with a sample size of 763. Their results showed a positive and significant relationship for the big five traits (extraversion and neuroticism), confidence in the armed forces, life satisfaction, and age.

External conditions such as income have a relatively weak impact on happiness compared to thoughts and behaviours (Lyubomirsky, et al. 2005). The passage underscores the idea that external conditions, such as income, have a relatively weak impact on happiness compared to thoughts and behaviours (Lyubomirsky, et al. 2005). This aligns with psychological theories that emphasise the importance of individual mindset, coping mechanisms, and behavioural choices in influencing overall well-being. It implies that personal agency and internal factors play a crucial role in determining happiness.

Income comparisons may challenge the law of diminishing marginal utility, which states that a higher income's marginal utility can increase with others' income, leading to a rat race or an arms race (Clark, et al. 2008). This law suggests that as income increases, the additional satisfaction or happiness derived from each additional unit of income decreases. Income comparisons, however, may disrupt this principle by introducing relative considerations, potentially leading to a competitive pursuit of a higher income in comparison to others.

Other studies have attempted to explain individuals' happiness through additional sociodemographic characteristics, such as age (Diener, et al. 1999; Blanchflower & Oswald, 2004) and gender (Louis & Zhao, 2002). For instance, research focusing on the relationship between age and subjective well-being suggests a convex "U" curve, corresponding to higher levels of individual happiness for both the youngest and oldest individuals, with lower subjective well-being observed in the middle age group (between 32 and 50 years) (e.g., Blanchflower & Oswald, 2004; Ferrer-i-Carbonell & Gowdy, 2007). Overall, while a higher income can alleviate sadness and reduce suicide rates, its impact on overall happiness is limited, and other factors such as personal relationships and positive behaviours play a more significant role in determining happiness.

The research exploring the relationship between income and happiness in the United States reveals intricate dynamics with various factors at play. Hutchinson's, et al. (2017) findings add a distinctive perspective, indicating that individuals who are exempt from paying income taxes tend to report higher levels of happiness. This observation raises questions about a potential link between the burden of taxation and individual happiness. In a similar vein, Liao (2021) and Dynan (2007) delve into the impact of social comparison on the income-happiness relationship. Liao specifically highlights the role of income inequality in influencing happiness, emphasising how disparities among individuals can affect their well-being. On the other hand, Dynan proposes that an individual's happiness is shaped by how their socio-economic standing compares to others in society. This underscores the significance of relative income in determining subjective well-being.

Oishi's (2011) contribution adds another layer to this discussion by highlighting the detrimental effects of income inequality on happiness, especially among individuals with lower incomes. Income disparities cause perceived unfairness and a lack of trust, which contributes to lower happiness levels. Together, these studies collectively underscore the multifaceted nature of the income-happiness relationship in the United States, emphasising the roles of income itself, the burden of taxation, and social comparison in shaping

individual well-being. For China, Ye, et al. (2023) estimated the causal effect of income on happiness using a unique dataset of Chinese twins. Their results show that individual income has a significant positive effect on happiness, with a doubling of income resulting in a 0.26 scale or 0.37 standard deviation increase in the four-scale happiness measure. Their results underline the importance of accounting for various biases when studying the relationship between socio-economic status and subjective well-being. An inverse line between income and happiness was studied by MA & MA (2021), who examined the influence of income on the subjective happiness of teachers in Chinese private universities. They established a model for measuring teachers' subjective happiness, taking into account the specific characteristics of Chinese private universities. Using the structural equation model to analyse data collected from teachers at private universities in China, they found that income has a significant positive impact on teachers' subjective happiness, in particular through the level of consumption and housing conditions.

Behera, et al. (2024) examined the socio-economic factors that contribute to happiness in 166 developed and developing countries (51 developed, 115 developing). They used robust, two-factor fixed effects and panel-quantile regression for the empirical analysis. Their results show that per capita income, social support, and the freedom to make life choices have a positive impact on happiness, while exposure to air pollution has a negative impact. On the other hand, Kundu, et al. (2024) examined the relationship between democracy, macroeconomic variables, and happiness in 83 countries (low- and high-income countries) from 2010 to 2016. They used a variety of panel data analyses, including the threshold panel model. Their results show that, although GDP per capita has no direct impact on happiness, it does establish the role of other variables in determining happiness. In higher-income countries, democratic quality and inflation have a significant impact on happiness. Furthermore, in low-income countries, inequality and government spending on health per capita have a negative and positive impact, respectively.

3. DATA AND STYLISED FACTS

This section is devoted to presenting the data and stylised facts underlying our analysis. We will describe in detail the data sources used for this study. We will also present a series of stylised facts about income and individual happiness that have been identified from the data. These stylised facts will form the basis of our analysis and help to illuminate the trends that we are attempting to capture.

3.1. Data

Since 1972, the United States has conducted a series of cross-sectional interviews known as the General Social Survey (GSS). The 2022 GSS Cross-section connects the two eras of GSS data collection—the face-to-face era from 1972 to 2018 and the web-based era of 2021. It retains many of the questionnaire changes that occurred during the transition but returns to a mixed-mode data collection strategy that includes face-to-face, web, and telephone. The GSS 2022 was structured to be comparable to the 2018 GSS; in other words, the 2022 research tried to mimic the 2018 GSS. In addition, the GSS 2022 carried over a number of web-specific methodological trials from the GSS 2021. The GSS 2022 marks the beginning of a multi-round shift to a mixed-mode survey, with questions delivered both in-person and online.

There are three distinct occurrences of GSS variables. There isn't much change to the items in the Replicating Core, Household Composition, and Contact/Validation categories, but in 2022, they will have web mode modifications. Certain subject modules, such as ISSP modules, may include items that occur more than once a year, but not every single time. Last but not least, most of the topical modules only release their products once a year. In the GSS 2022, the ISSP Family and Gender Roles, ISSP Health and Health Care, Shared Capitalism, NIOSH Quality of Working Life, National Endowment for the Arts, and High-Risk Behaviours modules are repetitions from prior years. It is vital to note that critical modifications to questions were made to the National Endowment for the Arts (NEA), Shared Capitalism, and NIOSH QWL. The board-initiated module entitled GSS Next contains a blend of traditional and new GSS variables. Table 1 (Column 2) illustrates the definitions and associated descriptive statistics for the important variables in our final sample.

Table 1

Statistics Summary of the Survey Data

Variable	Definitions	Mean	Std. Dev	Min	Max
income	The treatment variable indicates two levels of individuals: 1 for treated and 0 for untreated.	0.6148420	0.4867013	0	1
happiness	The outcome variable indicates if a person is happy (1) or not (0).	0.7734199	0.4186777	0	1
employment_status	Indicates whether the person is working full-time or part-time (1), or whether they are in school or homemaking (0).	0.5996050	0.4900476	0	1
marital_status	Indicates if the person is married (1) or not (0).	0.4844808	0.4998296	0	1
number_of_children	Indicates the number of children in the house.	1.7353273	1.6678576	0	8
age	The individual's age.	46.2911964	20.9220121	0	89
education_level	This represents the person's years of education.	14.0411964	3.0459824	0	20
school_degree	Education level is divided into two groups: less than high school (0), and high school degree or higher (1).	0.8092551	0.3929438	0	1
gender	Indicates if the individual is male (1) or female (0).	0.4590858	0.4983935	0	1
adults_house	Indicates the number of adults in the house.	1.8177201	0.8713859	0	9
health_status	Indicates the health status of the individual: above average (1) or below average (0).	0.7107788	0.4534648	0	1
social_class	Indicates the individual's social class: lower and working class (0), or middle and upper class (1).	0.1529345	0.3599752	0	1
satisfaction_level	Level of satisfaction with the individual's current financial situation: satisfied (1) or not (0).	0.4424379	0.4967456	0	1
unemployment_status	Indicates an individual's employment situation: unemployed (1) or not (0).	0.2200903	0.4143658	0	1

Source: Authors' calculations, R software.

Table 1 paints a detailed picture of the population studied, highlighting two key elements: income and level of happiness. Income distinguishes two categories of individuals: those who are 'treated' (1) and those who are not (0). The level of happiness gives us an insight into the emotional well-being of the population. At the same time, a series of variables offer a more in-depth view of people's lives. Age, gender, marital status, number of children, number of adults in the household, level of education, school qualifications, state of health, social class, level of satisfaction, and employment status are all facets that make up the complex picture of human life.

A closer look reveals that 61 percent of people are 'treated' in terms of income, and 77 percent of people say they are happy. Nearly 60 percent of people work full-time or part-time. Almost half are married, and the average number of children per household is approximately 1.74. The average age is 46, and the vast majority of people have a secondary education or higher. Less than half of the residents are men, and the average number of adults per household is approximately 1.82. A large majority of people are in above-average health, and a small proportion are middle- or upper-class. Less than half of the residents are satisfied with their current financial situation, and a small proportion are unemployed.

3.2. Stylised Facts

3.2.1. *The Happiness Index*

In our study, the outcome variable is the happiness of the household surveyed, obtained from a multiple-choice question: "Overall, how happy are you at the moment?" The three possible answers to this question are: very happy, fairly happy, or not too happy? Happiness is the most widely used indicator in the literature (Ferrer-i-Carbonell and Frijters (2004); Singh, et al. (2023); and Ye, et al. (2023). For our analysis, we construct a binary 'happiness' variable with a value of 1 if the person is very happy and fairly happy, and a value of 0 if the person is not too happy.

Table 2

Distribution of Individual Happiness by "health_status", "social_class", "unemployment_status"

Category	mean_happiness	sd_happiness	variable
0 (not happy)	0.624	0.485	health_status
1 (happy)	0.834	0.372	health_status
0 (not happy)	0.795	0.403	social_class
1 (happy)	0.651	0.477	social_class
0 (not happy)	0.806	0.395	unemployment_status
1 (happy)	0.656	0.475	unemployment_status

Source: Authors' calculations, R software.

Table 2 presents summary statistics for the sample on happiness status in relation to 'health_status','social_class', and 'unemployment_status'. From the data, it is clear that health status and employment status have a significant influence on people's level of

happiness. Individuals in good health have an average happiness level of 0.834, which is significantly higher than that of individuals in poorer health, which is 0.624. Similarly, individuals who are not unemployed have an average happiness level of 0.806, compared with 0.656 for those who are unemployed.

On the other hand, social class seems to have an inverse effect on happiness. Individuals from the lower or working class have an average happiness level of 0.795, which is higher than that of those from the middle or upper class, which is 0.651.

3.2.2. *Income Disparity*

Table 3 illustrates the distribution of income as a function of three key variables: 'health_status', 'social_class' and 'unemployment_status'. With regard to 'health_status', the data indicate a disparity in income between those who are happy and those who are not. Happy individuals have an average income of 0.644, while those who are not happy have an average income of 0.542. This is consistent with the study by Paul (2022), who also found a positive correlation between happiness and income. As far as the 'social_class' is concerned, there seems to be a reversal of this trend. Individuals who are not happy have a slightly higher average income (0.629) than those who are happy (0.537). This observation is supported by the work of FitzRoy and Nolan (2022), who also found a similar trend in their study. Finally, with regard to 'unemployment_status', the data also show an income disparity. Individuals who are not happy have a slightly higher average income (0.627) than those who are happy (0.573). This might suggest that unemployment can have an impact on happiness levels independently of income.

Table 3

Distribution of Income by "health_status", "social_class", "unemployment_status"

category	mean_income	sd_income	variable
0 (not happy)	0.542	0.498	health_status
1 (happy)	0.644	0.479	health_status
0 (not happy)	0.629	0.483	social_class
1 (happy)	0.537	0.499	social_class
0 (not happy)	0.627	0.484	unemployment_status
1 (happy)	0.573	0.495	unemployment_status

Source: Authors' calculations, R software.

4. METHODOLOGICAL APPROACH

To meet the objective of this study, which is to assess the impact of income on the happiness of individuals in the United States, we chose a methodological approach based on econometric modelling, using the exact matching method (this exact matching technique consists of displaying each treated unit with a control unit having exactly the same values for each covariate). This approach was chosen because it enables us to make a rigorous comparison between individuals with a high level of happiness and those with a low level of happiness, while controlling for selection bias and ensuring a fair comparison between the two groups (those with a high income and those with a low income).

We justify this choice of methodology by drawing on reference works such as those of Rosenbaum & Rubin (1983), who are the founders of the propensity score matching method. This approach is particularly relevant in our context, as it allows us to answer the crucial question: how do individuals' levels of happiness differ from those they would have had if they had no income or a low income?

In terms of data collection and processing, we have chosen to use the US Household Survey (GSS, 2022). This survey will provide us with data on various household characteristics, as well as the factors that influence their level of happiness. To analyse these data, we will use R statistical software, with specific R packages adapted to our analysis needs.

4.1. Model Specification

The challenge is to assess the impact of individual income in the United States, focusing specifically on its effect on their happiness. The variable of interest, as we will call it, represents household incomes. Thus, it would correspond to the result of household I's participation in the treatment group, while it would be the result in the absence of participation. The impact of income on household happiness can be simply expressed as follows:

$$\Delta_i = Y_{1i} - Y_{0i}$$

And the average impact for the entire population is:

$$E(\Delta_i) = E(Y_{1i} - Y_{0i})$$

The complexity lies in the need to simultaneously observe the same household in two distinct states, acting as both a participant and a non-participant for a task that is not performed. In each scenario, we have only de or de, depending on whether or not the household participates in the treatment group (person with above-average income). Impact analysis therefore faces the challenge of estimating missing data. Choosing an impact analysis method means devising a strategy for estimating the missing data. Various approaches are possible with a single measurement over time, such as the experimental method, PSM (propensity score matching), mentioned by Rosenbaum & Rubin (1983), Heckman, et al. (1997), and Caliendo & Hujer (2006).

It's not enough to just compare participants and non-participants; you also need to estimate the unobserved value of variable Y for participants (if they don't have any income) by dividing it by the unobserved value of variable Y for non-participants (people with below-average income). This approach does not allow an accurate estimate of the impact, as will be shown later. To overcome this limitation, we adopt a more rigorous approach. We consider a household i, where D represents the dichotomous variable of people with income above or equal to the average, if household i has income above or equal to the average (treated person) and otherwise. We assume that the variable Y depends on a set of explanatory variables, according to a linear model formulated as follows:

$$Y_{0i} = X_i\beta_{0i} + U_{0i} \text{ with } i=1, \ldots, n$$

$$Y_{1i} = X_i\beta_{1i} + U_{1i} \text{ with i=1, …, n}$$

According to the general principle of basic assumptions:

$$E(U_{0i} \mid X_i) = E(U_{1i} \mid X_i) = 0$$

Using these notations, we have:

$$\Delta_i = Y_{1i} - Y_{0i} = X_i(\beta_{1i} - \beta_{0i}) + (U_{1i} + U_{0i})$$

The indicator commonly used to measure impact is the average gain in income for those treated, also known as ATET (Average Treatment Effect on the Treated) in the evaluation literature.

It is calculated as follows:

$$ATET = E(\Delta_i \mid X_i, D_i = 1) = X_i(\beta_{1i} - \beta_{0i}) + E(U_{1i} + U_{0i} \mid X_i, D_i = 1)$$

In the specific case where the variable Y is not influenced by the explanatory variables X, we simply obtain the unconditional mean in X:

$$ATET = E(\Delta_i \mid D_i = 1)$$

If we wish to estimate ATET simply by calculating the difference between participants and non-participants, the estimator is as follows:

$$\begin{aligned} BATET &= E(Y_1 \mid X, D = 1) - E(Y_0 \mid X, D = 0) \\ &= E(Y_1 \mid X, D = 1) - E(Y_0 \mid X, D = 1) + E(Y_0 \mid X, D = 1) \\ &- E(Y_0 \mid X, D = 0) = ATET + BIAIS \\ &\text{with } BIAIS = E(Y_0 \mid X, D = 1) - E(Y_0 \mid X, D = 0) \end{aligned}$$

This bias is explained by the fact that households with an income above or equal to the average would have a different level of happiness than households with an income below the average (the control group). In other words, treated and untreated households are not identical. In order to eliminate this bias, the variables $Y_i(0)$ and T_i must be independent.

To confirm the absence of bias in this case, we introduce an additional variable, R, which is a dichotomous variable among potential participants. It takes the value 1 if the household actually participates in the treatment group, and 0 otherwise. Using this new notation, the effect of income on household happiness can be expressed as follows:

$$Y = D(RY_1 + (1 - R)Y_0) + (1 - D)Y_0$$

The impact of income is:

$$\begin{aligned} BATET &= E(Y \mid X, D = 1, R = 1) - E(Y \mid X, D = 1, R = 0) \\ &= E(Y_1 \mid X, D = 1) - E(Y_0 \mid X, D = 1) = ATET \end{aligned}$$

The experimental method offers the possibility of estimating the impact directly because the samples of treated and untreated people share the same observable and unobservable characteristics. However, when the experimental method is not feasible, 'matching' techniques, particularly PSM (Propensity Score Matching), offer a credible alternative.

PSM (Propensity Score Matching) is used to create a control group similar to the treatment group (households with an income equal to or greater than the average) from non-experimental data. Using a set of variables Z, which were used to select the

participants, the aim is to find a subset of households with similar characteristics in Z. In this way, PSM makes it possible to estimate the impact of income based on participation, just like the experimental method. Among the possible scores, the "propensity score" is often used, representing the probability of participating in the treatment group. For the group to be a valid control group, similar to a random sample of non-participants, two conditions must be met.

These conditions are as follows:

$$(Y_0, Y_1) \perp D \mid Z \qquad \text{And } 0 < \mathrm{P}(Z_i) = E(D_i \mid Z_i) < 1$$

The first hypothesis of PSM assumes that, conditional on Z, the distribution of results for non-participants is the same as that of participants had they not participated (persons with an income equal to or greater than the average).

The second assumption of PSM is that each unit has a positive probability of being selected, which makes it possible to form a control group. However, the difficulty lies in the fact that the pair is orthogonal to D conditional on Z and not on the score function m(Z). Rosenbaum and Rubin (1983) have shown that if it is orthogonal to D conditional on Z, then it is orthogonal to D conditional on m(Z).

The research of Heckman et al. (1997) shows that these assumptions are strict and can be relaxed. To estimate ATET, it suffices that:

$$Y_0 \perp D \mid Z$$

To construct the control group, different algorithms are used to match the observations of the treated and untreated groups. Whatever algorithm is used, the aim is to estimate the ATET (average treatment effect on the treated). Suppose we have a sample of size n for the treated group, where J_i represents the set of matched individuals in the control group for individual i, and $|J_i|$ is the cardinal of J_i. In addition, ω_i denotes the weight associated with each individual from the survey. Under these conditions, we can obtain an unbiased ATET estimator:

$$\hat{\Delta} = \sum_{i=1}^{n} \omega_i \left(Y_{1i} - \frac{1}{|J_i|} \sum_{j=1}^{|J_i|} Y_{0ij} \right)$$

4.2. PSM Implementation

Our study's implementation of Propensity Score Matching (PSM) aims to construct a control group with similar characteristics to the group of people with an income equal to or above the average (participant group) in order to be able to reliably assess the impact of income on the happiness of treated individuals (treatment group). We chose to set up this control group at the household level to ensure the results were robust.

To do this, we used a probit-type regression, taking the status of treated individuals as the dependent variable and including all relevant characteristics that influenced happiness as independent variables. This approach enabled us to predict a propensity score for each household, i.e., the probability of it being a treated person. Then, using an appropriate "matching" algorithm, we matched participating households to non-participating households with similar propensity scores. In this way, we were able to build a balanced control group based on the relevant characteristics, enabling us to better isolate the effect of income on the happiness of people with an income equal to or above the average (treated people).

Checking Post-matching Equilibrium

Before plunging into the analysis of impact results, it is essential to confirm that matching has indeed established a balance between treatment and control groups. Indeed, two main conditions, formulated by Rubin (1973) and Rosenbaum & Rubin (1983), are essential to guarantee equilibrium between treatment and control groups. The crucial element in our analysis is conditional equilibrium, which states that treatment assignment is independent of the potential outcome once covariates are taken into account. In other words, the probability of being subjected to a treatment should not be associated with potential outcomes after adjusting for covariates. This ensures that our analysis is robust and minimises selection bias.

Table 4 shows a post-matching comparison of characteristics between treatment and control groups. It is remarkable that for all variables, the treatment and control groups' means are identical, indicating perfect equilibrium after matching. Furthermore, the standardised mean difference is zero for all variables, reinforcing the idea of perfect equilibrium.

In terms of sample size, we initially have 1365 individuals in the control group and 2179 in the treatment group. After matching, we have an almost perfectly matched sample with 30 individuals in the control group and 29 in the treatment group. The number of unmatched individuals is 1335 in the control group and 2150 in the treatment group.

Table 4

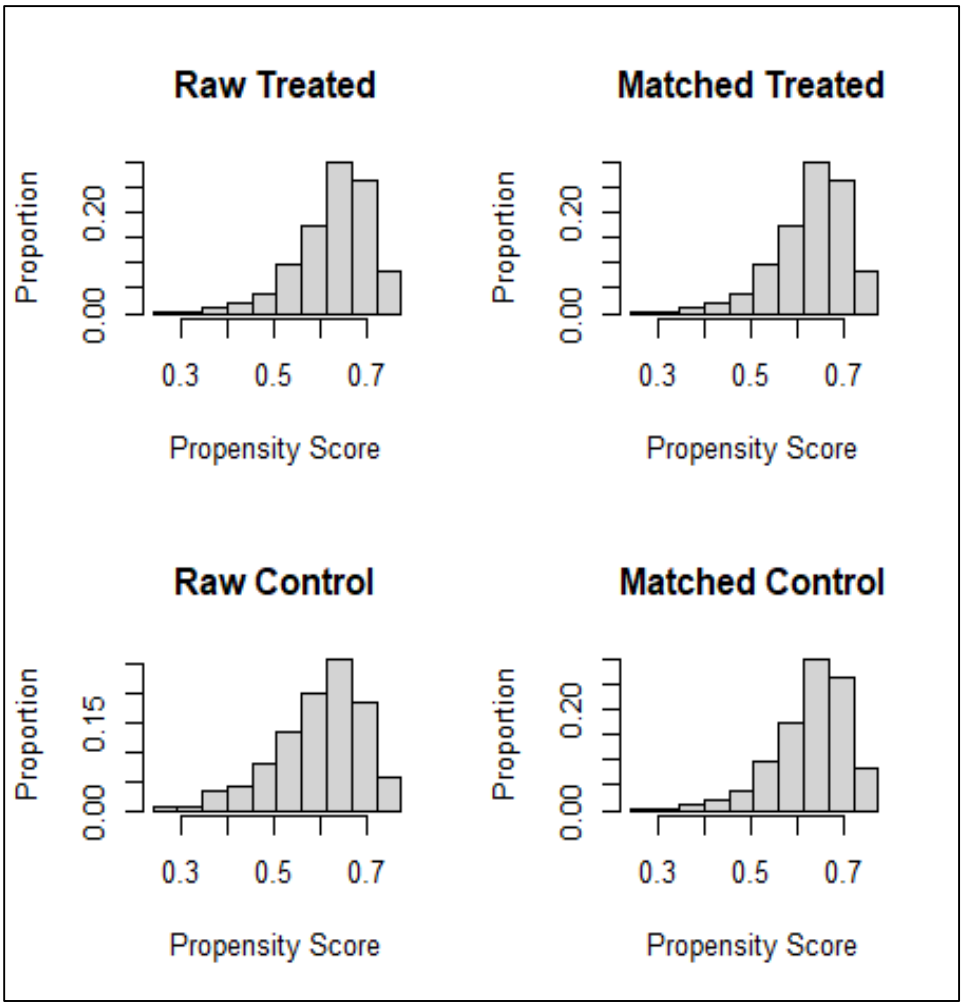
Comparison of Characteristics After Matching between Treatment and Control Groups

	Summary of Balance for Matched Data		
	Means Treated	Means Control	Std. Mean Diff.
employment_status	0.7241	0.7241	0
marital_status	0.4483	0.4483	0
number_of_children	1.2069	1.2069	0
age	34.3793	34.3793	0
education_level	14.6207	14.6207	0
school_degree	0.9655	0.9655	0
gender	0.4828	0.4828	0
adults_house	1.6207	1.6207	0
health_status	0.9310	0.9310	0
social_class	0.0000	0.0000	0
satisfaction_level	0.4483	0.4483	0
unemployment_status	0.0345	0.0345	0
	Sample Sizes		
	Control	**Treated**	
All	1365	2179	
Matched (ESS)	26.7	29	
Matched	30	29	
Unmatched	1335	2150	

Source: Authors' calculations, R software.

Figure 1 illustrates four histograms showing the distribution of propensity scores for the treatment and control groups, before and after matching. The "Raw Treated" and "Raw Control" histograms show that the treatment and control groups' propensity score distributions were not the same before they were matched. This means that the two groups cannot be compared based on visible characteristics. However, the "Matched Treated" and "Matched Control" histograms show that after matching, the propensity score distributions for the treatment and control groups became very similar. This shows that matching was successful in making the two groups comparable. These observations suggest that the common support hypothesis, which states that there must be treated and untreated individuals for each propensity score, is satisfied after matching. This strengthens the validity of the subsequent analysis of the impact results on the relationship between income and happiness.

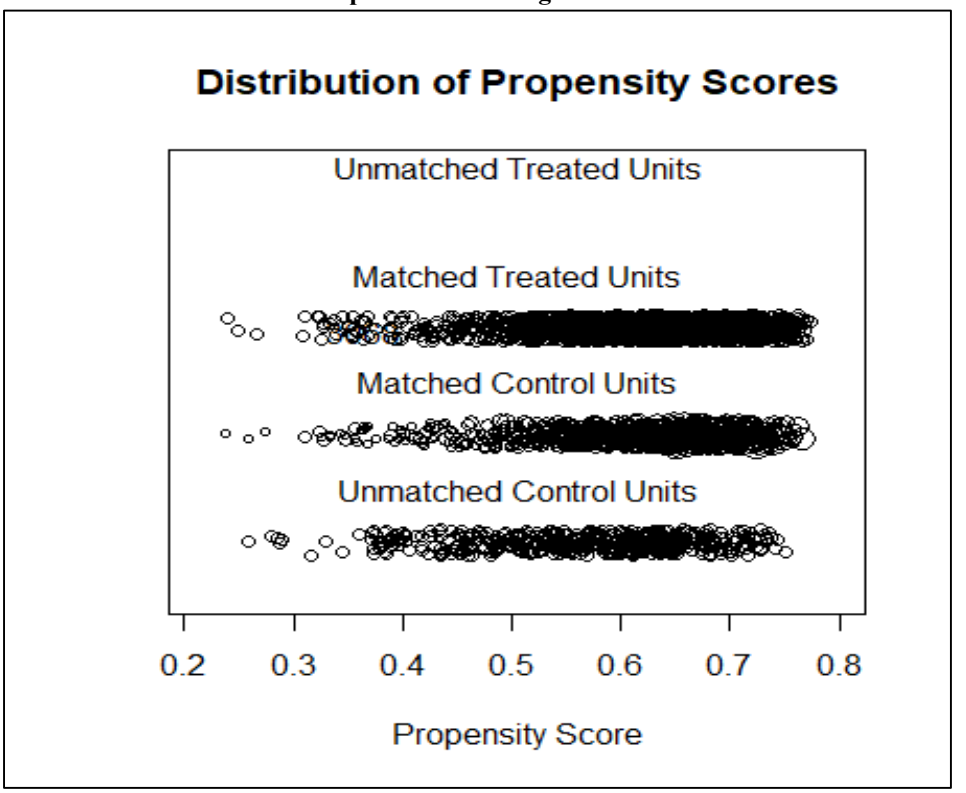
Fig. 1. The Distribution of Propensity Scores for Treatment and Control Groups after Matching



Source: Authors' calculations, R software.

Figure 2 illustrates the distribution of propensity scores for treated and untreated units, before and after matching. The dots on the graph represent the individual propensity scores for each unit. We observe that matched units (treated and control) have more concentrated distributions around the mean propensity scores, while unmatched units (treated and control) are more widely dispersed over the range of propensity scores. This figure demonstrates how well matching worked by aligning the distribution of propensity scores for the treatment and control groups. This suggests that matching worked to make the two groups similar in terms of observable characteristics, which strengthened the validity of the next impact outcome analysis.

Fig. 2. The Distribution of Propensity Scores for Treatment and Control Groups after Matching



Source: Authors' calculations, R software.

5. RESULTS AND DISCUSSIONS

In this section, we analyse the impact of income on household happiness in the United States and assess the quality of the methodology used in this study. First, we examine the impact of income on household happiness by presenting and discussing our analysis's results. Second, we will conduct checks to ensure the matching method's reliability and robustness. These two aspects will enable us to provide a complete and rigorous analysis of the relationship between income and individual happiness.

5.1. The Impact of Income on Happiness

Table 4 illustrates the significant impact of income on happiness. According to our regression results, there is a significant positive relationship between income and happiness. More specifically, each increase of one unit of income (i.e., from an untreated to a treated state) leads to an average increase in happiness of 0.04389, all other things being equal. This estimate is statistically significant at the 1 percent level (p-value = 0.00779 < 0.01), suggesting a substantial positive effect of income on happiness levels. This corroborates the findings of Hutchinson (2017), who found that those who are exempt from income tax tend to report higher levels of happiness.

Our results suggest that improving income could be an effective strategy for increasing individuals' happiness levels. This seems to be in line with the work of Liao (2021) and Dynan (2007), who have highlighted the importance of social comparison and income inequality in determining happiness. However, it is important to note that although our study shows a positive effect of income on happiness, the impact of income inequality and social comparison should not be neglected.

Table 5

Impact of Income on Individual Happiness

Variable	Estimate	Std. Error	t value	P > |z|
(Intercept)	0.74776	0.01388	53.860	< 2e-16 ***
income (1 vs 0)	0.04389	0.01648	2.663	0.00779 **

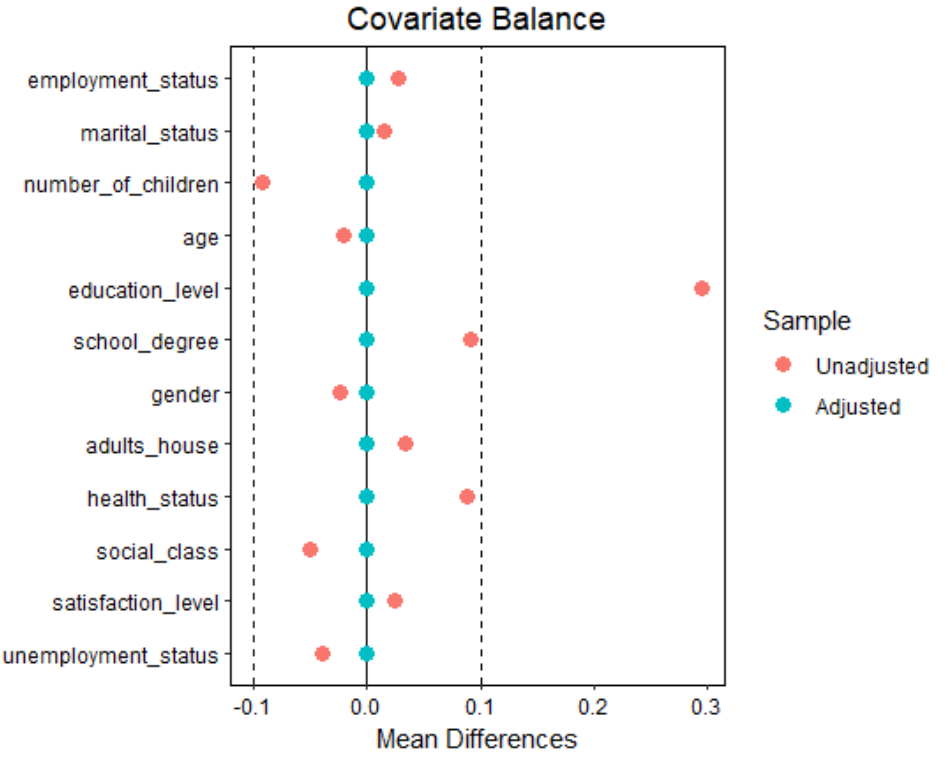
Source: Authors' calculations, R software.
Notes: *** P < 0.001, **P < 0.01.

5.2. Match Quality Checks

The matching quality used in our work is shown graphically in figure 3, which illustrates the balance of covariates, which are potentially confounding variables, before and after mating. The y-axis shows the various covariates. These covariates have been carefully selected for their potential relevance to our treatment variable, "income," and our outcome variable, "happiness." The x-axis represents the mean differences between the treatment and control groups for each covariate. Before matching, represented by the red dots, we observe a significant dispersion of mean differences, indicating a notable imbalance between treatment and control groups. This suggests that, in the absence of matching, any comparison between treatment and control groups could be biased by these differences.

However, after the matching, represented by the blue dots, the mean differences are significantly close to zero. This indicates that the matching has succeeded in creating treatment and control groups that are comparable in terms of covariables. In other words, for each covariable, the treatment and control groups have similar mean values, suggesting that they are well balanced (Ho, et al. 2007). In conclusion, the matching succeeded in minimising average differences between treatment and control groups for all covariables. This improves the study's validity by controlling potential confusion factors. Therefore, any difference observed in the result variable, "happiness," between the treatment and control groups can be attributed with greater confidence to the treatment variable, "income," rather than to differences in the covariables.

Fig. 3. The Balance of Covariables



Source: authors' calculations, R software.

6. CONCLUSION AND POLICY RECOMMENDATIONS

The article concludes that income has a significant impact on individual happiness in the United States, with higher income levels being associated with elevated levels of happiness. The study employs PSM analysis and the general principle of basic assumptions to comprehend the causal relationship between income and happiness. These findings are in line with the work of Hutchinson (2017), who found that those who are exempt from income tax tend to report higher levels of happiness. However, our findings add a new dimension to this discussion by showing that increasing income can actually increase the level of happiness of individuals, regardless of their tax status.

Furthermore, our results seem to be in line with the work of Liao (2021) and Dynan (2007), which highlighted the importance of social comparison and income inequality in determining happiness. However, it is important to note that, while our study highlights the positive effect of income on happiness, it does not overlook the importance of other factors that can influence this relationship. In particular, Liao (2021) and Dynan (2007) highlight the importance of social comparison and income inequality in determining happiness. Furthermore, Oishi's study (2011) highlights the adverse effects of income inequality on happiness among low-income people.

It is also important to note the limitations of this study. Although we found a significant relationship between income and happiness, our study focuses on the United

States, and the results may not be generalisable to other countries or regions. Furthermore, our study does not address the long-term effects of income on happiness and does not take into account other factors that may influence individual well-being, such as inflation and the level of stability of economies that can affect the income of individuals. Furthermore, our study does not deal with the temporal dynamics of happiness. Happiness is an emotional state that can fluctuate over time in response to various life events. Therefore, a longitudinal analysis that follows the same individuals over time could provide more accurate information on the relationship between income and happiness.

Based on these findings, it is recommended that policymakers take into account not only income but also other factors such as social comparison and income inequality when designing policies to improve people's happiness. Indeed, policies aimed at reducing income inequality, improving social support, and promoting the freedom to make life choices could help increase overall happiness. Furthermore, given the impact of income tax exemptions on happiness, tax policies could also be considered as a means of improving well-being. These recommendations could help steer public policy towards 'creating well-being' rather than 'creating wealth'.

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Policy

Pakistan's Urban Water Challenges and Prospects

NAZAM MAQBOOL

Cities in Pakistan are increasingly faced with problems of erratic supply of piped water and unsafe and declining levels of groundwater. Additionally, over one-third (35 to 40 percent) of piped water is wasted through leakages and theft in the water distribution networks.[1] By 2050, the country's urban population is expected to double in size (from 81 million in 2022 to 160 million in 2050 or from 37.7 percent of the total population to 52.2 percent) (see table 1). Providing water for these citizens is a challenging task; finding money to pay for the provision of that water is at least as daunting. Urban water tariffs are low and infrequently adjusted, even with current efforts at reform.

1. INTRODUCTION AND BACKGROUND

Pakistan is rapidly urbanising. From 1980 to 2022, the Pakistani population living in cities increased from 21.9 million (28.1 percent) to 81.4 billion (37.7 percent) and is projected to reach 160.2 million (52.2 percent) by 2050 (table 1). At present, a majority of Pakistan's urban population faces water scarcity—water demand exceeding water supply. Declining groundwater, expanding populations, aging infrastructure and changing weather patterns have placed significant pressure on water supplies. Population growth, urbanisation, and socioeconomic development are expected to increase urban water demand by over 100 percent by 2050 (Figure 1). Climate change will also affect the spatial distribution and timing of water availability. As a result, urban water scarcity is likely to become much more serious in the future. Pakistan's urban population facing water scarcity is projected to increase from 39.9 million (57 percent of Pakistani urban population) in 2016 to 97.5 million people (61 percent of Pakistani urban population) in 2050.[2]

Table 1

Trends in Urban Population in Pakistan, 1980-2050

	1980	1990	2000	2010	2022	2050
% of Total Population	28.1%	30.6%	33.0%	35.0%	37.7%	52.2%
in Millions	21.9	32.9	45.7	59.7	81.4	160.2

Source: DESA 2024.

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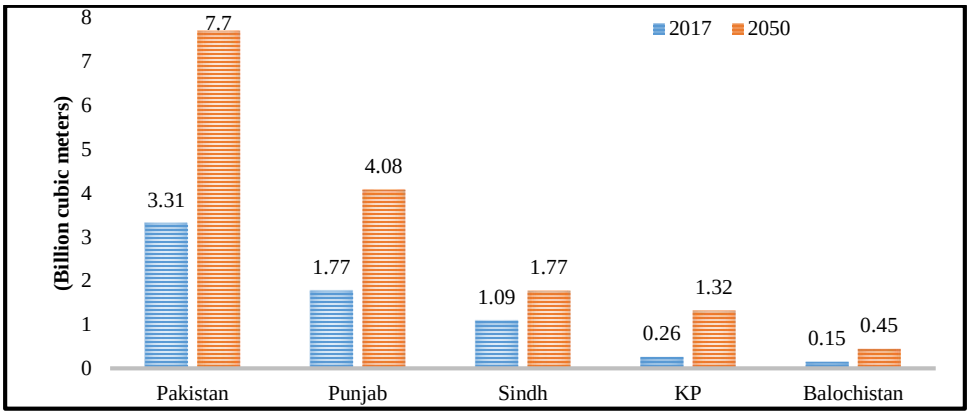
[1] GOP 2012.

[2] Liu et al., 2021.

Water services in Pakistan's major cities and urban centres remain fragmented and intermittent, as no city currently has 24-hour of water supply for seven days a week. Current water use in most cities is approaching or exceeds local sustainable supplies of surface and groundwater. Pakistani cities that are dependent on groundwater for municipal supply, such as Lahore, observe falling water tables requiring increased drilling and pumping costs. Cities that depend on surface water, such as Hyderabad, Karachi and Islamabad, face intermittent or insufficient supply. Reliable water supply is already challenging in many cities due to growing demand combined with ageing and insufficient infrastructure.

A mismatch between urban water supply and demand will impact in several ways. First, the health of (poorer) urban populations will suffer, due to drinking contaminated water or unsanitary conditions resulting from water scarcity. Second, the economic potential of urban areas will be reduced, due to disproportionate spending by municipalities, households and industries to ensure adequate water supply. Ensuring a reliable water supply has become an urgent policy concern for municipal leaders and city authorities.

Fig. 1. Annual Domestic Water Demand Projections for Urban Households in Pakistan



Source: World Bank 2021.

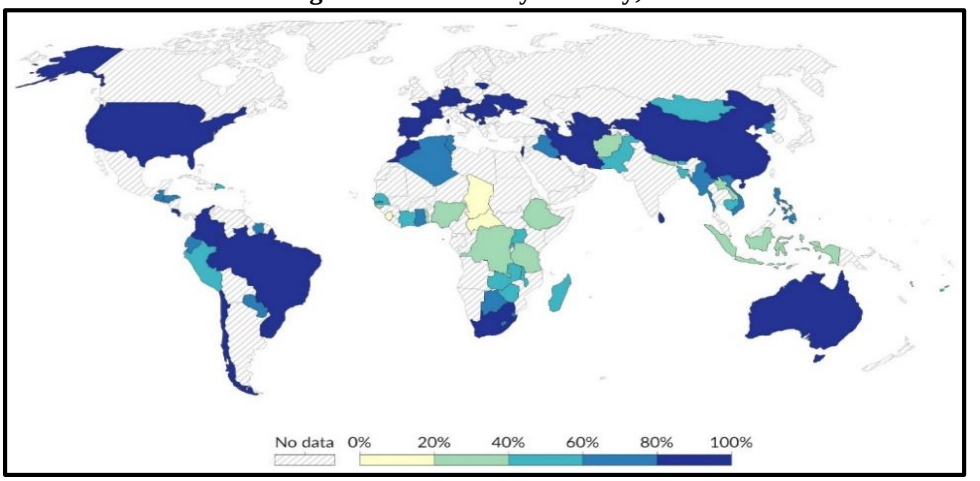
2. URBAN WATER ISSUES AND CHALLENGES

Too often, cities in Pakistan operate under ill-informed and unsustainable water management and end up facing grave risks from coastal and inland flooding, scarcity of quality water, access inequalities and climate change. *The problems range from poor management of water sources, contaminated supplies, leaky distribution networks and vast volumes of untreated wastewater being poured into Pakistan's rivers.*

2.1. Water Availability

In urban areas of Pakistan, about 43 percent of the population does not have access to safely managed water (Figure 2). That means that over 35 million people do not have safe water. By the year 2050, there will be nearly 180 million people in urban areas needing these services.

Fig. 2. Share of the Urban Population Using Safely Managed Drinking Water Sources by Country, 2022



Source: Ritchie, *et al*., 2022.

Urban areas in Pakistan are increasingly facing water scarcity and poor quality of water supplies due to depletion in underground sources of water and leakages and theft in water distribution networks. The main source of drinking water in cities is piped water, 36 percent of urban households have piped water connections but with substantial provincial variations. The rest rely mainly on self-provided hand pumps and motorised pumps or at the worst on unprotected water sources. For instance, about 33 and 36 percent of households in urban Punjab and Khyber Pakhtunkhwa respectively use motorised pumps for drinking water (Figure 3 and Table 2).

Trends in providing piped water to urban citizens portray a picture of deterioration in the level of public services. Reliance on piped water has been decreasing, replaced by water from motorised and hand pumps and tankers. Overall, a decrease of almost 40 percent in the provision of piped water is noted between 2007 and 2020 (Table 3). As compared to 2008, about 66 percent fewer households reported having piped water connections in Punjab. The data reveals that during this period, the use of filtration plants has increased for obtaining water. There has been a shift from tap water to motorised pumping, largely due to the unreliability of government provision leading to households turning to self-provision.

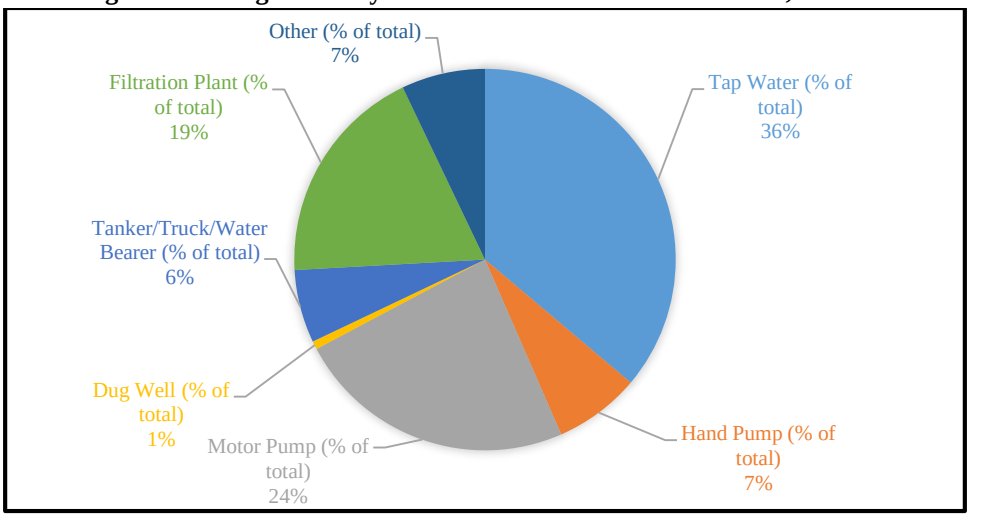
Simply having access to water does not ensure the availability and reliability of water. The situation is deplorable, excluding Punjab. For instance, over 93 and 98 percent of urban households in Balochistan and Sindh respectively receive water for less than 6 hours per day, compared to the national average of 73 percent (in 2014). Households get water from installing ground or roof tanks for collecting water when it is available and hoarding it, buying water from tankers, or using shallow wells and/or river water. A few private tankers are licensed by water utilities, but all tanker owners benefit from the irregular water supply.

In Pakistan's largest city Karachi alone, one-fourth of households depended upon tanker water, which was 29 times more expensive than municipal water supply in 2019.[3]

[3] Mustafa and Ginn 2020.

In the city, over 10,000 tankers operate across the city, completing roughly 50,000 trips a day (prices vary between Rs1,200 to Rs7,000 PER tanker/trip), according to Noman Ahmed. The business is so lucrative that more than 100 illegal hydrants operate across the city, tapping into the city's mains to steal water. stealing water in Karachi is an industry worth more than half a billion dollars annually.[4]

Fig. 3. Drinking Water by Source in Urban Areas of Pakistan, 2019-20



Source: GOP 2021.

Table 2

Main Sources of Water in Urban Areas of Pakistan, 2019-20

	Pakistan	Punjab	Sindh	Balochistan	KP (Including Merged Areas)
Tap Water (% of total)	36.2	18.3	56.9	55.0	49.1
Hand Pump (% of total)	7.3	6.3	9.5	1.3	6.2
Motor Pump (% of total)	23.8	33.2	10.2	11.6	35.5
Dug Well (% of total)	0.7	0.4	0.4	0.7	5.0
Tanker/Truck/Water Bearer (% of total)	6.2	4.8	6.5	29.3	0.9
Filtration Plant (% of total)	18.8	33.9	2.6	0.2	0.5
Other (% of total)	7.1	3.1	13.8	1.9	2.7
Total (%)	100	100	100	100.01	100

Source: GOP 2021.

Table 3

Trends in Piped Water Supply (%) in Urban Areas of Pakistan by Province

	2006-07	2008-09	2010-11	2012-13	2014-15	2019-20
Pakistan	62.0	61.8	57.7	55.9	50.6	36.2
Punjab	53.2	52.3	46.2	42.6	34.8	18.3
Sindh	74.2	74.1	71.6	72.2	69.2	56.9
Balochistan	81.4	84.6	86.8	80.2	69.0	55.0
KP (Including Merged Areas)	62.9	65.9	63.4	62.3	55.0	49.1

Source: GOP 2021.

[4] Hashim, 2017.

2.2. Water Quality

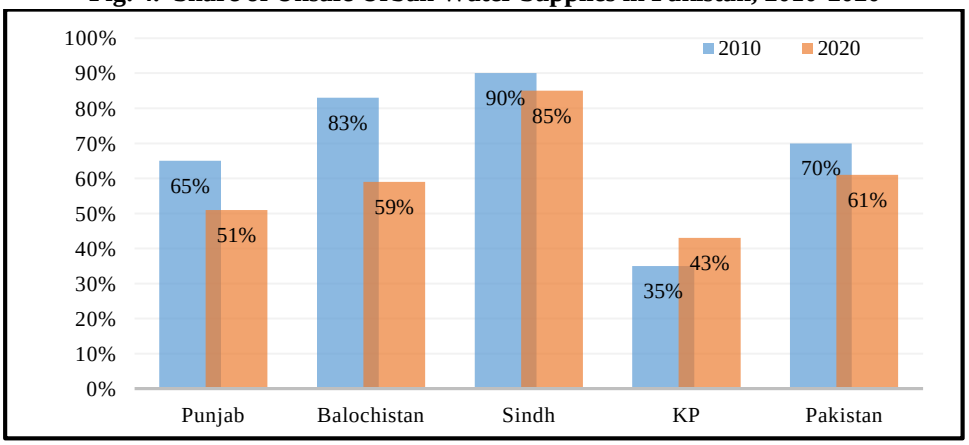
An overwhelming majority of the cities, including the mega cities, in Pakistan do not have safe drinking water for citizens. Both surface and groundwater have become polluted mainly due to domestic sewage, industrial effluents and solid waste with devastating consequences of people's health. Groundwater sources across the country are increasingly being polluted through intensive agriculture, industry and poor sanitation.

Sixty-one percent of the monitored water sources were found safe for drinking in 29 main cities. Out of the 29 cities, there are 20 cities where more than 50 percent water of obtained from various sources was found to be unsafe. A provincial-level analysis shows that 85 percent of water was unsafe for consumption in Sindh and 59 percent in Balochistan. Over the last decade, major improvements have been made in Punjab (65percent to 51 percent) and Balochistan (83 percent to 59 percent), a slight improvement in Sindh (90 percent to 85 percent), while the poor quality in KP has worsened (from 35 percent to 43 percent) (Figure 4).

The water was found to be contaminated mainly with arsenic, iron, fluoride and bacteria. Consuming unsafe water may cause health problems such as diarrhoea, dysentery, typhoid, hepatitis, skeletal and dental fluorosis, methemoglobinemia, and cancer (see table 4). Overall analysis of 29 cities has identified 11 major water quality problems in drinking water sources of Pakistan i.e. 41 percent bacteriological contamination, TDS (14 percent), Iron (14 percent), Hardness (10 percent), Turbidity (9 percent), Chlorides (8 percent), Arsenic (5 percent), Nitrates (4 percent), Fluoride (4 percent), and pH (1 percent).

Bacteria is a major factor in diseases of the intestinal tract—some of them potentially fatal especially for children and infants, among whom diarrhoea is the leading cause of mortality. Prolonged exposure to contaminants like arsenic in drinking water can lead to cancer and skin lesions and is also associated with cardiovascular disease and diabetes. In utero and in early childhood, it may even have a negative impact on cognitive development. Poor quality of drinking water has been found to be responsible for nearly 30pc of diseases and 40pc of deaths in the country.[5]

Fig. 4. Share of Unsafe Urban Water Supplies in Pakistan, 2010-2020



Source: PCRWR 2021.

[5] *Dawn*, 2021.

Table 4

Potential Health Impacts of Drinking Water Contaminants in Major Cities of Pakistan, 2020-21

Contaminants	Hotspot cities	Health impacts
Microbiological Contamination	Islamabad, Bahawalpur, Faisalabad, Gujranwala, Kasur, Lahore, Multan, Rawalpindi, Sheikhupura, Sargodha, Khuzdar, Loralai, Quetta, Ziarat, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Shaheed Benazirabad, Tando Allahyar Muzaffarabad, and Gilgit	Cholera Diarrhoea Typhoid Dysentery Gastroenteritis Hepatitis A & E
Arsenic	Bahawalpur, Lahore, Multan, and Sheikhupura	Skin hyperpigmentation Oxidative stress Peripheral neuropathy Cancer of bladder, skin, liver, lung, and lymphatic cancer
Nitrate	Sargodha, Sheikhupura and Khuzdar	Blue baby syndrome in infants: Symptoms include shortness of breath
Fluoride	Bahawalpur, Faisalabad, Sargodha, Quetta, Loralai, Karachi and Sukkur	Skeletal Fluorosis: Bone disease (pain and tenderness of the bones); Dental Fluorosis: Children may get mottled teeth
Turbidity	Bahawalpur, Kasur, Lahore, Sheikhupura, Khuzdar, Loralai, Quetta, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Shaheed Benazirabad Muzaffarabad, and Gilgit	Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria
Hardness	Bahawalpur, Faisalabad Sheikhupura, Sargodha, Khuzdar, Loralai, Quetta, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Tando Allahyar and Shaheed Benazirabad	Hardness is not a health concern, but it can cause mineral buildup in plumbing, fixtures, and water heaters, and poor performance of soaps and detergents
TDS	Bahawalpur, Faisalabad, Lahore, Rawalpindi, Sheikhupura, Sargodha, Quetta, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Tando Allahyar and Shaheed Benazirabad	High TDS level alters the taste of water and makes it salty, bitter, or metallic High TDS levels also indicate the presence of health-hazardous toxic minerals
Chlorides	Faisalabad, Sargodha, Quetta, Hyderabad, Karachi, Sukkur, Badin, Mirpur Khas, Shaheed Benazirabad	Chloride in drinking water is not harmful, however, the sodium part of table salt has been linked to heart and kidney disease
Iron	Islamabad, Bahawalpur, Faisalabad, Lahore, Sheikhupura, Sargodha, Abbottabad, Mangora, Mardan, Peshawar, Sukkur and Shaheed Benazirabad	Iron is not hazardous to health, but it is considered a secondary or aesthetic contaminant

Source: PCRWR 2021.

2.3. Groundwater Over Extraction

Pakistan has the 4th largest groundwater aquifer- covering an area of 1,137,819 km, making it slightly larger than England. On the other hand, Pakistan is the third largest groundwater user in the world and fourth-largest groundwater withdrawing country contributing to 9 percent of the global groundwater extraction and making the Indus Basin aquifer the second most “overstressed” groundwater basin in the world. Annual

groundwater withdrawal is estimated to be 65 bcm while annual renewable groundwater resources are estimated to be 55 bcm.[6]

Since the 1960s, Pakistan has turned from a surface water-dependent country to a groundwater-dependent country, and from a groundwater surplus country to a country with significant issues of groundwater overdraft, exacerbated by increasing salinity issues due to the use of poor-quality groundwater for irrigation. Approximately 21 percent of the irrigated area is affected by salinity.[7] The use of groundwater varies in each of the provinces. Sindh has minimal groundwater exploitation because of its poor quality. In Khyber Pakhtunkhwa and Baluchistan, there are high costs because of greater depths and aquifer characteristics. Punjab has groundwater at shallow depths with relatively good quality, resulting in its widespread use. It has 50 million acre-feet of groundwater and accounts for 90 percent of total groundwater pumping in Pakistan.[8]

Almost half of Pakistan's groundwater is used for domestic purposes, mostly in urban areas. In Punjab, for example, about 70pc of the groundwater is said to be used for drinking and other domestic and commercial purposes. Punjab's heavily degraded groundwater meets around 90 percent of the province's drinking water requirements. This unregulated access, with over 1.2 million tube wells and millions of individual pumping machines belonging to urban residents, has seriously degraded water quality in every nook and corner of the country.[9]

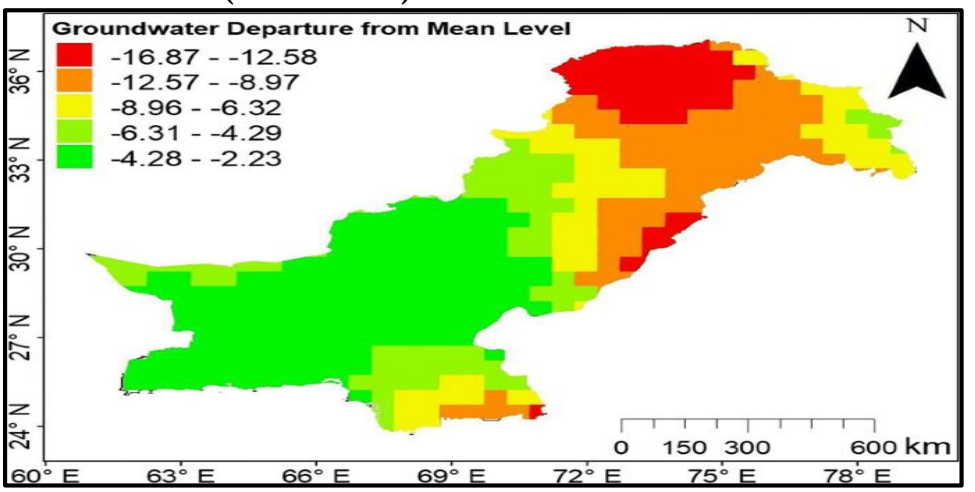
The water supply of the Lahore city is solely dependent on groundwater. Presently, about 1,800 public and private tubewells are extracting about 4.32 million cubic meter (MCM) of water daily. Similarly, there are about 190 tube wells managed by the Capital Development Authority (CDA) in Islamabad, extracting about 127 MCM annually to manage water supply. In Rawalpindi, the estimated annual groundwater abstraction through 490 tubewells is about 58 MCM for the provision of drinking water supply.[10]

The extensive extraction has caused groundwater depletion. Figure 5 shows that the highest decrease was noticed in the range of −16.87 to −12.58 cm/year in the north (Himalaya region of Pakistan) and some grid points in the central east. Groundwater decline in the north may be due to rapid glacial melting due to rising temperatures and a decrease in precipitation over Himalaya regions, and due to excessive use of groundwater for irrigation in the northeast of Pakistan. The groundwater storage was found to decrease in the south-western parts in the range of −4.28 to −2.23 cm/year, mainly due to decrease in precipitation.

The highest groundwater depletion of about 6 m per year is recorded in Quetta Valley, where tube well drilling depth has crossed 350 m. The situation in other metropolitan cities such as Rawalpindi (2.5 m/year), Lahore (1 m/year) and Islamabad (1 m/year) is also a matter of grave concern for long-term drinking water supplies, besides issues of deteriorating quality.[11]

[6] Imran 2019.
[7] UN Water 2022.
[8] Kamal 2023.
[9] Sheikh 2022.
[10] Arshad, et al. 2023.
[11] Arshad, et al. 2023.

Fig. 5. Spatial Patterns of Changes in Groundwater Storage (from the mean) in Pakistan from 2002 to 2016



Source: Ahmed, *et al.*, 2019.

2.4. System Inefficiency/Cost Recovery

The municipal water system in a typical city of Pakistan is characterised by poor service delivery, inadequate maintenance of physical systems, and very low recovery of costs resulting in inadequate resources for the maintenance of physical systems/ investments.

Intermittent water supply (IWS) is an important factor in the poor performance of water utilities. Water is not available continuously to all households and industries but instead is provided in turn to different urban zones, each for a limited period. Table 5 shows the average hours of water supply in a day in major cities of Pakistan. Low reliability reflects poor customer orientation by water service providers. Intermittent services discourage users from paying water tariffs, impacting the financial sustainability of service providers, which further undermines service quality. There are many drivers of IWS, including physical water supply constraints due to seasonal and population trends, limiting water leakage from damaged pipes, and prioritising access due to privatisation or local governance policy.

Table 5

Water Supply by Daily Hours in Major Cities of Pakistan

Faisalabad	Karachi	Lahore	Multan	Peshawar	Rawalpindi
8	4	11	8	9	8

Source: Abbas, *et al.*, 2022 and World Bank 2014.

Municipal utilities suffer from high levels of non-revenue water[12]—a measure of Water supply technical operations efficiency. NRW losses of 50 percent are not uncommon in South Asian cities (see Figure 6). Losses can be in the form of leakages as well as theft.

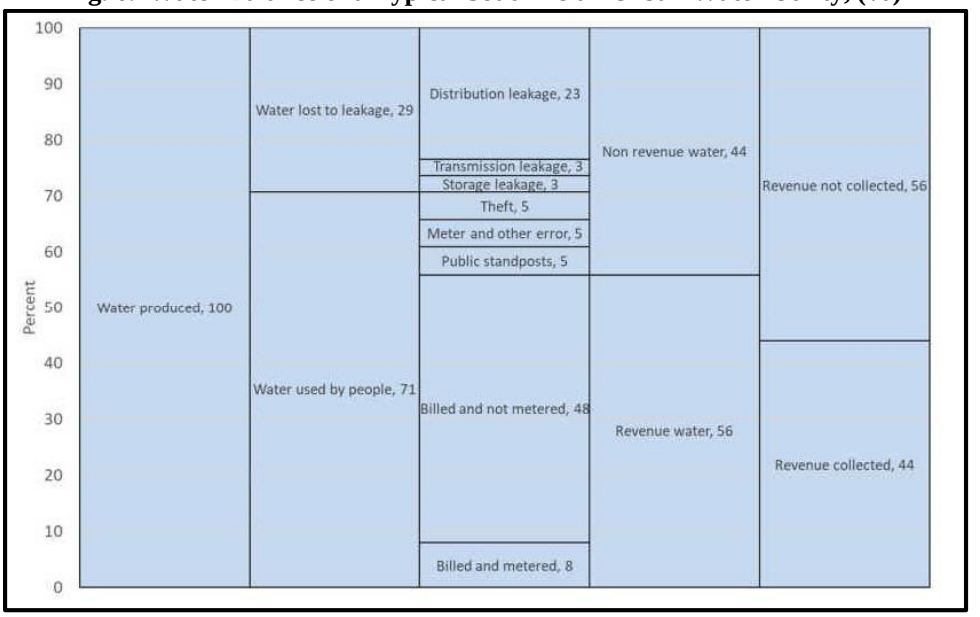
[12] Water that has been sourced and prepared for distribution but is lost before it reaches the customer.

About three-quarters of NRW is real physical loss of water, and one-quarter is apparent loss. Non-revenue water (unbilled water) is estimated at between 24 percent and 68 percent (Figure 7). The ratio is very high compared to value of 4 percent for Singapore, 9 percent for Japan and 19 percent for private companies in the UK. Coupled with collection inefficiency, the water effectively paid for by the customers ranges from 16 percent of production in Quetta to 52 percent in Rawalpindi and Lahore.[13] Urban service tariffs cover only 16 percent of the cost of urban water supply and sanitation services.[14]

More recently, water tariff rates have gone up in most of cities. Between July 2022 and July 2023, water tariffs in all cities of Punjab, Northern areas and Islamabad increased significantly due to rising energy costs. The urban areas of Punjab witnessed an average tariff surge of 213 percent, with Lahore — where water tariffs had remained unchanged since 2004 — bearing the most significant impact with a staggering 591.9 percent increase. However, for the two lowest plot size categories, the government of Punjab is subsidising water rates, reducing them by half.[15] Despite the substantial tariff hikes after no change for decades, water tariffs in Punjab remain low at US$0.12/m^3 which is very low compared to the global average of $2.36 for water tariffs.[16]

In Lahore, 98 percent of the customer connections in Lahore are unmetered. WASA Lahore is facing financial constraints due to high energy costs and low water tariff rates, which has resulted in the reduction of supply hours by the tube wells from 14–18 h per day in 2013 to 10–11 h per day in 2020.[17]

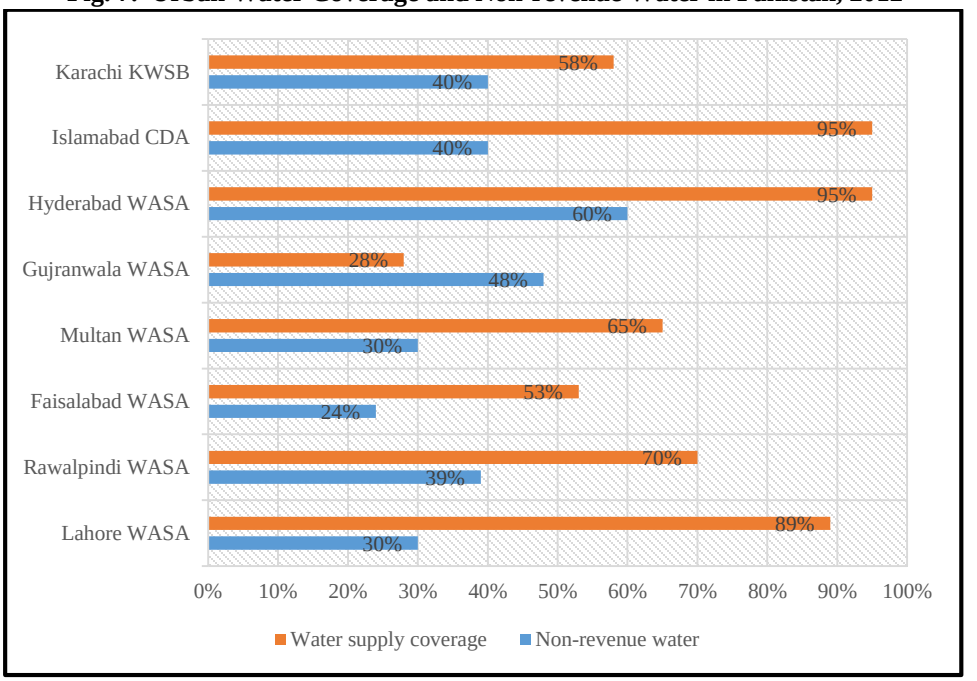
Fig. 6. Water Balance of a Typical South Asian Urban Water Utility, (%)



Source: Sathre, *et al.*, 2022.

[13] GOP 2012.
[14] World Bank. 2019.
[15] In Punjab, tariff rates are calculated based on the plot size of each household.
[16] Yuno 2023.
[17] Abbas, *et al.*, 2022.

Fig. 7. Urban Water Coverage and Non-revenue Water in Pakistan, 2012



Source: World Bank. 2014.

2.5. Urban Flooding

Flooding in cities of Pakistan is linked with the destruction of green areas that absorb water, encroachments on water run-offs, blocking of drainage systems, flyovers/roads, and urban sprawls (see Figure 8). With the number of people living in urban areas increasing rapidly—owing to a high population growth rate and migration from the rural areas—and cities projected to house half the Pakistani population by 2050, the rising incidence of urban flooding presents a major challenge to planners.[18]

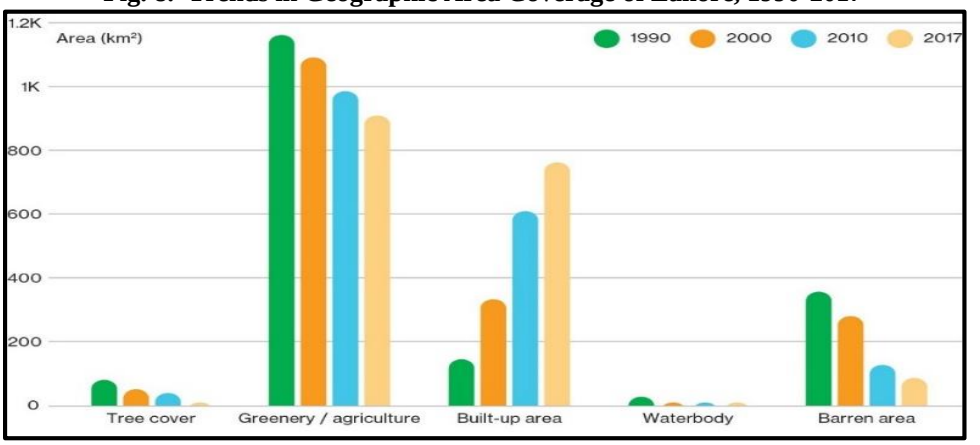
For instance, intense rainfalls in Lahore in 2010, 2014 and 2018 caused extensive flooding in the most densely populated areas of the city such as Bhatti Gate and Lakshmi Chowk.[19]

In 2020, Karachi experienced its heaviest rains in almost a century, killing dozens and leaving hundreds of thousands trapped. Natural drainage channels, already clogged with solid waste choked Karachi's natural stormwater management system.[20] As a result, rainwater had nowhere to go and once severe weather events occurred, existing infrastructure in its marginalised state of disrepair, was overwhelmed.

There is a need to address weak administrative and operational infrastructure in Pakistan's megacities, poor solid waste management, and inadequate urban drainage systems in order to mitigate the urban flooding challenge.

[18] *Dawn*, 2023.
[19] Talbot and Ranjan, 2023.
[20] Shams, 2020.

Fig. 8. Trends in Geographic Area Coverage of Lahore, 1990-2017



Source: Iqbal, 2019.

2.6. Weak Institutional and Regulatory Framework

In Lahore, Rawalpindi, Faisalabad, Multan, Gujranwala, Quetta and Hyderabad, Water and Sanitation Agencies (WASAs) are responsible for planning, designing, development and maintenance, repair and operations of water supply and sewerage and draining system, as well as collection of Aquifer Water charges. Karachi Water and Sewerage Board (KWSB) and Capital Development Authority (CDA) are in charge of water and sanitation in Karachi and Islamabad respectively. Water and Sanitation Services Companies (WSSC) are responsible for water and sanitation services in Peshawar, Mardan, Kohat, Abbottabad and Swat. Tehsil Municipal Administrations (TMAs) and Municipal Corporations govern small and medium-sized cities across the country.

WASAs, TMAs and other urban management authorities suffer from a lack of capacity in terms of both human resources and management systems. They cannot make their own investment and operational decisions and lack performance incentives. Regarding wastewater, they also lack capacity, infrastructure and systems, including functioning water treatment plants.[21]

3. RECOMMENDATIONS AND THE WAY FORWARD

The solution requires efficient management and conservation of water and political ownership to resolve the issue. The supply-side interventions include recycling wastewater by encouraging private sector participation and optimal pricing of water. This needs to be coupled with investment in cost-effective brackish groundwater and seawater desalinisation. Demand-side interventions include enforcement of efficiency standards/practices, conservation and population control. In addition, water pricing needs to be implemented.

The government needs to institute a major paradigm shift that promotes the more judicious use of water. This will include water infrastructure maintenance, water conservation technologies and awareness-raising.

[21] Cooper 2018.

Following are a few recommendations:

3.1. Recycling of Wastewater

Pakistan treats only 1 percent of its wastewater, while in cities about 8 percent of wastewater is treated in municipal treatment plants.[22] There is little or no regulation to check or restrict the flow of contaminated wastewater into canals and rivers across the country. This contaminated water not only reaches cultivated lands for irrigation purposes but also makes its way into supply lines that take water to homes for use by domestic consumers. The policy-makers need to rethink water policy by urging effective collection, treatment and recycling of wastewater as is done in Israel and Singapore based on the principle of private sector participation and optimal pricing of water.

Israel, which was water-deficient with 70 percent desert, has achieved water security by reusing around 90 percent of its (collected and treated) wastewater, meeting 25 percent of its total water demand. Similarly, Singapore – another water-scarce country – is meeting 40 percent of its water demand from recycled wastewater which is expected to reach 55 percent by 2060.[23]

3.2. Rainwater Harvesting to Address Issues of Urban Flood and Groundwater Recharge

There is a need to use innovative methods to solve problems of urban flooding and recharge groundwater. Rainwater harvesting can address issues of urban flood and solve the problem of depleting groundwater in cities of Pakistan. *"rainwater harvesting is essential to institutionalise the response to yearly urban floods and with a little ingenuity turn a crisis into an opportunity to utilise this water resource and recharge our depleting groundwater aquifers"*, says Malik Amin Aslam, former adviser to the prime minister on climate change.[24] Instead of storing rainwater water in tanks for reuse, recharging (the water table) is cost-effective, and can help address urban flooding and improve the water table. It will help to reduce abstraction [of groundwater] and boost recharging. *"Any water that is collected from rain (like in Lahore) is good news but perhaps concrete storage tanks are not the answer. The water should be used to recharge the aquifer"*, says Simi Kamal, former chair of the Hisaar Foundation.[25] Recharging wells receive water from rooftops and roads, filter it and channel it underground to increase the water table.

3.3. Water Metering/Pricing to Reduce Non-revenue/Unaccounted Water

People should pay a price that reflects both direct and indirect costs of water consumption. This has to be coupled with removal of subsidies that promote increased water extraction (e.g., in Balochistan) or water pollution. Affordability issue may be addressed using instruments such as vouchers, cash transfers or rebates.

Once the amount of utilisation is known, it enables better planning and management of the precious resource. The current pricing regime offers little incentive to consumers to conserve water. Pricing may be linked with income levels along with several other

[22] Hifza, *et al.*, 2020.
[23] UNEP, 2023.
[24] The Third Pole, 2020.
[25] The Third Pole, 2020.

dimensions. Increasing the cost of water consumption will not only push consumers to use water more judicially but also generate sufficient revenues for the maintenance of infrastructure and water-conserving technologies. It is vital to introduce a transparent, effective, and modern system for water metering in Pakistan so that water misappropriation and waste can be controlled. There is also a need to remove groundwater subsidy and make water users pay their electricity bills. This will result in water use efficiency and, circular debt will go down.

3.4. PROMOTE WATER CONSERVATION

Pakistan needs to adopt a culture of water conservation - using water efficiently and avoiding wasteful use. There is a need to employ rational water resource practices, implement water-saving technologies, and prevent unauthorised use of drinking groundwater. Through aggressive water conservation measures, including strict watering restrictions and the replacement of water-intensive landscaping with drought-tolerant plants, Las Vegas has significantly reduced its water consumption.[26] The Minnesota state's (in the US) largest cities are among the conservation leaders: Minneapolis homes and businesses used 10 billion gallons less than 35 years ago; St. Paul cut its use by a third; Duluth by more than half in the same time frame. Success is attributed to changes by consumers, businesses and, investment in water infrastructure to reduce usage and minimise waste.[27]

3.5. CONTROL URBAN SPRAWL

Rapid urbanisation has left a sprawling growth of residential, commercial and industrial areas. There is a need to stop the wasteful urban sprawl. up to 70 percent of urban water is used on horticulture and golf courses. Denser, walkable urban design is also water-efficient. Ban the import of exotic plants and use local Xeric plants.

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Book Review

Bardach, Eugene, and Eric M. Patashnik. *A Practical Guide for Policy Analysis: The Eightfold Path to More Effective.* (2011), Paperback, 224 p.

Political scientists Eugene Bardach and Eric Patashnik's "a practical guide for policy analysis: eightfold path to more effective problem-solving" has attained the status of a classic in the public policy literature, and become the premier guide for policy practitioners since its first publication in 2011. The book is a culmination of years of accumulated policy design and implementation experience that the authors conjoin to provide real-life examples and case studies, underscoring the various trajectories and contours that an instrument takes before it blossoms to germinate into a hatchable policy. The authors have used their policy experiences to identify repeating patterns of activities to develop a widely acknowledged taxonomy of the policy-making process.

They have organised the often disparate, scattered and isolated activities to develop a chef's recipe comprising actions for the practitioner to arrive at desirable policy outcomes, and meaningful and objective conclusions. Their thesis that policy analysis can be understood as a series of structured and sequential activities that are part of a logical framework has developed into a separately identifiable ideological position and become a divisive and polarising subject, leading to the rapid mainstreaming of it, and its antithesis (policy making is unstructured and non-sequential), within the policy discourse. This school of thought is challenged by scholars who postulate that the policy environment is more complex than what Bardach and Patashnik assume, and model it to be and therefore, requires a more nuanced way of looking at the entwined and interconnected web of structures, networks, institutional processes, actors, and a multitude of interactions and interests that shape their behaviour.

The principal question that emerges out of this background is whether a structure-sequence lens to understand the mechanics and processes that underlie policy analysis can stand the test of relevance and robustness in addressing the challenge posed by complex and non-linear systems? Scholars who challenge the notion of a 'Bardachian' linear system, are divided between those that suggest that there is structure without sequence, and those that suggest that both structure and sequence create policy images divorced from real-world policy situations. The authors use the Buddhist 'eightfold path' trope to represent their eight distinct steps for conducting policy analysis which include 'problem identification', 'assemble the evidence', 'construct the alternatives', 'select criteria', 'project outcomes', 'confront the trade-offs', and 'decide and tell your story'.

They offer an extension to this path by proposing the ninth step which is to repeat in the same sequence the first eight. Bardach and Patashnik explain in detail what activities and sub-activities will be performed, and the critical questions that will be addressed by

the policy analyst at each of these steps. They begin by defining what 'problem identification' is, and the theoretical and conceptual questions that surround the identification and framing of the policy issue. A perceptive distinction that Bardach and Patashnik make is between private troubles and public problems. Private troubles impact political people and bureaucrats in policy positions who foresee political gains from elevating private troubles to the status of pubic problems.

These troubles are problems peculiar to their group, political party or electorate, highlighting that such motivations to identify problems could become potential pathways for market failures. The authors use this as the basis to raise incisive questions like 'what is the evaluative framework or lens through which a problem is viewed and considered to be a public problem?' and propose that in order to capture fully the dimensions of a problem, it's important to think in terms of excess or deficit and recognise the part of the problem identification that suffers from 'issue rhetoric' which is ideologically aligned and dependent on the opinion and perspective of the group or person defining the issue. It's important that the policymaker makes accommodations for the issue rhetoric when trying to position the problem within the larger policy agenda. They refer to this instance as 'modelling the system in which the problem is placed' by using the nomenclatural creativity and inventiveness that is also otherwise a hallmark of their writing style and found elsewhere in this text.

There is pervasive emphasis on the criticality of evidence not just as a vital second step of the eightfold path, but generally across other steps too. This inclination is met with a contradiction that develops when the authors mix their unquestioning reverence for empirics with 'guesstimates' (estimates based on guesswork). They tend to overstep in their love for gathering evidence to start promoting guesstimates that can often be questioned for their frailty and categorisation as credible substitutes of real evidence. The concern that one can then raise is whether such emphasising of evidence could lead to oversimplification, whimsicality and formulation of alternatives with ad-hocism, instead of objectivity, as a goal. Or perhaps, one can also argue that guesstimating a policy analyst's way out of a 'lack of data' situation is expressive of a disregard of evidence in cases where empirics are hard to establish. In other cases when the evidence is available, the authors question whether the new policy that emerges from a policy change will produce better outcomes than the one before and call it the 'value of evidence'. This is the supra-existential question that has engaged the policy scholars in discourses that both yielded, and did not yield answers.

While evidence is essential as a tool to construct alternatives, the authors point to situations where alternatives are so narrowly separated that it becomes difficult to make a clear policy choice. None of the closely competing alternatives seem to emerge as a clear winner. Interestingly, while the authors implicitly express a disregard for the complexity of the real-world when they propose a logical and sequential framework for policy analysis, they suggest that one can only accommodate the interests of so many of the policy actors given the heterogeneity of the real world, which leads them to trade-off between different policy designs (design trade-offs).

The other themes that emerge quite strongly out of this book, and the advanced steps of the eightfold path include an argument about wider acceptability of the criteria that will be used for evaluation. The authors suggest that it is important to create political

acceptability for the evaluative criteria which, it appears, they propose to avoid possible disagreements and controversy over the methodology that will be used to assess outcomes. When the authors use the term 'projecting outcomes', they seem to imply that the analyst is able to put its finger on certain metrics and indicators for measurement, and evaluates the utility of a policy in context of those standards.

They identify efficiency as one such metric that can be, and is widely used as an end goal. However, they also believe that efficiency has an elitist ring to it, implying that a domineering focus on efficiency could divert from seemingly pedestrian, but socially robust and vital concerns like equity and participation. They use this value judgement to also question the methods that can be used to determine the level of efficiency that will have to be added to the system to merit and justify some level of spending.

In conclusion, the book provides a vivid and pragmatic perspective on policy analysis. It can be used as an implementable toolkit by the practitioner to organise and model a policy problem within systems that are less disorderly, but in many ways, identical to the real-world.

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