The role of economic development in improvements of Cambodian housing conditions

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ABSTRACT

In the past, investing in housing has served as an engine of growth for many economies as it is widely recognized that poor housing conditions can have significant negative impacts on human health, education, and economic opportunities. To assess the housing-related quality of life, indicators such as housing quality, housing environment, and cost burdens can be applied. However, recent studies indicate that materials used for construction are critical. Permanent materials, as opposed to temporary materials, typically offer a range of benefits in terms of durability, low maintenance, improved energy efficiency, increased property value, and better safety. The ultimate aim is to identify the key drivers of housing conditions in Cambodia, with a particular focus on materials and water quality, and the legal status of housing. To find the empirical relationship between economic, socio-economic, and demographic variables on the one hand, and variables measuring housing and living conditions in Cambodia on the other, the analysis employs Ordinary Least Squares and Methods-of-Moments regression modeling. Results indicate that high employment rates and entrepreneurship increase home ownership, and improve the quality of drinking water available. Furthermore, in addition to employment and entrepreneurship, the higher-performing construction materials can also be empirically explained by a bigger labor force and variables capturing the wider macroeconomic environment.

1. Introduction

Since the end of its civil war in 1975, Cambodia has gone through turbulent economic times experiencing peaks and troughs. Nevertheless, taken together, its economy can be seen as a role model of economic development, weathering the COVID-19 storm comparatively well and being on East Asia's fasted expected recovery path in 2023 (Asian Development Bank, 2022; World Bank, 2022a). One of the main goals of such sustainable economic development is to improve the general quality of life of people. Such an improvement can be evaluated using various dimensions and indicators. One of these indicators is the housing dimension, which ultimately plays a significant factor affecting the quality of life. Therefore, in the past, the relationship between economic development and housing conditions has been the subject of much research and debate.

However, the effectiveness of economic growth in improving housing conditions is influenced by a range of factors, and further research is needed to better understand the complex relationships between economic development, housing conditions, and other social, cultural, and institutional factors.

Therefore, the ultimate aim of this study is to identify the key drivers of housing conditions in Cambodia with a particular focus on materials and water quality, and the legal status of housing. The findings of this paper have significant implications for policymakers and stakeholders in the construction industry and economic governance alike. By identifying the factors that drive the improvement of housing that leads to a better quality of life, policymakers can make informed decisions on how to allocate resources efficiently and invest sustainably in the construction industry. The construction sector plays a crucial role in driving economic growth and creating jobs, and gaining insights into its key drivers can facilitate sustainable development. Moreover, the results of this study can assist industry stakeholders in making informed decisions that benefit their businesses. By comprehending the factors that impact the level of construction activity, companies can identify growth prospects and enhance their competitive edge in the marketplace.

The main contributions of this paper extend and broaden previous studies that emphasized the importance of the interaction between economic variables and the housing sector. As opposed to relying on survey data in order to understand a snapshot picture of the relationship between the interaction of economic activity and the real estate sector, as in Tan (2008) and Hu et al. (2022), this study uses macro-data collected and published by the Cambodian Bureau of Statistics. In an attempt to understand the dynamic interaction effects between sustainable development and the socio-economic and demographic environment, this study uses time-series data and regression methodology. This is in contrast to Tan (2008), and Mandic and Cirman (2012) who use cross-sectional analysis in order to find statistically robust relationships. Furthermore, as opposed to identifying micro-decisions about buying or renting property in a developing country, as in Hu et al. (2022), this study uses macro-data in order to be able to understand, and control for, the macroeconomic environment. Last but not least, we identify the drivers of changes in housing conditions during the developing process as opposed to trying to explain the difference between heterogenous countries within a greater economic union as in Mandic and Cirman (2012).

The main results in this paper indicate that high employment rates and entrepreneurship increase home ownership, and improve the quality of drinking water available. Furthermore, in addition to employment and entrepreneurship, the higher-performing construction materials can also be empirically explained by a bigger labor force and variables capturing the wider macroeconomic environment.

The paper is organized as follows; the introduction section emphasizes the importance of discussing the relationship between housing conditions and macro-economic developments. In addition, is shows the gaps in previous works and therefore validates its analysis. The second section gives the literature review and leads the reader down a path of building blocks important to appreciate the importance of the quality of housing during sustainable development, vice versa. The following section discusses the data and the empirical tools used, and puts the empirical findings into theoretical and real-life context. The last section concludes.

2. Literature Review

2.1. The importance of housing for economic development

Until the 1960s, development was equated with economic growth, and capital formation was seen as the dominant development approach. Housing investment was not considered a meaningful development strategy, as it was viewed as an unproductive investment that used valuable resources, tying them up for a long time. Housing improvement was considered a by-product of economic growth, so investment in housing was postponed until later stages of development. Housing was seen as a passive element in the development process, with economic growth leading automatically to housing improvement.

Over time, scholars and international agencies increasingly recognized the economic benefits of housing, including its potential for planned development in areas such as employment, health, productivity, and savings (Arku, 2006). Research has shown that economic growth can positively impact housing conditions, particularly in developing countries (Ramezani et al., 2019; Hossain et al., 2018). For example, a study of housing conditions in Latin America found that improvements in income and economic growth were associated with improvements in housing quality (Belsky and Hidalgo, 2012). Similarly, a study in China found that economic development was a major factor in improving housing conditions in rural areas (Li et al., 2019).

Investing in housing has served as an engine of growth for many economies, particularly the US, Japan, and Asian NICs like Singapore, South Korea, Taiwan, and Hong Kong. Public housing construction, home-ownership expansion, and housing loans have been used as macroeconomic stabilizers in the housing sector. In Japan and Singapore, the government devoted a significant proportion of GDP to housing construction, thereby increasing the rate of homeownership to around 60%. The residential property market has been an engine of growth for many Asian cities, notably Singapore and Hong Kong, and has generated considerable revenue and employment opportunities, it can lead to increased income and access to credit, which in turn can facilitate investment in housing (World Bank, 2016; Liu and Zhao, 2018). However, the relationship between economic development and housing conditions is not always straightforward. Rapid economic growth can also lead to urbanization, which can cause overcrowding, environmental degradation, and the proliferation of informal settlements. In such cases, housing conditions may deteriorate, particularly for low-income households. It is important to ensure that urban planning uses policies that are in place to promote sustainable development and prevent the negative impacts of rapid urbanization. It is widely recognized that poor housing conditions can have significant negative impacts on human health, education, and economic opportunities (United Nations, 1948; Krieger and Higgins, 2002). However, the relationship between economic development and housing conditions is complex, and several factors can influence the effectiveness of economic growth in improving housing conditions. These include government policies, institutional frameworks, and social and cultural factors (Hughes and Wright, 2015; Pivo and McNamara, 2015).

2.2. Factors affecting housing quality

To assess the housing-related quality of life, indicators such as housing quality, housing environment, and cost burdens can be applied. Kurian and Thampuram (2011) list seven indicators with 47 criteria that influence perceived housing quality, including location, infrastructure, design, aesthetics, material and construction techniques, sustainability, and concept. Based on the study, the order of importance for housing quality indicators is material and construction techniques, sustainability, aesthetics, concept, infrastructure, design, and location. Streimikiene (2015) highlighted that noise exposure indicator is crucial for measuring the quality of the housing environment as living in noisy areas can negatively impact comfort and human health, especially in urban areas and multi-flat houses where noise pollution is a significant problem. As notice exposure is linked with insulation, it strongly indicates that materials used for construction are critical, and multi-criteria decision-making models have been developed for choosing optimal materials (Klemm and Sikora, 2012; Sikora and Klemm, 2014; Anysz et al., 2021). Permanent materials, as opposed to temporary materials, typically offer a range of benefits in terms of

durability, low maintenance, improved energy efficiency, increased property value, and better safety (Xing et al., 2019; O'Ceallaigh et al., 2019, 2020; Nical and Sikora, 2022). While temporary materials may offer some benefits in terms of cost and flexibility, permanent materials are more reliable and sustainable choices for roofing, walls, and flooring (Xing et al., 2021).

2.3. Economy of Cambodia

Cambodia's economy is expected to continue its recovery in 2023, with GDP projected to grow by 6.2%, thereby reaching the highest growth projection in Asia (Asian Development Bank, 2022; World Bank, 2022a). This growth is supported by the government's management of the ongoing COVID-19 pandemic and the reopening of international borders to unvaccinated travelers, which is expected to boost domestic consumption (Coface, 2022). While the tourism sector is expected to remain subdued due to China's strict COVID-19 policies, demand for services, including catering and hospitality, is expected to be strong (World Bank, 2022b). Especially for Cambodia, the construction sector seems to have been playing a key role in the development process in the last 20 years, supporting industrialization and urbanization. In 2019 alone, construction accounted for more than 15% of its gross domestic product and experienced a year-to-year increase of almost 50% to 2020 (Gerth and Sikora, forthcoming).

2.4. Housing in Cambodia

The perception of housing quality standards is influenced by differences in climate, culture, degree of urbanization, level of technological advancement, and socio-economic progress. To achieve the best housing quality standards, traditional practices should be combined with modern techniques for increased economy and rationality (Sinha et al., 2017). In Cambodia, housing is a critical issue, particularly in urban areas, where access to affordable and adequate housing is increasingly difficult for low-income households. During the 1970s, the Khmer Rouge regime destroyed much of Cambodia's housing stock, resulting in a severe housing crisis that persisted for several decades. In the 1990s, the government began to implement policies to address the housing crisis, including the establishment of a social housing program and the adoption of a land law to address land disputes. In the early 2000s, Cambodia's urban areas experienced a surge in construction activity, with developers building high-end condominiums and commercial buildings. However, this development has largely excluded low-income households, who have been forced to live in informal settlements, often without access to basic services such as water and sanitation. The government and civil society organizations are working to address these challenges via recent policy developments, including the National Housing Policy.

3. Empirical Analysis

3.1. Data

The data comes from two official sources. First, the Statistical Yearbook of Cambodia published in December 2021, and the World Bank Development Indicators. Data for the former is collected and organized by the Cambodian National Institute of Statistics, Ministry of Planning, and contains a myriad of economic, socio-economic, demographic, environmental, and infrastructure variables on the macro and regional levels. Launched to showcase the country's economic and social progress over the last 13 years, the information is obtained via consensuses and surveys conducted by the National Institute of Statistics. Its final aim is to inform economic and financial stakeholders about the implementation and evaluation of fiscal policy and the Cambodian business and social environment.

The Yearbook is a panel consisting of 17 major categories (Environment and Climate, Government, Public Finances, Population, Housing, Labor, Education, Healthy, Agriculture, Industry, Construction, Transportation, Post and Telecommunication, Tourism, Investment, Price, and National Accounts) from 2010 to 2019 for 25 provinces

within Cambodia and the entire Cambodian economy. The number of variables for each category varies; from 4 variables for the category Industry to 22 variables for the category Health. In total, the dataset contains 193 individual variables.

Figure 1 shows the relative proportion of the legal status of a property. As can be seen, the big majority of people (70.9%) inhabit their own homes. A smaller proportion resides with their family (20.4%), and only a very small one (8.8%) rent. Figure 2 gives insight into the source of drinking water within one's building. More than 70% have an improved drinking water source. The improved category includes pipes into the dwelling, compound, raw, or plot; a public tap or standpipe; a tubed or piped well; a protected well; collected rainwater; or bottled water. Almost 30% of the people only have access to unimproved drinking water. These count unprotected wells; springs; tanker-truck; carts; or surface water. Figure 3 shows that almost 98% of the people have improved roof materials. These are tiles; cement and concrete; galvanized iron; or aluminum. Similarly optimistic are the results in Figure 4; more than 90% of the people possess improved wall materials for their buildings. Improved wall materials are wood or logs; plywood; concrete, brick and stone; galvanized iron or aluminum of other metal sheets; or cement. Regarding floor materials, Figure 5 shows the opposite. Whereas 31% of the people have access to improved materials, 69% still only use the lesser quality. Regarding the latter, unimproved floor materials are earth and clay; wooden planks; or bamboo strips. Improved floor materials would be cement; parquet and polished wood; polished stone and marble; vinyl; or ceramic tiles.
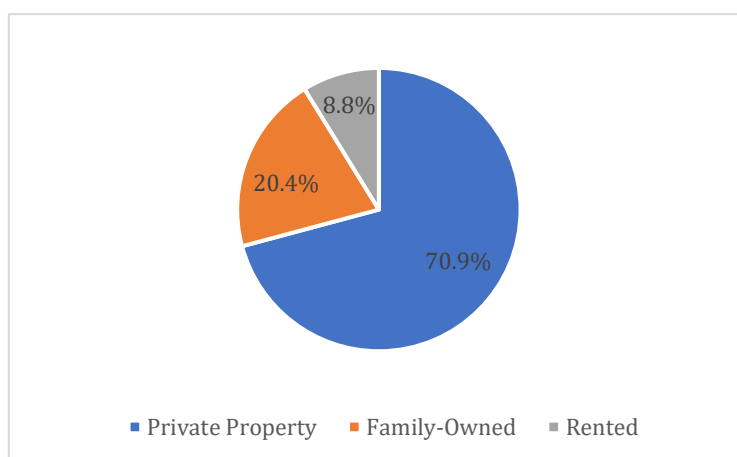

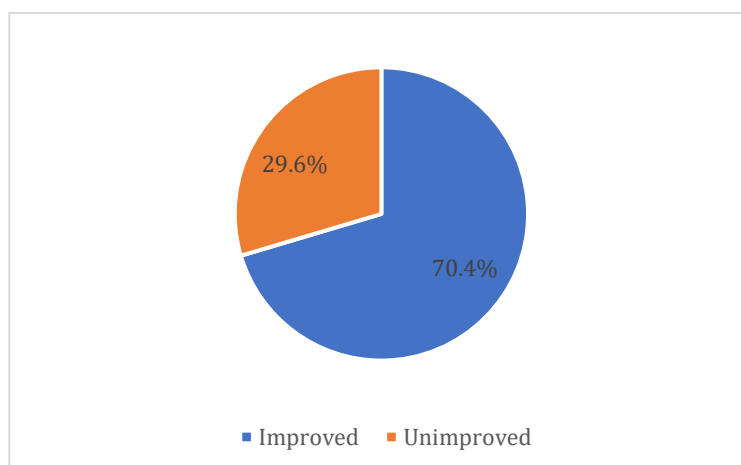**Figure 1.** Housing Conditions (Legal Status) in Cambodia.

Figure 2. Housing Conditions (Source of Water) in Cambodia.
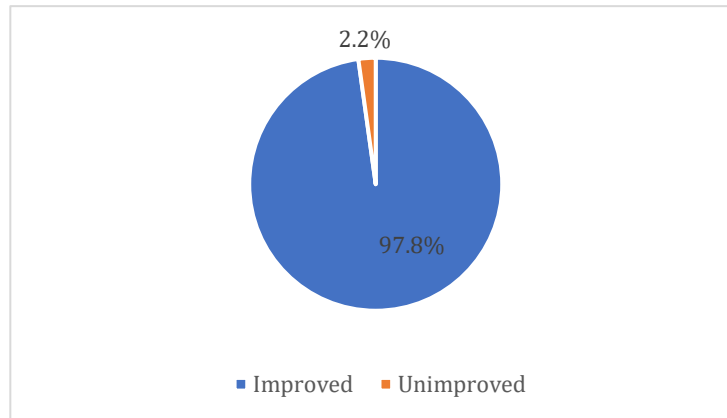
Figure 3. Housing Conditions (Roof Material) in Cambodia.
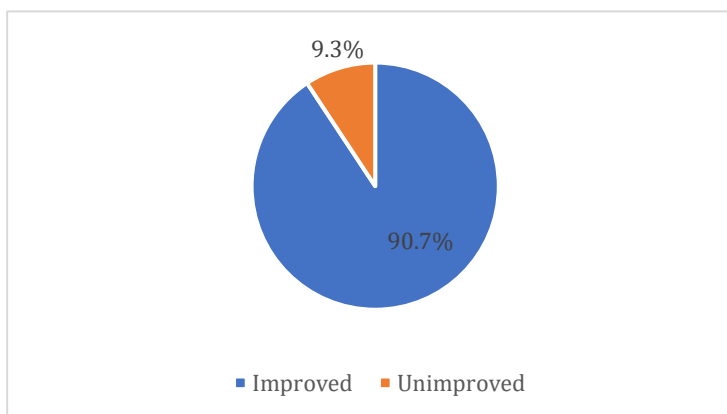
Figure 4. Housing Conditions (Wall Material) in Cambodia.
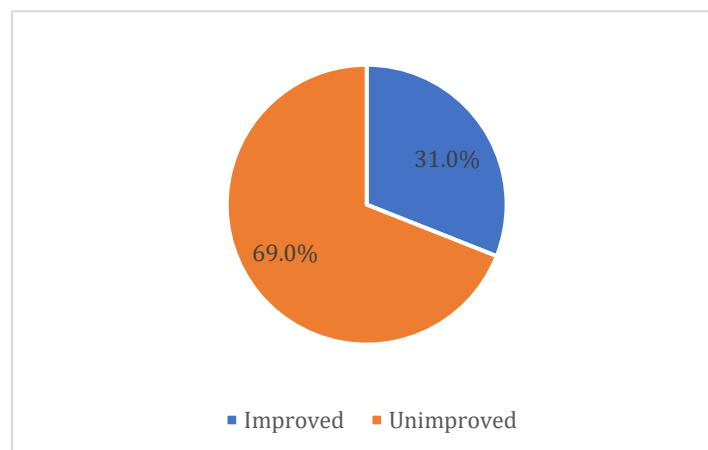
Figure 5. Housing Conditions (Floor Material) in Cambodia.

Table 1 gives insight into the data used for the empirical analysis. Rows one to eleven have already been discussed above and therefore will not obtain any more descriptive attention. The numbers show us that the labor-force participation rate in Cambodia lies on average above 55%. Of these people who are willing to work, almost 85% do find a job. As can be expected, the relative proportion of people in primary education is higher than in secondary education. However, the numbers are close to each other and therefore show continuity in education within the Cambodian education sector. It is interesting to emphasize the relatively small proportion of investment

in total GDP and the high amount of consumption within income; the average rate of consumption relative to total income exceeds 77%. However, given that Cambodia is a developing country, GDP per capita is low and is mainly used to survive. Also interesting to see is the amount of Small-and Medium-Sized Enterprises; on average Cambodia has almost 42,500 SMEs with a maximum of almost 50,000 within the sample period.

Table 1. Variable Description.

Variable	Mean	Minimum	Maximum
Private Property (%)	70.9	59.3	92.3
Family-Owned Property (%)	20.4	3.5	29.7
Rental Property (%)	8.8	6.3	10.1
Source of Water (Improved) (%)	70.4	61.1	79.7
Source of Water (Unimproved) (%)	29.6	20.3	38.9
Roof Materials (Improved) (%)	97.8	97.3	98.6
Roof Materials (Unimproved) (%)	2.2	1.4	2.7
Wall Materials Roof Material (Improved) (%)	90.7	88	93.9
Wall Materials Roof Material (Unimproved) (%)	9.3	6.2	12
Floor Materials (Improved) (%)	31	28	36.7
Floor Materials (Unimproved) (%)	69	63.3	72
Population (Mio. #)	15.8	15.6	16
Labor Force (Mio. #)	8.807	8.624	9.020
Employment Rate (%)	84.5	83.9	85.4
Primary Education (%)	27.1	26	28.9
Secondary Education (%)	22.7	22.1	23.7
Number of Schools (#)	12,835.7	12,505	13,113
Number of Students (Mio. #)	3.113	3.077	3.143
Educational Personnel (#)	110,519.7	108,741	111,670
SME (#)	42,481.33	38,562	49,949
Road Construction (km)	7,540	5,474	8,620
Vehicles (#)	422,844.3	344,249	525,764
Tourism (#)	6,155,942	5,656,157	6,610,592
GDP per Capita (thousand $)	1.548	1.415	1.686
Pr. Investment (billion $)	5.528	4.809	6.283
Government Consum. Exp. (billion $)	1.206	1.125	1.293
Consumption per Capita (thousand $)	1.193	1.109	1.281

Notes: All monetary variables are in real terms and expressed in USD.

3.2. Regression Analysis

To find the empirical relationship between economic, socio-economic, and demographic variables on the one hand, and variables measuring housing and living conditions in Cambodia on the other, the analysis employs the following regression model:[1]

$$HousingConditions_{k,t} = \beta_k + \sum_{r=1}^{16} IV_{r,t} * FT_{r,t} + \varepsilon_{k,t} \qquad (1)$$

The dependent variable captures the variety of unknowns concerning housing conditions (k) occurring at time (t). We include eleven variables fundamental for the standard and quality of dwelling conditions; Legal Status (homeownership, family accommodation or rented), Quality of Water Source (high quality or low quality), Roof Materials (hard/permanent or soft/temporary), Wall Materials (hard/permanent or soft/temporary) and Floor

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[1] The methodology of this paper follows and extends the models used in Gerth and Sikora (forthcoming) and Gerth et al. (2021a).

Materials (hard/permanent or soft/temporary).

The (r) independent variables (IV) reflect 16 variables included to capture the wider economic, socio-economic, and demographic environment within the country; Population, Labor Force, Employment Rate, Percent of Population within Primary Education, Percent of Population within Secondary Education, Total Number of Schools, Total Number of Students, Number of Educational Personal, Number of Small- and Medium-Sized Enterprises, Ongoing Road Construction in km, Number of Vehicles, Number of International Visitors (Tourists), GDP per capita, Private Investment, Government Consumption Expenditure, and Consumption Expenditures per capita.[2]

To estimate the coefficient of the equation above, ordinary least squares, as the main pillar in contemporary empirical analysis, is used. During estimation, attention is given to ensure conformity with the classical linear regression function assumptions. For instance, the statistical behavior of the error terms as well as the parameter values were analyzed and where necessary, they were adopted. The processes ensure that the model estimated generates heteroscedastic-robust standard errors to guarantee a time/observation-independent variance. More specifically, the White-Huber approach was used.[3]

The estimator, Ordinary Least Squares, is the workhorse for classical and modern econometric analysis. It estimates the marginal effects running from the independent variables to the respective dependent variable by allocating the latter's variability to the former. That is, it tries to minimize overall variance in the dependent variable given the statistical correlation to its independent counterparts. Should they empirically correlate with each other, a particular coefficient value is assigned that maintains statistical significance. Should, on the other hand, they not empirically correlate with each other, meaning the variabilities are independent of one another, the marginal effect between both variables will be statistically insignificant and therefore cannot be used to make a quantitative and qualitative interference regarding a historical relationship.

As a robustness test, the same model was estimated using the Method-of-Moments estimation technique. To do so, predeterminedness was assumed, and the moment condition of non-stochastic covariates. Instead of minimizing and assigning respective variances between variables, this estimator maximizes the probability that the density function obtained via the model matches the density function observed in the data. Given the assumed linearity in the data, both estimators are, a priori, expected to reach the same conclusions. Ultimately, the quantitative and qualitative results remain the same.

3.3. Empirical Evidence and Discussion

Table 2 presents the regression results using the empirical models discussed in section 2.2. It shows that only the Employment Rate and the variable capturing the amount of Small- and Medium-Sized Enterprises statistically explain the Legal Status with respect to home ownership. That is, an increase in employment leads to an increase in personally held private property (26.12) and a decrease in family-owned (-128.06) and rental (-37.28) arrangements. Interesting to note is the stronger absolute decrease in family-owned living compared to renting one's own accommodation; this implies that the newly employed move from home rather to their own accommodation than renting living space. The empirical finding confirms the income and wealth effects of

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[2] To comply with the regression model assumption of normality, all variables have been log-transformed.
[3] The regression model might potentially suffer from reverse-causality. That is, there might be feedback effects coming from the independent to the dependent variable and back. In order to avoid such a problem, instrumental variable estimation might be used. The data obtained, unfortunately, does not allow to construct instruments to control for such an issue. This shortcoming is left to further research.

households that argue that employment, income, and savings lead to higher levels of consumption and real-estate investment (Case and Quigley, 2008). Furthermore, the variable SME, approximating the level of entrepreneurship within the economy, also contributes positively towards homeownership (1.68 vs. -8.29 & -2.44). The theoretical reason is the importance of entrepreneurship in the development process from the factor-driven over the efficiency-driven to the innovation-driven stages of economic progress and therefore its link to a higher degree of disposable income (Acs et al., 2008).

Rows five and six show the empirical results regarding the quality of the drinking water sources available to households. The results highlight the importance of the size of the labor force with respect to having improved-quality drinking water compared to unimproved-quality sources, (5.81 vs. -14.44). The findings compare and reinforce Olmstead (2010)'s findings in which she argues that economic development, driven by the size of the labor force, positively contributes to the availability of high-quality drinking water. According to the author, this is partly driven by the availability of public finances dedicated to water pollution control. The variable capturing the number of vehicles, approximating the degree of infrastructure, also positively contributes to improved-quality drinking water (0.60 vs. -1.51). The argument is in line with the previous discussion. That is, everything that contributes positively towards economic development creates funding for improvements in the quality of drinking water. The same is true for the remaining variables which are statically significant in explaining improvements in drinking water; Tourism (1.69 vs. -4.07), GDP per capita (1.51 vs. -3.71), Private Investment (0.99 vs. -2.43), Government Consumption (1.90 vs. -4.69), Private Consumption per capita (1.84 vs. -4.51).

Rows seven and eight of Table 2 show the results for the first dependent variable capturing the quality of housing. The numbers show that the only variable statistically significant in explaining hard/permanent roof materials is the variable measuring the number of Small- and Medium-Sized Enterprises (0.05 vs. -2.51). The economic rationale is that entrepreneurship has a direct link to job creation and wage growth within the region (Malchow-Moller et al., 2011). As soon as more firms are created, people find employment, experience wage growth, and start improving their living conditions.

Regarding labor market conditions and the quality of wall materials, rows nine and ten, the size of the labor force (1.45 vs. -14.86), as well as, the employment rate (3.41 vs. 35.66-) are empirically important. As before, preferable labor-market conditions lead to increases in wages and therefore in disposable income. Since housing is the biggest portion of the latter, the quality of housing increases. The theoretical importance of the remaining statistically significant variables (Vehicles, Tourism, GDP per Capita, Private Investment, Government Consumption, and Private Consumption per Capita) guides in the same direction. That is, improvements in infrastructure and a growing economy both lead to improvements in disposable income and living conditions.

The last set of dependent variables (hard/permanent vs. soft/temporary floor materials) can be found at the bottom of Table 2. The two variables statistically important to explain the quality of floor materials are the Employment Rate (16.15 vs. -7.70) and Small- and Medium-Sized Enterprises (1.04 vs. -0.49). Regarding the former, this again confirms the income and wealth effects of households which argues that employment, income, and savings lead to higher levels of consumption and real-estate investment (Case and Quigley, 2008). The latter emphasizes the importance of entrepreneurship in the development process from the factor-driven over the efficiency-driven to the innovation-driven stages of economic progress and therefore its link to a higher degree of disposable income (Acs et al., 2008).

Table 2. Regression Results.

	Population	Labor Force	Employment rate	Primary Education	Secondary Education	Number of Schools	Number of Students	Educational Personal
Legal status								
Owned	-16.27	10.29	26.12	-1.89	-3.99	8.37	16.78	11.90
	(7.60)	(2.58)	(2.37)*	(2.75)	(3.77)	(4.19)	(11.20)	(8.97)
Family	82.17	-50.00	-128.06	8.59	20.66	-40.16	-85.64	-56.25
	(35.28)	(14.09)	(15.16)*	(13.78)	(18.03)	(21.81)	(52.95)	(45.79)
Rented	25.06	-14.35	-37.28	2.18	6.53	-11.26	-26.52	-15.39
	(9.34)	(4.78)	(6.08)*	(4.16)	(5.04)	(6.92)	(14.49)	(14.18)
Source of Water								
Improved	-4.93	5.81	13.22	-1.89	-0.52	5.49	3.86	8.89
	(6.55)	(0.65)*	(3.63)	(0.96)	(2.51)	(0.46)	(8.35)	(2.08)
Unimproved	14.97	-14.44	-33.85	4.18	2.39	-13.17	-13.18	-20.72
	(14.85)	(0.27)**	(5.85)	(2.75)	(5.99)	(2.37)	(19.47)	(7.08)
Roof								
Hard/permanent	-0.53	0.29	0.76	-0.04	-0.14	0.22	0.56	0.30
	(0.18)	(0.11)	(0.14)	(0.09)	(0.10)	(0.15)	(0.29)	(0.29)
Soft/ temporary	25.99	-14.65	-38.19	2.14	6.83	-11.42	-27.62	-15.49
	(9.30)	(5.08)	(6.69)	(4.30)	(5.11)	(7.25)	(14.59)	(14.76)
Wall								
Hard/permanent	-1.55	1.45	3.41	-0.41	-0.26	1.31	1.39	2.05
	(1.46)	(0.00)***	(0.52)*	(0.28)	(0.59)	(0.26)	(1.92)	(0.75)
Soft/ temporary	17.75	-14.86	-35.66	3.85	3.41	-13.13	-16.65	-20.13
	(14.03)	(0.88)**	(3.28)*	(3.16)	(5.95)	(3.49)	(18.92)	(8.92)
Floor								
Hard/permanent	-10.29	6.32	16.15	-1.10	-2.57	5.09	10.69	7.16
	(4.51)	(1.73)	(1.81)*	(1.72)	(2.29)	(2.71)	(6.74)	(5.72)
Soft/ temporary	-4.93	-3.01	-7.70	0.52	1.24	-2.42	-5.14	-3.39
	(2.13)	(0.84)	(0.89)*	(0.83)	(1.09)	(1.31)	(3.19)	(2.75)

*Notes: Values in brackets below the coefficients represent their respective standard errors. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.*

Table 2. Regression Results (continue).

	SME	Road Construction	Vehicles	Tourism	GDP per capita	Private Investment	Government consumption	Consumption per capita
Legal status								
Owned	1.68	0.54	1.10	2.66	2.51	1.66	3.25	3.06
	(0.04)**	(0.55)	(0.22)	(1.19)	(0.89)	(0.57)	(0.99)	(1.07)
Family	-8.29	-2.54	-5.37	-12.80	-12.15	-8.03	-15.77	-14.82
	(0.41)***	(2.79)	(1.26)	(6.21)	(4.76)	(3.04)	(5.35)	(5.69)
Rented	-2.44	-0.68	-1.55	-3.61	-3.45	-2.29	-4.50	-4.21
	(0.12)**	(0.85)	(0.44)	(1.99)	(1.55)	(0.99)	(1.77)	(1.86)
Source of Water								
Improved	0.78	0.46	0.60	1.69	1.52	0.99	1.90	1.84
	(0.32)	(0.16)	(0.09)*	(0.08)**	(0.03)**	(0.03)**	(0.12)**	(0.05)**
Unimproved	-2.05	-1.04	-1.51	-4.09	-3.71	-2.43	-4.69	-4.51
	(0.61)	(0.49)	(0.09)**	(0.57)*	(0.26)**	(0.15)**	(0.14)**	(0.29)**
Roof								
Hard/permanent	0.05	0.01	0.03	0.07	0.07	0.05	0.09	0.09
	(0.003)**	(0.02)	(0.009)	(0.04)	(0.03)	(0.02)	(0.04)	(0.04)
Soft/ temporary	-2.51	-0.67	-1.58	-3.66	-3.52	-2.33	-4.59	-4.29
	(0.15)**	(0.89)	(0.47)	(2.08)	(1.63)	(1.04)	(1.88)	(1.96)
Wall								
Hard/permanent	0.21	0.10	0.15	0.41	0.37	0.24	0.47	0.45
	(0.06)	(0.05)	(0.01)**	(0.06)*	(0.03)*	(0.02)**	(0.02)**	(0.04)*
Soft/ temporary	-2.20	-0.99	-1.57	-4.10	-3.76	-2.47	-4.79	-4.57
	(0.46)	(0.59)	(0.03)**	(0.92)	(0.57)*	(0.35)*	(0.52)*	(0.66)*
Floor								
Hard/permanent	1.04	0.32	0.68	1.62	1.54	1.02	1.99	1.87
	(0.001)***	(0.35)	(0.15)	(0.77)	(0.59)	(0.38)	(0.66)	(0.70)
Soft/ temporary	-0.49	-0.15	-0.32	-0.77	-0.73	-0.48	-0.95	-0.89
	(0.001)***	(0.17)	(0.08)	(0.37)	(0.29)	(0.18)	(0.32)	(0.34)

*Notes: Values in brackets below the coefficients represent their respective standard errors. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.*

4. Conclusion

One of the main goals of sustainable development is to improve the quality of life. This is evaluated using various dimensions and indicators, including the housing dimension, which is a significant factor affecting the quality of life. Therefore, the relationship between economic development and housing conditions has been the subject of much research and debate.

However, until to-date, empirical research has been scarce and, at best, inconclusive. This paper, therefore, is the first step to finding more concrete and statistically significant evidence about the empirical relationship in question. To do so, this paper's analysis employs Ordinary Least Squares and Methods-of-Moments regressions to model the interaction and conditional dependence between economic, socio-economic, and demographic variables on the one hand, and variables measuring housing and living conditions in Cambodia on the other. Results indicate that high employment rates and entrepreneurship increase home ownership, and improve the quality of drinking water available. Furthermore, in addition to employment and entrepreneurship, the higher-performing construction materials can also be empirically explained by a bigger labor force and variables capturing the wider macroeconomic environment.

The findings of this paper have significant implications for policymakers and stakeholders in the construction industry and economic governance alike. By identifying the factors that drive the improvement of housing that leads to a better quality of life, policymakers can make informed decisions on how to allocate resources efficiently and invest sustainably in the construction industry. Moreover, the results of this study can assist industry stakeholders in making informed decisions that benefit their businesses. By comprehending the factors that impact the level of construction activity, companies can identify growth prospects and enhance their competitive edge in the marketplace.

One shortcoming of the paper is that possible reverse-causality has not been taken into account. This might arise because the macroeconomic environment might be conditional on the state and quality of housing and living standards which in turn might drive the overall macroeconomic environment. This issue might be resolved using instrumental variables. Alas, data availability does not allow to do so and therefore this issue is left for further research.

To more thoroughly understand the interrelationship between the construction sector and overall economic activity, further research should focus on the development of the national financial sector and its importance in the allocation of resources efficiently to the real economy. Hereby, it is fundamental not only to discuss the aggregate picture but also the micro-level understandings and actions of individual economic actors (Gerth et al., 2021b; Gerth, forthcoming).

The third and last suggestion regarding future research in this field is the disruptive importance of the Covid-19 crisis on the Cambodian economy and what role fiscal and monetary policy played in allocating resources efficiently to the construction sector. This is important since not all industries in the economies reacted in the same way to the Covid-19 shock, nor did they behave uniformly to stabilizing measures (Gerth et al., 2021a).

Declaration of Competing Interest

The authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

References

Acs, Z. J. and Desai, S. and Hessels, J. (2008). "Entrepreneurship, economic development and institutions", Small Business Economics. Vol. 31, pages 219-234. https://doi.org/10.1007/s11187-008-9135-9

Anysz, H. and Nicał, A. and Stević, Ž., Grzegorzewski, M. and Sikora, K. S. (2020). „Pareto optimal decisions in multi-criteria decision making explained with construction cost cases". Symmetry. Vol. 13(1), pages 46. https://doi.org/10.3390/sym13010046

Arku, G. (2006). "The housing and economic development debate revisited: economic significance of housing in developing countries". Journal of Housing and the Built Environment. Vol. 21, pages 377–395. https://doi.org/10.1007/s10901-006-9056-3

Asian Development Bank. (2022). Asian Development Outlook 2022. https://www.adb.org/publications/asian-development-outlook-2022

Belsky, E.S. and Hidalgo, E. (2012). "Housing conditions and economic development in Latin America". Journal of Housing and the Built Environment, Vol. 27(2), pages 211-225.

Case, K. R. and Quigley, J. M. (2008) "How Housing Booms Unwind: Income Effects, Wealth Effects, and Feedbacks through Financial Markets", European Journal of Housing Policy. Vol. 8(2), pages 161-180. https://doi.org/10.1080/14616710802037383

Coface (2022). "Risk-Assessment-Studies/Cambodia" from https://www.coface.com/Economic-Studies-and-Country-Risks/Cambodia.

Gerth, F. (forthcoming). "Nexus between Financial Inclusion and Economic Activity: A Study about Traditional and Non-Traditional Financial Service Indicators Determining Financial Outreach", Financial Inclusion: In Pursuit of UN SDG 8.10, edited by Muschert, G. and Pereira V. and Ramiah, V. and Doker, A. C., Springer, Berlin.

Gerth, F. and Lopez, K. and Reddy, K. and Ramiah, V. and Wallace, D. and Muschert, G. and Frino, A. and Jooste, L. (2021b). "The Behavioural Aspects of Financial Literacy", Journal of Risk and Financial Management. Vol. 14(9), pages 1-16. https://doi.org/10.3390/jrfm14090395

Gerth, F. and Ramiah. V. and Toufaily, E. and Muschert, G. (2021a). "Assessing the effectiveness of Covid-19 financial product innovations in supporting financially distressed firms and households in the UAE", Journal of Financial Services Marketing. Vol. 26, pages 215-225. https://doi.org/10.1057/s41264-021-00098-w

Gerth, F. and Sikora, K. S. (forthcoming). "The Empirical Relationship Between Economic Development and the Construction Sector in Cambodia", Journal of Economic Development.

Hossain, M. and Alam, M.M. and Khan, M.A. and Kabir, M.A. (2018). "The effect of economic growth on housing conditions in developing countries: evidence from Bangladesh". Housing Studies. Vol. 33(7), pages 1063-1079.

Hu, M. and Lin, Z. and Liu, Y. (2022). "Housing Disparity between Homeowners and Renters: Evidence from China". Journal of Real Estate Finance and Economics. https://doi.org/10.1007/s11146-022-09932-x

Hughes, A. and Wright, R. (2015). "Housing and economic development: the influence of institutional factors". Housing Studies. Vol. 30(5), pages 732-751.

International Monetary Fund. (2022). World Economic Outlook - Real GDP growth

Klemm, A. J. and Sikora, K. S. (2012). „The effect of cement type on the performance of mortars modified by superabsorbent polymers". Alexander et al.(eds.): Concrete Repair, Rehabilitation and Retrofitting III. London: Taylor and Francis. Pages 210-216. https://doi.org/10.1201/b12750

Krieger J. and Higgins D.L. (2002). "Housing and health: time again for public health action". American Journal of Public Health. Vol. 92(5), pages 758-768. https://doi.org/10.2105/AJPH.92.5.758

Kurian, S. M. and Thampuran, A. (2011). "Assessment of housing quality". Institute of Town Planners, India Journal. Vol. 8(2), pages 74-85.

Li J. and Liang J. and Wang J. (2019). „Rural housing conditions and regional economic development in China". Habitat International. Vol. 90.

Liu H. and Zhao, Y. (2018). "Impact of credit on housing quality improvement: Evidence from rural China". China Economic Review. Vol. 48, pages 238-252.

Malchow-Moller, N. and Schjerning, B. and Sorensen, A. (2011). "Entrepreneurship, job creation and wage growth", Small Business Economics. Vol. 36, pages 15-32. https://doi.org/10.1007/s11187-009-9173-y

Mandic, S. and Cirman, A. (2012). "Housing Conditions and Their Structural Determinants: Comparisons within the Enlarged EU". Urban Studies. Vol. 49(4), pages 777-793. https://doi.org/10.1177/0042098011405688

O'Ceallaigh, C. and Sikora, K. S. and McPolin, D. and Harte, A. M. (2019). "The mechano-sorptive creep behaviour of basalt FRP reinforced timber elements in a variable climate". Engineering Structures. Vol. 200. https://doi.org/10.1016/j.engstruct.2019.109702

O'Ceallaigh, C. and Sikora, K. S. and McPolin, D. and Harte, A. M. (2020). "Modelling the hygro-mechanical creep behaviour of FRP reinforced timber elements". Construction and Building Materials. Vol. 259. https://doi.org/10.1016/j.conbuildmat.2020.119899

Olmstead, S. M. (2010). "The Economics of Water Quality", Review of Environmental Economics and Policy. Vol. 4(1), pages 44-62. http://dx.doi.org/10.1093/reep/rep016

Pivo, G. and McNamara P. (2015). "The impact of culture on housing and economic development". Journal of Housing and the Built Environment, 30(3):517-528.

Ramezani M. and Bagheri A. and Sajjadi, S.N.A. (2019). "Housing conditions and economic development: a comparative study". Journal of Housing and the Built Environment. Vol. 34(2), pages 661-679.

Sikora, K. S., and Klemm, A. J. (2014). "The effect of superabsorbent polymers on performance of fly ash cementitious mortars exposed to accelerated freezing/thawing conditions". International Journal of Computational Methods and Experimental Measurements. Vol. 2(3), pages 255-268. https://doi.org/10.2495/CMEM-V2-N3-255-268

Sinha, R.C. and Sarkar, S. and Mandal, N.R. (2017). "An Overview of Key Indicators and Evaluation Tools for Assessing Housing Quality: A Literature Review". Journal of the Institution of Engineers. Vol. 98, pages 337–347. https://doi.org/10.1007/s40030-017-0225-z

Statistical Yearbook of Cambodia (2021). Ministry of Planning, Cambodia.

Streimikiene, D. (2015). "Quality of life and housing". International Journal of Information and Education Technology. Vol. 5(2). http://dx.doi.org/10.7763/IJIET.2015.V5.491

Tan, T.-H. (2008). "Determinants of homeownership in Malaysia". Habitat International. Vol. 32, pages 318-335. https://doi.org/10.1016/j.habitatint.2007.11.006

United Nations. (1948). Universal Declaration of Human Rights.

World Bank (2016) World Development Report 2016: Digital Dividends. World Bank Publications.

World Bank (2022a). "Cambodia/overview." from https://www.worldbank.org/en/country/cambodia/overview.

World Bank. (2022b). Cambodia Economic Update, April 2022: Toward a Resilient Recovery. https://www.worldbank.org/en/country/cambodia/publication/cambodia-economic-update-april-2022-toward-a-resilient-recovery.

Xing, W. and Hao, J. and Sikora, K. S. (2019). "Shear performance of adhesive bonding of cross-laminated bamboo". Journal of Materials in Civil Engineering. Vol. 31(9). http://dx.doi.org/10.1061/(ASCE)MT.1943-5533.0002854

Xing, W. and Hao, J. L. and Qian, L. and Tam, V. W. and Sikora, K. S. (2021). "Implementing lean construction techniques and management methods in Chinese projects: A case study in Suzhou, China". Journal of Cleaner Production. Vol. 286. https://doi.org/10.1016/j.jclepro.2020.124944

Yang. C.-H. and Chen, J.-R. and Chuang, W.-B. (2004). "Technology and Export Decision", Small Business Economics. Vol. 22, pages 349-364. https://doi.org/10.1023/B:SBEJ.0000022213.61143.37