

Transitory Income and Consumption Behaviour: Evidence from Hydroelectric Infrastructure Investment

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Abstract: *Infrastructure investment is widely regarded as a driver of economic development, yet its welfare consequences at the household level remain underexplored, particularly in hydropower-affected regions. This study examines how the Kiru and Kwar hydroelectric projects in Block Nagseni, District Kishtwar, have influenced household income, consumption, and savings, using primary survey data from 161 project-affected households. Employing a three-stage analytical framework, the study first documents the distribution of households across categories of income, consumption, and savings change; second, computes household-level Marginal Propensity to Consume (MPC); and third, applies an interaction regression grounded in Friedman's Permanent Income Hypothesis to test whether the marginal propensity to consume differs between households that received one-time land compensation and those that did not, treating compensation as a proxy for transitory income. Results show that most households experienced positive income and consumption gains, with an average MPC of 0.607. Regression estimates reveal a significantly lower MPC among compensation recipients (0.331) than non-recipients (0.566), indicating that the consumption response to income differs systematically between the two groups and supporting the hypothesis that transitory income is consumed less readily than regular income. These findings suggest that recurring employment-based income, rather than one-time compensation, is the more effective channel through which infrastructure investment translates into sustained improvements in household welfare, offering guidance for how compensation and employment policies accompanying large infrastructure projects might be designed.*

Keywords: Infrastructure Investment; Marginal Propensity to Consume; Permanent Income Hypothesis; Land Compensation; Household Welfare; Hydropower Projects

Introduction

The private sector tends to underinvest in certain types of productive capital because consumption can be non-rivalrous, non-excludable, or both. Therefore, the government may intervene to enhance social welfare by providing public capital (Ramey, 2020). For instance, Gordon (2017) emphasized that public investment in electric infrastructure during the 1900s had a significant impact on US productivity.

For a long time, policymakers have prioritized investment in public infrastructure to reduce disparities and promote growth. The literature provides strong evidence that improving infrastructure is crucial for supporting development (Foster et al., 2023). Most research on infrastructure investment has focused on macroeconomic or sector-wide factors and generally finds that infrastructure capital significantly impacts economic output and growth (Kessides, 1993). Infrastructure investment can boost household consumption indirectly by increasing income and directly by raising consumption expectations, leading to a notable "crowding-in" effect. In China, government investment is also seen as a key policy tool to regulate demand and stimulate consumption (Yan, Yuan, and Xue, 2024). Additionally, development projects in a region may influence household saving behavior by altering income levels (Ravallion and Chen, 2005). Changes in income due to investment can thus affect both consumption and saving habits among individuals (Escobal and Ponce, 2002).

In the hydropower context, welfare effects are less likely to be uniform. Duflo and Pande (2007) found that districts hosting a dam construction often experience greater income volatility, while downstream districts tend to benefit, highlighting the need for household-level data from the project affected area. Income from the project infrastructure reaches households in different ways: some receive recurring regular income through employment or business, while others get a one-time land compensation payment. Since consumption responds more strongly to regular income than to temporary income (Friedman, 1957), these two income sources may lead to different consumption patterns.

Motivated by this literature, the present study uses household survey data from Block Nagseni, District Kishtwar, to examine the impact of the Kiru and Kwar hydroelectric investments on household income, consumption, and savings. It estimates the household-level Marginal Propensity to Consume and tests whether the consumption response to income changes differs between compensation recipients and non-recipients using a Permanent-Income-Hypothesis-based interaction regression.

Literature Review

Infrastructure Investment and Household-Level Welfare in Hydropower-Affected Areas

Evidence at the household level shows that infrastructure investment-related income shocks affect both consumption and saving behaviour. Ravallion and Chen (2005) use panel data from a poor-area development project to demonstrate that household savings respond significantly to income gains, indicating that windfall-type gains are not fully consumed. Similarly, Escobal and Ponce (2002) find that rural road investment enhances income opportunities for poor rural

households, primarily through improved access to labour markets and non-farm activities. In the context of large dams, Duflo and Pande (2007) reveal that welfare outcomes vary sharply depending on a household's location relative to the project, emphasizing the need for site-specific, household-level data like that collected in this study. Where infrastructure investment involves land acquisition, Cernea's (1997) risks and reconstruction model show that displaced or land-losing households face higher risks of landlessness, joblessness, and loss of access to common property resources unless compensation is paired with sustainable livelihood restoration. This body of literature supports the study's sampling design, which limits the survey to households connected to the Kiru and Kwar projects through employment, business activity, or land compensation-identified as the three key channels for measurable household-level impact.

Marginal Propensity to Consume: Theoretical and Empirical Evidence

The Marginal Propensity to Consume (MPC) is a key parameter for understanding how income changes affect household welfare. Jappelli and Pistaferri (2010) review extensive evidence showing that consumption responses to income changes vary widely across households and depend on the size, persistence, and predictability of the income change. Johnson, Parker, and Souleles (2006) use variation in the timing of the 2001 U.S. tax rebate to show that households significantly increased consumption in the quarter the rebate was received, providing direct empirical estimates of the MPC from a one-time payment. Kaplan and Violante (2014) explain this heterogeneity with a model where "wealthy hand-to-mouth" households, despite holding illiquid assets, respond to income shocks similarly to liquidity-constrained households, resulting in a broad distribution of MPC values within a population. This literature directly informs the study's second analytical stage, which categorizes sampled households by MPC to explore the extent and variation of consumption responses to project-related income changes.

Permanent Income Hypothesis and the Role of Transitory Income

Friedman's (1957) Permanent Income Hypothesis (PIH) posits that household consumption is mainly driven by permanent income, with transitory income largely saved rather than spent. Deaton (1992) formalizes this consumption-smoothing idea, showing that with well-functioning credit and savings markets, rational households adjust consumption gradually instead of matching short-term income fluctuations. Empirical evidence is mixed but generally supportive: Campbell and Mankiw (1989) find consumption tracks current income more closely than a strict PIH predicts, though the type of income shock still affects the response magnitude. More directly relevant, Paxson (1992) uses rainfall-driven income shocks among Thai rice farmers as a proxy for transitory income and finds a substantially higher portion of transitory income is saved rather than consumed. This approach is methodologically similar to the present study's use of a one-time land compensation payment as a proxy for transitory income, forming the basis for the interaction regression testing whether the marginal propensity to consume differs between compensation recipients and non-recipients.

Research Gap

Although both literatures are well-developed, they have largely evolved independently. The macro-focused literature on infrastructure investment (Kessides, 1993; Ramey, 2020; Foster, Gorgulu, Straub, and Vagliasindi, 2023) seldom explores household-level consumption

behaviour. Conversely, the MPC and Permanent Income Hypothesis literature primarily relies on developed-country tax or transfer data (Johnson et al., 2006; Kaplan and Violante, 2014) or agricultural income-shock contexts (Paxson, 1992), rather than large infrastructure projects. Notably, no study has tested whether land compensation paid for infrastructure-related land acquisition behaves as transitory income compared to recurring project-linked income within a household consumption framework. This gap is particularly evident in Jammu and Kashmir, where multiple large hydroelectric projects along the Chenab basin have been developed recently, yet no household-level empirical evidence exists on how project-related income affects consumption and saving behaviour. The present study addresses this gap using primary survey data from project-affected households in Block Nagseni, District Kishtwar.

Objectives of the Study

1. To assess the changes in household income, consumption expenditure, and savings associated with the Kiru and Kwar hydroelectric projects among project-affected households in the study area.
2. To estimate the household-level Marginal Propensity to Consume (MPC) and examine the heterogeneity in households' consumption responses.
3. To examine whether households receiving one-time land compensation exhibit a lower marginal propensity to consume than non-recipient households, and assess whether this differential consumption response is consistent with the Permanent Income Hypothesis.

Methodology

4.1. Study Area

The study was carried out in Block Nagseni of District Kishtwar, Jammu and Kashmir. The block was purposively selected because of the scale of infrastructure investment associated with hydroelectric power project development along the Chenab basin in the area, amounting to approximately 8,000 crores. Because of the significant impact of this investment on local employment, business activities, and land compensation, Block Nagseni was deemed an ideal location to explore how infrastructure investments from these projects affect economic outcomes at the household level.

4.2. Sampling Design and Target Population

Block Nagseni consists of 14 villages in total. For the survey, 6 villages near the project sites were chosen, as proximity was seen as the main way project-related employment, business, and compensation opportunities reached local households. Villages farther from the project sites were less likely to be directly impacted and were thus excluded.

The survey in the selected villages focused only on households directly affected by the project through one of three ways: (i) employment created by the project, (ii) business or self-employment opportunities linked to project-related economic activity, or (iii) monetary compensation due to land acquisition or displacement. This focus was necessary because households not connected to the project, such as those relying solely on government jobs, did

not experience economic changes from the investment. Including them would have weakened the sample by adding data that wouldn't effectively reflect project-related impacts.

The restriction was also necessary due to practical challenges in the field. Some potentially eligible households had moved out of the surveyed villages after gaining project-related jobs and could not be located or interviewed. For those who stayed, the project's working hours from 8 a.m. to 8 p.m. meant many economically active members were away most of the day during the survey, limiting their availability. Considering these factors along with the population restriction, a total of 161 project-affected households were successfully surveyed across the six villages.

4.3. Data Collection and Variables

Primary data were gathered using a structured household questionnaire completed by a designated adult in each sampled household. The questionnaire recorded household income, consumption, and savings before and after the project investment, along with employment status and any compensation received, including amounts. Change variables for income (ΔY), consumption (ΔC), and savings (ΔS) were calculated as the difference between post-project and recalled pre-project baseline values for each household.

4.4. Analytical Framework

The empirical analysis is conducted in three stages:

Descriptive Analysis of Household-Level Change

The first stage analyzes how sampled households are distributed across categories of change—decline, no change, and positive change—in income, consumption, and savings. This descriptive analysis identifies the overall direction and size of welfare changes experienced by project-affected households after the infrastructure investment, before moving on to more detailed household-level ratio and regression analyses.

Marginal Propensity to Consume (MPC)

In the second stage, the household-level Marginal Propensity to Consume (MPC) is calculated as the ratio of the change in consumption expenditure to the change in income ($MPC = \Delta C / \Delta Y$) for each household. Households with no change in income ($\Delta Y = 0$) were excluded from this calculation, as the ratio is undefined for them; however, they were still included in the descriptive analysis from the first stage. Households with valid MPC values were grouped into the following categories—Negative, Zero, Low (0.01–0.24), Medium (0.25–0.49), High (0.50–0.74), Very High (0.75–0.99), Unitary ($=1$), and Above Unitary (>1)—to assess how much project-related income increase is translated into additional consumption.

Interaction Regression Model: Testing the Permanent Income Hypothesis

The third stage tests whether the source of a household's income change - recurring regular project-related income as opposed to a one-time compensation payment - alters the strength of the consumption response, drawing on Friedman's (1957) Permanent Income Hypothesis, under which transitory income is expected to generate a lower marginal propensity to consume than regular income. Compensation was used as a proxy for transitory income, since it was received by only 24 of the 161 sampled households (14.91 percent) as a one-time, non-recurring

payment. A dummy variable D was defined, taking the value 1 for households that received compensation and 0 otherwise, and the following interaction regression model was estimated by Ordinary Least Squares (OLS):

$$\Delta C = \beta_0 + \beta_1 \Delta Y + \beta_2 D + \beta_3 (\Delta Y \times D) + \varepsilon$$

where ΔC and ΔY denote household-level change in consumption expenditure and income respectively, D is the compensation dummy, and the interaction term $\Delta Y \times D$ captures the differential marginal propensity to consume of compensation-recipient households relative to non-recipient households. Under this specification, β_1 gives the estimated MPC for non-recipient households, while the sum $\beta_1 + \beta_3$ gives the estimated MPC for compensation recipient households.

Prior to interpreting the estimated coefficients, the model was subjected to standard diagnostic checks. Variance Inflation Factors (VIF) were computed for all regressors to assess multicollinearity; all VIF values were well below the conventional threshold of 5, indicating that multicollinearity was not a concern despite the inclusion of an interaction term. The Breusch-Pagan test was used to test for heteroscedasticity in the residuals, and returned a statistically significant result, indicating that the assumption of constant error variance was violated. To address this, heteroscedasticity-consistent (HC1) robust standard errors (MacKinnon and White, 1985) were computed and used for all subsequent hypothesis tests and significance levels reported for the model coefficients in place of conventional OLS standard errors. Finally, the Shapiro-Wilk test was applied to the model residuals to assess normality; the test did not reject the null hypothesis of normality at the 5 per cent level, supporting the validity of the inferential procedure used.

Results and Discussion

5.1. Household-Level Changes in Income, Consumption, and Savings

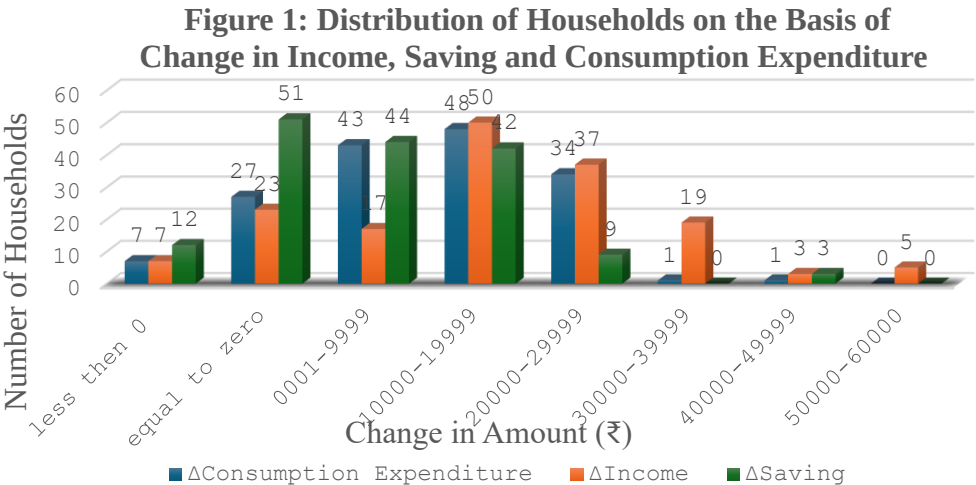


Figure 1 illustrates how the sampled households are distributed based on changes in their income, savings, and consumption expenditure after the infrastructure investment in the study area.

The distribution indicates that the majority of households experienced positive changes in all three indicators, although a small proportion reported negative changes. Specifically, 4.35% of households (7 households) experienced a decline in income. Responses obtained during the field survey revealed that most of these respondents had voluntarily left their previous employment outside the region and accepted relatively lower-paying jobs closer to their home villages in order to improve their overall quality of life. The same proportion of households (4.35%) also reported a decline in consumption expenditure. According to the respondents, this decline was primarily attributed to lower commuting costs, the elimination of rental expenses and reduced food expenditure after relocating to their native villages. In contrast, 7.45% of households (12 households) reported a decline in savings. Survey responses indicated that this reduction was mainly associated with lower income following relocation, rising prices, higher educational expenditure and, in some cases, increased household spending resulting from the availability of a stable monthly source of income.

With respect to households reporting no change, savings exhibited the highest concentration, with 51 households (31.68%) maintaining unchanged savings, followed by consumption expenditure, where 27 households (16.77%) reported no change, and income, where 23 households (14.29%) experienced no change. These findings suggest that, despite the economic opportunities generated through infrastructure investment, a considerable proportion of the affected households continued to experience relatively stable economic conditions.

Among households reporting positive changes, the largest concentration of increases in both income and consumption expenditure occurred within the ₹10,000–19,999 category. In this range, 50 households (31.06%) reported an increase in income, while 48 households (29.81%) experienced a corresponding increase in consumption expenditure. In contrast, savings exhibited the highest concentration in the ₹1–9,999 category, where 44 households (27.33%) reported an increase in savings, while 43 households (26.71%) recorded an increase in consumption expenditure within the same range. This pattern suggests that relatively modest gains in household income were accompanied by improvements in both consumption expenditure and savings, indicating that households were able to allocate additional income towards meeting current needs while simultaneously strengthening their financial position.

A different pattern emerges in the ₹20,000–29,999 category. In this range, 37 households reported an increase in income, accompanied by higher consumption expenditure for 34 households, whereas only 9 households recorded an increase in savings. This distribution indicates that households experiencing relatively larger income gains were more likely to report increases in consumption expenditure than comparable increases in savings. However, since the figure presents the distribution of households across categories of change rather than the proportion of additional income allocated to consumption and savings, it does not permit direct inference regarding household consumption or saving propensities.

Overall, the findings indicate that infrastructure investment was associated with either stable or moderately positive economic outcomes for the majority of sampled households, with the largest concentration of improvements occurring within the ₹10,000–19,999 category. While increases in income were generally accompanied by higher consumption expenditure,

improvements in savings were comparatively modest, and nearly one-third of households reported no change in savings. Collectively, these findings suggest that the additional income generated through project-related economic opportunities contributed to improved household welfare, primarily through higher levels of consumption expenditure while also enabling savings for a section of the sampled households.

5.2. Marginal Propensity to Consume and Households’ Consumption responses

Category	Range
Negative	<0
Zero	0
Low	0.01-0.24
Medium	0.25-0.49
High	0.50-0.74
Very High	0.75-0.99
Unitary	1
Above unitary	>1

Figure 2: Distribution of Households Based on their MPC

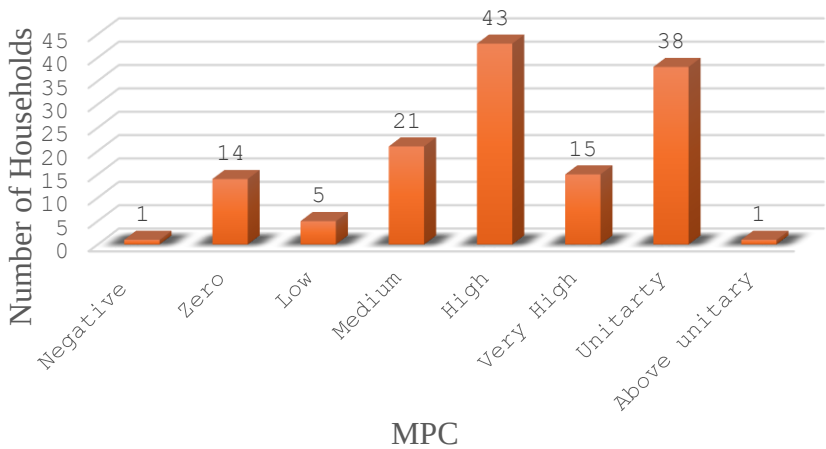


Figure 2 displays the distribution of sampled households based on their Marginal Propensity to Consume (MPC), computed as the ratio of the change in household consumption expenditure to the change in household income. Table 1 defines the categories used to classify households by MPC value. Out of 161 households, MPC was calculated for 138 households. However, for 23 households (14.29%), MPC could not be determined because their income did not change ($\Delta Y = 0$), causing the denominator in the MPC formula to be zero. These households were excluded from the subsequent MPC analysis. Among the households with valid data, the average MPC was 0.6070 with a standard deviation of 0.3586, and a median value of 0.6667. The MPC values ranged broadly from -0.5 to 1.6 . This means that, on average, households spent about ₹0.61 of every additional rupee they earned on consumption, suggesting that a

significant portion of the extra income obtained from project-related economic activities was used to enhance current household consumption.

Further analysis of the distribution shows that the largest group of households-43 in number, representing 26.71% of the total sample-fell into the High MPC category, defined as MPC values between 0.50 and 0.74. These households typically spent between 50% and 74% of their additional income on consumption, saving or allocating the remainder for other uses. Following this group were 38 households (23.60%) with a Unitary MPC ($=1$), indicating they spent all of their additional income on consumption without increasing their savings. Another 15 households (9.32%) belonged to the Very High MPC category (0.75 to 0.99), meaning they consumed most of their extra income while saving only a small fraction. Together, these three categories account for nearly 60% of the sample, highlighting that the additional income generated from the hydroelectric projects was mainly directed towards improving household consumption.

The Medium MPC category, ranging from 0.25 to 0.49, included 21 households (13.04%), reflecting a more balanced approach with additional income being split relatively evenly between consumption and savings. Only 5 households (3.11%) fell into the Low MPC category (0.01 to 0.24), indicating that these households devoted a small portion of their additional income to consumption while saving a larger share. These households might have prioritized precautionary savings, paying down debts, or investing for the future rather than immediate consumption.

The data also identified a few unique cases. One household (0.62%) had a negative MPC, which occurred when consumption increased despite a decrease in income. According to survey information, this household had voluntarily quit a higher-paying job outside the study area and returned to their native village. Although income dropped with this employment change, consumption rose, resulting in a negative MPC. Similarly, another household (0.62%) recorded an MPC greater than one, where consumption increased by more than the rise in income. This was attributed to factors such as inflation, rising educational expenses, increased reliance on market purchases, and reduced kitchen-garden production after securing regular project employment. The extra spending was funded by dissaving rather than current income. These examples reflect specific household circumstances rather than typical consumption behavior across the sample.

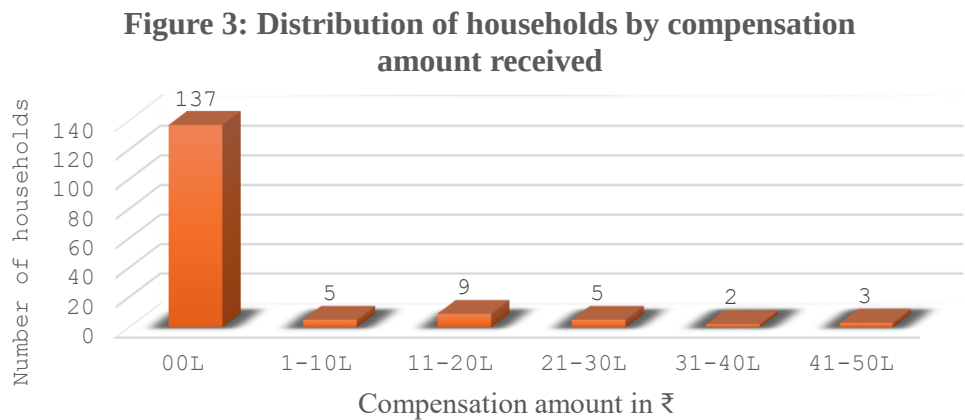
In summary, the findings reveal a relatively high average propensity to consume, with households spending about 61% of every additional rupee of income on consumption. The concentration of households in the High, Very High, and Unitary MPC categories illustrates that income gains from the hydroelectric projects were largely translated into greater household consumption. However, the magnitude of this consumption response varied among households depending on their socioeconomic status, financial responsibilities, and expenditure needs.

5.3. Transitory Income and Household Consumption Behaviour

According to the Permanent Income Hypothesis (Friedman, 1957), transitory income, being short-term or one-time, does not increase future earnings. Households spend only a small part

of transitory income and save or repay debt with the rest. Therefore, the marginal propensity to consume (MPC) is lower for transitory income than for permanent income.

The present study does not directly estimate permanent income. Instead, it examines whether households receiving a one-time compensation payment exhibit a different consumption response to subsequent changes in income than households that did not receive compensation. Compensation is therefore treated as a proxy for transitory income, and the observed behavioural differences are interpreted through the lens of the Permanent Income Hypothesis. Figure 3 shows the distribution of compensation among the sampled households. Out of 161 households, 137 (85.09%) did not receive compensation, while 24 (14.91%) did. Among recipients, five received between ₹1 lakh and ₹10 lakh, nine between ₹11 lakh and ₹20 lakh, five between ₹21 lakh and ₹30 lakh, two between ₹31 lakh and ₹40 lakh, and three between ₹41 lakh and ₹50 lakh.



five between ₹21 lakh and ₹30 lakh, two between ₹31 lakh and ₹40 lakh, and three between ₹41 lakh and ₹50 lakh. The figure indicates that compensation was limited to a small portion of households and was a one-time payment, supporting its classification as transitory income for analysis.

To investigate whether transitory income alters household consumption behaviour, the following interaction regression model was estimated, where the reported statistical significance is based on HC1 robust standard errors:

$$\Delta C = 941.75 + 0.5664\Delta Y + 2563.37D - 0.2355(\Delta Y \times D)$$

The coefficient for income change is positive and highly significant ($\beta = 0.5664$, $p < 0.001$), confirming that increases in household income led to higher consumption. The coefficient for the compensation dummy is positive ($\beta = 2563.37$) but only marginally significant ($p = 0.052$), suggesting that compensation alone does not cause a statistically strong change in household consumption at the conventional 5% significance level.

The key finding is the negative and statistically significant interaction coefficient between income and compensation ($\beta = -0.2355$, $p = 0.011$). This shows that the relationship between change in income and consumption differs significantly between households that received compensation and those that did not. In other words, the effect of additional income on household consumption is influenced by whether the household received compensation.

For households that did not receive compensation, the estimated marginal propensity to consume equals the coefficient of income, that is,

$$MPC_{Non-recipient} = 0.5664.$$

This implies that every additional ₹100 increase in income leads to an average increase of approximately ₹56.64 in household consumption.

For households receiving compensation, the marginal propensity to consume becomes

$$MPC_{Recipient} = \beta_1 + \beta_3 = 0.5664 - 0.2355 = 0.3309.$$

Thus, among compensation recipients, every additional ₹100 increase in income increases household consumption by only about ₹33.09, substantially lower than that observed for non-recipient households.

The findings align with the Permanent Income Hypothesis, showing that households receiving a one-time compensation payment respond differently to income increases compared to those who did not. Both groups raise consumption when income grows, but compensation recipients have a notably lower marginal propensity to consume. This indicates that temporary wealth boosts affect consumption differently than regular income increases, with compensated households tending to save more, pay off debts, invest, or build wealth rather than proportionally increasing consumption.

Discussion

6.1. Income, Consumption, and Savings Responses in Comparative Perspective

Apart from the overall pattern of improvement, the specific distribution of households' outcomes reported in the results section is also interesting to consider. Households that experienced income reductions (4.35%) and reduction in consumption (4.35%) were predominantly those who consciously chose to give up a better-paying job outside the region to accept a worse-paying job nearby in their native villages. The observed reduction was thus a result of the lifestyle change rather than a conventional income shock. This detail is relevant to understanding how the findings relate to Ravallion and Chen's (2005) view of income shocks decreasing households' ability to smooth out their consumption. In this case, the household's experiencing the reduction of income did not become worse off in welfare terms. Reduction in savings was observed by a larger share of households (7.45%) - for reasons of price increase, education expenses, and sometimes greater expenses after the stable regular income was achieved. The preponderance of "no change" responses in savings (31.68%, the largest one among the three outcomes, as opposed to 16.77% and 14.29% for consumption and income respectively) also indicates that savings was the least flexible of the three variables; it would be modified only after all the current consumption demands were addressed. This fact supports the conclusion of Adams (2002), made in a comparable rural and poor environment, on households' propensity to save depending on the variability/uncertainty of a certain income source and not its amount, meaning that in this case households had fewer incentives to modify their savings behaviour than their spending behaviour.

The growth in household spending as part of an increase in project-related income, observed in most households in the study, is consistent with the "crowding in" theory developed by Yan et al. (2024) in the case of infrastructure investment in China, where public investment increased

rather than reduced household spending. Similarly, the fact that many households experience changes in savings along with the changes in income supports the idea by Ravallion & Chen (2005), according to which development projects may affect household savings through changes in earnings. In our research, the impact on savings was much smaller compared to consumption, with about a third of households reporting no change in savings at all.

The relatively stable or positive trends identified in the study – the income and consumption increase in households benefitting from repeated payments as a result of projects and not only as a function of compensation – show how the type of income earned plays a crucial role in determining whether investment in infrastructure leads to sustainable improvements in household well-being. This conclusion corresponds with the claims made by Escobal and Ponce (2002) in their discussion of how rural infrastructure improves household well-being through increasing income-generating opportunities and not because of the value of the asset itself. At the same time, the small portion of households in the studied group that experienced income reductions or no changes needs to be taken into account and cannot be overlooked, just like in the work of Khanal et al. (2024) in Nepal.

The allocation of income gains across income groups merits more scrutiny. In the case of households that experienced income gain between ₹1 and ₹9,999, an almost equal number of households reported both higher consumption (43, 26.71%) and savings (44, 27.33%), which shows that even a small amount of income gain was utilized for satisfying basic requirements and saving. Conversely, in the case of the households which had the highest recorded income gain (₹20,000 – ₹29,999), there were 37 households which had higher income gain, 34 with higher consumption expenditure, but only 9 households had higher savings – this disparity goes against the consumption theory expectation of increasing marginal propensity to save with income gain. Explanation in line with the characteristics of households reported in the results section, is that the biggest income gains which households experienced was those engaged in project employment on a regular basis, and thus the money gain was used for fulfilling postponed requirement such as better living conditions, education and health expenditure, and not for saving. This explanation is in line with the argument provided by Escobal and Ponce (2002) that rural infrastructure benefits households by creating earning opportunity rather than through asset formation.

6.2. The Marginal Propensity to Consume in Comparative Perspective

The average MPC of 0.607 obtained in this study is higher than the national micro-level estimates reported for India. Alivelu et al. (2023), using large-scale household survey data, found that while the aggregate, macro time-series MPC for India stood at 49.8% for 1990–2020, household-level MPCs computed from micro survey data were considerably lower than this macro figure. The present sample, drawn from households directly affected by infrastructure investment in a resource-constrained rural setting, thus displays a distinctly higher propensity to consume out of additional income than the typical Indian household captured in national surveys. A plausible explanation is that project-affected households, many of whom faced suppressed consumption prior to the investment, used additional income primarily to meet previously unmet current needs rather than to build financial assets, producing a stronger consumption response than would be expected in more economically

secure populations. This pattern is consistent with Fisher, Johnson and Smeeding's (2020) finding, using U.S. panel data, that the MPC is systematically higher among lower-wealth households than among wealthier ones, since low-wealth households have fewer assets to draw on to smooth consumption and therefore respond more strongly to a given change in income; the resource-constrained, project-affected households in the present sample fit this low-wealth, high-MPC profile particularly well.

The categorical distribution of MPC values underlying this average is informative in its own right. Only a small minority of households (5, 3.11%) fell into the Low MPC category, saving most of their additional income, whereas the High, Very High and Unitary categories together accounted for close to 60% of households with valid MPC data (43, 38 and 15 households respectively), consuming half or more, and in many cases all, of an additional rupee of income. A further 16 households (9.94%) recorded an MPC above unity, with consumption rising by more than income. Read against Adams's (2002) finding that rural households save a larger share of income they regard as variable or uncertain, and a smaller share of income they expect to keep receiving, this concentration in the high-consuming categories, together with the scarcity of cautious, high-saving households, is consistent with most recipients treating the project-related income underlying this study as a reasonably dependable addition to their livelihood rather than as a precarious or one-off gain.

The lower MPC estimated for compensation recipients (0.331) sits close to the MPC out of lottery windfalls of around 0.35 that Fagereng, Holm and Natvik (2021) documented using Norwegian administrative data, and is well below the MPC out of regular income found for non-recipients in this study (0.566). The convergence of these two estimates, drawn from very different economic settings, lends support to the broader empirical regularity that transitory, one-time payments are consumed at a substantially lower rate than income households expect to receive repeatedly, regardless of the country or income level in which the payment occurs. This finding is also compatible with Wilmsen, Webber and Duan's (2011) study of Three Gorges Dam resettlers in China, where households receiving compensation for lost housing obtained a payment worth several times their average annual income and, rather than spending it on immediate consumption, used it primarily to rebuild their asset base; taken together, the two studies suggest that displacement-linked compensation, unlike routinely received income, tends to be channelled toward restoring lost wealth rather than raising current spending.

6.3. Transitory Income, Compensation, and the Permanent Income Hypothesis

The finding that compensation recipients exhibit a significantly lower marginal propensity to consume than non-recipients are consistent with the Permanent Income Hypothesis (Friedman, 1957), under which households are expected to save or use a one-time payment to restore wealth rather than proportionally raise current consumption. This result, however, stands in contrast to Cabanillas-Jiménez's (2024) study of the Spanish Christmas Lottery, which found a violation of the Permanent Income Hypothesis: households in winning regions raised both durable and non-durable consumption substantially after receiving windfall lottery income. A plausible explanation for this divergence lies in the differing nature and meaning of the transitory payment in each context. A lottery prize is an unanticipated pure gain with no offsetting loss, which may be treated psychologically as "found money" and spent relatively freely, particularly

on durable goods. Compensation for infrastructure-induced displacement, by contrast, is paid to offset the loss of land, housing, or livelihood, and may therefore be mentally earmarked by recipient households for replacing the lost asset base rather than for current consumption, a distinction consistent with Ramey's (2020) framing of infrastructure-linked payments as being tied to capital rather than to discretionary income. The relatively small size and rural, income-constrained context of the present sample, where precautionary saving and debt repayment carry high value, may further reinforce this more conservative consumption response relative to the wealthier, more liquid Spanish lottery-winning households.

This result also offers a partial counterpoint to the qualitative concerns raised in the hydropower literature regarding compensation misuse. Lata et al. (2013) reported that compensation money in Kinnaur was, in a number of cases, wasted or misspent. The present study's quantitative finding -that compensation recipients as a group show a lower, not higher, propensity to convert additional income into consumption-suggests that at the aggregate statistical level, compensation in this sample was more often channelled into saving, debt repayment, or asset-building than into discretionary spending, even though individual cases of misuse, as documented elsewhere in the region, cannot be ruled out.

Conclusion

This study set out to examine how infrastructure-linked income — arising from employment, business activity, and land compensation associated with the Kiru and Kwar hydroelectric projects — shapes household consumption and saving behaviour in Block Nagseni, District Kishtwar. By combining descriptive analysis of household-level change with an MPC-based interaction regression grounded in the Permanent Income Hypothesis, the study tests whether the marginal propensity to consume differs between households that received compensation and those that did not, offering empirical evidence on a question that has received little attention in the hydropower literature: whether the *source* of project-related income, and not merely its magnitude, determines how it is used by recipient households.

The evidence points to a clear distinction between recurring and one-time income. Regular income from employment and business activity was consumed at a substantially higher rate than income received as land compensation, with recipients of compensation converting roughly a third of every additional rupee into consumption compared with more than half among non-recipients. This gap indicates that compensation, though valuable as immediate financial relief, functions primarily as a mechanism for restoring lost assets and wealth rather than as a driver of sustained consumption growth. Recurring income, by contrast, appears to be the channel through which infrastructure investment translates into durable improvements in household living standards.

These findings carry direct implications for how infrastructure-linked compensation and rehabilitation policy should be designed. Government agencies and project developers should not treat a one-time monetary payment as a substitute for sustained livelihood support: compensation disbursed purely as a lump sum, without complementary measures, is unlikely to generate lasting welfare gains for displaced or land-losing households. Policy should instead

prioritise the creation of stable, recurring income opportunities — through preferential local hiring, skill training tied to project operations, and support for business activity linked to the project economy — since these appear to be the pathways through which affected households achieve meaningful and sustained improvements in consumption.

At the same time, compensation should not be discounted or minimised on the grounds that it is not consumed as readily. Its lower marginal propensity to consume is consistent with recipients using it for debt repayment, asset rebuilding, or precautionary saving — outcomes that are themselves desirable following displacement. What the findings caution against is treating compensation as a stand-alone welfare instrument: policy should not assume that a sufficiently large payment can compensate for the absence of recurring income opportunities, nor should disbursement be delayed or fragmented in ways that undermine its role in wealth restoration. Equally, project authorities should avoid a narrow focus on income restoration alone; without complementary attention to how income is earned — job security, regularity of payment, and access to local employment — welfare gains risk remaining uneven across the affected population, as reflected in the minority of households in this sample that experienced stagnant or declining outcomes.

More broadly, the study underscores that large infrastructure investments in ecologically and economically sensitive regions such as the Chenab basin should be accompanied by household-level monitoring frameworks, rather than relying solely on macroeconomic or project-level indicators of success. Future policy design would benefit from institutionalising periodic household surveys in project-affected villages, allowing authorities to track whether compensation and employment channels are functioning as intended over time, and to recalibrate rehabilitation packages where recurring income opportunities fail to materialise. In doing so, infrastructure investment can be positioned not merely as a source of regional economic growth, but as a sustained contributor to the welfare of the households most directly affected by it.

Limitations of the Study

Several limitations should be borne in mind when interpreting these findings. First, the data are cross-sectional and rely on households' retrospective, self-reported recall of income, consumption and savings changes since the start of the project; in the absence of a pre-project baseline or panel data, the estimates are subject to recall bias and cannot establish causality with the same confidence as a before-after or difference-in-differences design. Second, the compensation-recipient subsample is small (24 of 161 households), which limits the statistical power of the interaction regression and is reflected in the only marginally significant coefficient on the compensation dummy itself; a larger or multi-project sample would allow more precise estimation and sub-group analysis by compensation amount. Third, the sampling design, while appropriate for the study's objectives, was purposive and confined to six of Block Nagseni's fourteen villages and to households connected to the project through employment, business or compensation; this was necessary to isolate project-related effects but means the findings may not generalise to non-project-connected households in the same villages or to hydropower-affected communities in other parts of the Chenab basin.

Fourth, the absence of a control group of otherwise comparable households unaffected by the project means that observed changes cannot be fully separated from concurrent regional or macroeconomic trends unrelated to the investment itself. Finally, the analysis does not control for potentially relevant household characteristics such as landholding size, household composition, or pre-project asset base, which may independently influence both the likelihood of receiving compensation and the household's consumption response; future research incorporating such covariates, a longer panel, and comparisons across multiple hydropower projects would help establish the robustness and generalisability of the patterns identified here.

References

- Adams, R. H. (2002). *Precautionary saving from different sources of income: Evidence from rural Pakistan* (Policy Research Working Paper No. 2761). World Bank.
- Alivelu, K., Bhattarai, K., Prasuna, A., & Siva Kumar, S. N. V. (2023). Consumption functions of India: Pre and post Covid-19. *Journal of Development Economics and Finance*, 4(2), 451–463.
- Cabanillas-Jiménez, G. (2024). Testing the permanent income hypothesis using the Spanish Christmas Lottery. *Applied Economic Analysis*, 32(96), 232–259.
- Campbell, J. Y., & Mankiw, N. G. (1989). Consumption, income and interest rates: Reinterpreting the time series evidence. *NBER Macroeconomics Annual*, 4, 185–216.
- Cernea, M. M. (1997). The risks and reconstruction model for resettling displaced populations. *World Development*, 25(10), 1569–1587.
- Deaton, A. (1992). *Understanding consumption*. Clarendon Press.
- Duflo, E., & Pande, R. (2007). Dams. *The Quarterly Journal of Economics*, 122(2), 601–646.
- Escobal, J. A., & Ponce, C. (2002). *The benefits of rural roads: Enhancing income opportunities for the rural poor* (Working Paper No. 40-I). GRADE.
- Fagereng, A., Holm, M. B., & Natvik, G. J. (2021). MPC heterogeneity and household balance sheets. *American Economic Journal: Macroeconomics*, 13(4), 1–54. <https://doi.org/10.1257/mac.20190211>
- Fisher, J. D., Johnson, D. S., Smeeding, T. M., & Thompson, J. P. (2020). Estimating the marginal propensity to consume using the distributions of income, consumption, and wealth. *Journal of Macroeconomics*, 65, 103218. <https://doi.org/10.1016/j.jmacro.2020.103218>
- Foster, V., Gorgulu, N., Straub, S., & Vagliasindi, M. (2023). *The impact of infrastructure on development outcomes: A qualitative review of four decades of literature* (Policy Research Working Paper). World Bank.
- Friedman, M. (1957). *A theory of the consumption function*. Princeton University Press.

Government of India. (2013). *The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013* (Act No. 30 of 2013). Ministry of Law and Justice.

Jappelli, T., & Pistaferri, L. (2010). The consumption response to income changes. *Annual Review of Economics*, 2(1), 479–506.

Johnson, D. S., Parker, J. A., & Souleles, N. S. (2006). Household expenditure and the income tax rebates of 2001. *American Economic Review*, 96(5), 1589–1610.

Kaplan, G., & Violante, G. L. (2014). A model of the consumption response to fiscal stimulus payments. *Econometrica*, 82(4), 1199–1239.

Kessides, C. (1993). *The contributions of infrastructure to economic development: A review of experience and policy implications* (World Bank Discussion Paper No. 213). World Bank.

Khanal, R., Duan, Y., Ramsey, T. S., Ali, S., & Oo, K. H. (2024). Impacts of livelihood assets on hydropower displacees' livelihood strategies: Insights from the Tanahu hydropower project in Nepal. *Heliyon*, 10(14), e34485.

<https://doi.org/10.1016/j.heliyon.2024.e34485>

Lata, R., Rishi, M. S., Kochhar, N., & Sharma, R. (2013). Socio-economic impacts of Sorang hydro-electric project in district Kinnaur, Himachal Pradesh, India. *Journal of Environment and Earth Science*, 3(3), 54–61.

MacKinnon, J. G., & White, H. (1985). Some heteroskedasticity-consistent covariance matrix estimators with improved finite sample properties. *Journal of Econometrics*, 29(3), 305–325.

Paxson, C. H. (1992). Using weather variability to estimate the response of savings to transitory income in Thailand. *American Economic Review*, 82(1), 15–33.

Ramey, V. A. (2020). *The macroeconomic consequences of infrastructure investment* (NBER Working Paper No. 27625). National Bureau of Economic Research. <https://doi.org/10.3386/w27625>

Ravallion, M., & Chen, S. (2005). Hidden impact? Household saving in response to a poor-area development project. *Journal of Public Economics*, 89(11–12), 2183–2204.

Wilmsen, B., Webber, M., & Duan, Y. (2011). Involuntary rural resettlement: Resources, strategies, and outcomes at the Three Gorges Dam, China. *The Journal of Environment and Development*, 20(4), 355–380.

Yan, Z., Yuan, Y., & Xue, Y. (2024). Crowding-in or crowding-out: How infrastructure investment affects household consumption. *China Finance and Economic Review*, 13(1), 43–66. <https://doi.org/10.1515/cfer-2024-0003>