(2023) 53, 23–42

The Review of Regional Studies

The Official Journal of the Southern Regional Science Association

# Regional Infrastructure Effects on the Life Satisfaction of Rural and Urban Residents. A Case Study for Ecuador*

Grace Guevara-Rosero

*Department of Quantitative Economics, Escuela Politécnica Nacional, Ecuador*

**Abstract:** In developing countries, many households lack basic household services and the provision of utility infrastructure is uneven across regions, leaving lagged regions behind. This lack of infrastructure in specific places can affect the welfare of its inhabitants. This paper aims to measure the influence of household basic services and sub-national infrastructure activities on individual subjective well-being in Ecuador. To determine how important the geographical context is for individual welfare, a hierarchical ordered logistic multilevel model is conducted. The results show that the individual heterogeneity is explained in 7% by the variation across cantons. There are 52 cantons that are above the average life satisfaction and 43 cantons below it. Findings regarding infrastructure evidence that sub-national utility projects and road infrastructure have a positive significant effect on the life satisfaction of rural residents whereas it is not significant for urban residents, indicating the diminishing marginal utility of urban people. Once a satiation point is achieved, marginal utility increases are lower. As for household services, access to the internet has a higher positive welfare effect than access to sewerage and access to water via pipelines.

*Keywords*: life satisfaction, urban-rural, infrastructure, household, Latin America

*JEL Codes*: R28, D60, O18

## 1. INTRODUCTION

The conceptualization of welfare has been a necessary and hard task for societies, with particular urgency in developing countries toward a better understanding of the conditions under which poverty persists. On theoretical grounds, well-being can be conceived as an interplay of three main components: i. the resources that a person has, ii. what they can achieve with those resources and iii. the future goals and aspirations that they have (Gough and McGregor, 2007). Given the complexity of this phenomenon, there is not a universally accepted measure of welfare (Ferrara and Nisticò, 2015). Several approaches have

*Guevara-Rosero is an associate professor in the Department of Quantitative Economics of Escuela Politécnica Nacional in Quito, Ecuador. She also gives lectures in master programs at Universidad Técnica Particular de Loja.*Corresponding Author:* G.C. Guevara-Rosero, E-mail: carolina.guevara@epn.edu.ec


**ISSN 1553-0892, 0048-49X (online)**
**www.srsa.org/rrs**

been undertaken, ranging from the widely criticized income measure to subjective measures such as happiness and life satisfaction. While happiness is a self-assessment of the pleasant effects of a particular aspect, life satisfaction takes into account several domains of life (Diener et al., 1999). To study welfare, objective circumstances, and subjective perceptions, which are shaped by a given context (social, economic, political, geographical, etc.), need to be considered (Gough and McGregor, 2007; Berry and Okulicz-Kozaryn, 2009; Knight and Gunatilaka, 2010; Easterlin et al., 2011). With respect to objective aspects, the satisfaction of basic needs is a key element to analyze. Basic needs must be satisfied first, and then, higher capabilities allow people to meet new challenges and enhance their well-being. However, in many countries, especially in developing ones, basic needs are hardly satisfied. These lacks compromise the achievement of the well-being of their population. Particularly, in Latin America, 26% of households struggle to satisfy their basic housing needs such as sanitation, water, and space (Inter-American Development Bank, 2012). So far, the literature considers that income is a key element to determine satisfaction regarding basic needs for food, water, and shelter (Florida et al, 2013). However, the infrastructure for household basic services is an external factor that does not depends on the individuals' income but on governments. This study aims to determine the well-being effect of access to basic housing services and the marginal well-being increase of sub-national infrastructure such as road construction and utility projects in Ecuador. It also aims to distinguish the marginal effect of such infrastructure on urban and rural residents.

The effect of basic housing services on well-being is expected to be higher in developing countries, especially in rural areas where a satiation point regarding these needs is not reached yet (Stevenson and Wolfers, 2013). At low levels of consumption of housing services, additional units make individuals happier. Once the satiation point is reached, generally in urban areas, there would be small increases in well-being (Diener and Seligman, 2004). To analyze the levels of satiation, the indicator of unsatisfied basic needs (UBN) is useful. According to this indicator, rural-urban differences are clearly evident in Ecuador with an index of poverty in terms of UBN of 61.6% in rural areas and 21.4% in urban ones in 2019. This shows that in rural areas, compared to urban areas, a higher proportion of the population has households that lack adequate conditions and basic services. Moreover, the basic service coverage in Ecuador varies across types of cities. While a metropolis has 92% and 78% of households with water served by pipelines and sewerage, respectively, small cities record lower coverage in those services with 78% and 54%, respectively (Ministerio de Desarrollo Urbano y Vivienda, 2015). Such geographical disparities in terms of basic infrastructure dotation might influence the well-being of individuals in those areas. As long as people have unmet needs, they can hardly have good levels of well-being. Given this, infrastructure projects to provide basic household services in places with low provision are key elements to improve the life quality of inhabitants. In Ecuador, infrastructure activities are present in 175 cantons out of 221. In 2015, 138 cantons recorded less than 10 infrastructure projects in spite of the fact that their population lacks basic household services. The resources are mainly devoted to big cities whereas small cities with low coverage of basic infrastructure have less funding which leaves them even more lagged.

By focusing on the case of Ecuador, this study seeks to determine the individual's welfare effect of both the basic service infrastructure of the household and the infrastructure of the

canton where he/she lives by distinguishing the rural and urban context of the individual. This approach allows analyzing the welfare effect considering the existent and direct access and consumption of infrastructure, on the one hand, and the additional and indirect infrastructure of the location where individuals live, on the other hand. To do so, a multilevel ordinal logistic model is conducted, using a module on the subjective well-being of the ENEMDU survey for 2014 and 2015 of Ecuador. Results evidence that the heterogeneity of life satisfaction is explained by differences across cantons in 7%. The availability of sewerage in a household is important for individual welfare but access to the internet has a higher positive effect. Regarding the contextual infrastructure, the effect of the construction of utility projects is higher for rural residents than for urban ones, reflecting the diminishing marginal utility principle. The consumption of additional units of utility infrastructure makes individuals in urban places less happy than the consumption of previous ones. As the satiation point in this type of infrastructure is not reached in rural areas, their residents report increasing utilities for marginal increases. While an increase from \$0 to \$8192 of productivity in utility projects makes rural residents more likely to report a high level of life satisfaction by 2.2 p.p, the same productivity increase makes urban residents more likely to report a high level of life satisfaction only by 1.7 p.p. As for Other infrastructure activities such as industrial facilities, it positively affects urban residents and negatively affect rural ones.

The remainder of this paper is structured as follows. Section 2 presents a brief literature review on the role of infrastructure in the well-being of the population. Section 3 describes data and econometric methodology. Section 5 discusses the results and Section 6 concludes.

## 2. LITERATURE REVIEW

The infrastructure, besides being a growth determinant, is an important well-being driver since it facilitates human capital development, increases the standard of living, and in turn, improves the distribution of wealth when is also focused on deprived areas (Schwartz, 2011; Popova, 2017). Infrastructure investment can improve the quality of life for the population without having a direct impact on their income (Haughwout, 2001). For instance, transport infrastructure such as roads is necessary to carry food between rural and urban places, workers to workplaces, children and young people to educational institutions, etc. Therefore, infrastructure is a means to do daily activities that have an important welfare role. For instance, highway infrastructure allows traveling and trading at lower costs, which has a positive impact on welfare. Such impact varies across highway segments (Allen and Arkolakis, 2022). Additionally, access to publicly provided goods and services is an important source of welfare (Boltvinik, 2003). The well-being of people, especially in rural areas, would improve when they have access to household sewerage connections, drinking and irrigation water, to roads, among other utility facilities. In this sense, infrastructure is a powerful tool to reduce regional disparities making some lagged territories more attractive for people and industrial settlement (Popova, 2013). From the cost-benefit analysis of water supply and sewerage projects, their benefits are multidimensional in fields such as economics, health, amenity, and ecology (Vucijak and Ceric, 2010). In line with the health edge, Soares (2009) obtained that mortality has reduced in Latin America due to the provision of treated water and sewerage services. More literature about utility projects focuses on the efficiency differences

between the public and private provision of these services (Galiani et al., 2005; Smith et al., 2018). Regarding rail infrastructure, Knaap and Oosterhaven (2011) shows that it has an effect of redistribution of employment towards the invested area.

Especially, in developing countries, the existing poverty in lagged areas may reduce with the provision of infrastructure since it allows for satisfying some basic needs. Besides, infrastructure in rural areas can have an impact on the reduction of peri-urban poverty in cities, generated by urban-rural migrations. Thus, infrastructure can kill two birds with one stone.

It is expected that rural residents in less advantageous conditions in terms of the construction of roads and utility projects have a higher marginal utility as compared to urban residents. For those people with a low provision of infrastructure, the effect of having one more unit increases their utility to a larger extent than for those people with a high provision of infrastructure. Sapkota (2018) focusing on rural Nepal observed that perceived impacts of access to infrastructure were higher in more remote areas. Once the physical infrastructure is sufficient, generally achieved in urban areas, additional benefits are marginal (Stone and Strutt, 2010). On the contrary, the rural populations have double the benefits of infrastructure on the current standard of living and future additional gains (Popova, 2013). To the best of our knowledge, the differences in the effect of infrastructure on life satisfaction across urban and rural residents have not been studied from a holistic perspective, only from an isolated rural one with Sapkota (2018).

## 3. METHODOLOGY

### 3.1. Data

The database combines two types of data: individual data from the National Survey of Employment, Unemployment and Underemployment of 2014 and 2015 of Ecuador (ENEMDU, Spanish acronym); and aggregate data from the Directory of firms and the Regional Accounts from the Central Bank of Ecuador. Both types of data are available online where technical information is provided. The data is arranged to apply the multilevel methodology which is grounded on empirical evidence (Frey and Stutzer, 2002; Schyns, 2002; Di Tella et al., 2003; Helliwell, 2003; Carr et al., 2011; Levin et al., 2011; Ballas and Tranmer, 2012; Ngamaba, 2017; Novak and Pahor, 2017) that analyze the effects of aggregate variables such as national income, inequality, and education. The infrastructure, however, has been neglected despite that it is a key element that provides basic conditions for the functioning of a society. By using novel data of firms dedicated to infrastructure, the specific effect of this item is assessed on urban and rural residents.

### 3.2. Estimation strategy

To identify the determinants of self-reported life satisfaction, ordered logit models and multilevel models have been used. The former does not deal with the hierarchical structure of the data where individuals are nested within cantons (De Leeuw and Meijer, 2008). To deal with the resulting intra-canton correlation, a two-level variance components ordinal logistic regression is employed:

$$\mathrm{LS}_i = \beta_0 + \beta_1 X_i + \beta_2 X_{canton(i)} + u_{canton(i)} + e_i \quad (1)$$

where $\mathrm{LS}_i$ is the life satisfaction of individual $i$, $X_i$ is a vector of individual variables and $X_{canton(i)}$ is a vector of cantonal variables, $u_{canton(i)}$ represents the cantonal random effects and $e_i$ is the error term. The individual variables are socioeconomic and demographic characteristics, typically used in the literature (Blanchflower and Oswald, 2004). The sociodemographic variables are sex with a female as the reference category, the age, the age squared, the ethnic auto-identification (mestizo, afro-descendent, indigenous, montubio, white, and other) with mestizo as the category of reference, the civil status (married, single, free union, widowed, divorced, separated) with single as the reference category. The socio-economic variables are the personal income in logarithm, whether the person worked the last week, the level of education (no education, primary education, secondary education, and tertiary education) with no education as a reference category, whether the person accounts for medical insurance, whether the individual does sports activities, whether the person is a homeowner and whether the person has been the victim of a crime. In addition, variables associated with satisfaction with other aspects of life are included. They are the satisfaction level with social relations, with the government, and with the family. The lowest levels of satisfaction are the reference categories. These satisfaction variables are recategorized in the same way as the dependent variable. Contextual variables are given by household variables and cantonal variables. Household variables are related to the type of access route, sewerage, pipelines, and urban/rural area. The cantonal variables are the population density, the gross value added and the labor productivity of activities[1] related to basic infrastructure in year $t$. The basic infrastructure refers to i. construction of roads and railways[2], ii. construction of utility projects[3], iii. construction of other civil engineering projects[4].

The use of the labor productivity of infrastructure in the current year allows us to determine the additional welfare benefit of infrastructure utilities that people obtain given an existent level of infrastructure. In big cities, the additional benefit of infrastructure would be marginal since these cities already account for a sufficient or almost sufficient level of infrastructure meanwhile in small cities the additional benefit of infrastructure would be

[1]The number of establishments dedicated to infrastructure can also be used. However, the number hides how big the infrastructure projects are, limiting the analysis of the effective impact of infrastructure on well-being.

[2]The activity of construction of roads and railways (F4210) includes the construction of motorways, streets, roads, and other vehicular and pedestrian ways, surface work on streets, roads and highways, bridges or tunnels, construction of bridges, including those for elevated highways, construction of tunnels, construction of railways and subways and construction of airfield runways.

[3]This activity of utility projects includes the construction of distribution lines and related buildings and structures that are integral parts of these systems. These civil engineering constructions are for long-distance pipelines, communication and power lines, urban pipelines, urban communication, and power lines; ancillary urban works, water main and line construction, irrigation systems (canals), and reservoirs. This class also includes the construction of sewer systems, including repair, sewage disposal plants, pumping stations, and power plants.

[4]This activity (F4290) includes the construction of industrial facilities such as refineries and chemical plants, construction of waterways, harbor and river works, pleasure ports, dams, and dykes, dreading of waterways, outdoor sports facilities. This class also includes land subdivisions with land improvements such as adding of roads and utility infrastructure.

high as those places account for low levels of infrastructure.

To determine the validity of the multilevel model over the single-level ordered logit, the Likelihood ratio test is employed. The results show that the statistic chibar2(01) = 1451.49 with a p-value of 0.000, which indicates that the second-level cantonal random effects are significant, so a multilevel model is appropriate.

### *3.2.1. Dependent Variable*

The measure of subjective well-being is based on the self-reported life satisfaction obtained from the perception module of the ENEMDU survey. Life satisfaction considers several domains such as work, family, leisure, health, etc. (Diener et al., 1999). According to this survey, this variable is reported on a scale from 0 to 10 where 0 represents the lowest level of life satisfaction and 10 is the highest level. Due to parsimony reasons, the 0-10 scale is subdivided into three categories so that each category has at least 10% of individuals. According to this, the first 5 levels are re-categorized as Low-Life-Satisfaction-Level (LLS), the 6th and 7th levels are re-categorized as Medium-Life-Satisfaction-Level (MLS), and finally, the 8th to 10th levels are re-categorized as High-Life-Satisfaction-Level (HLS) as shown in Table 1.

**Table 1:** Distribution of the life satisfaction

| **Original Scale** | **% Cumulative** | **Re-classification** |
|---|---|---|
| 0 | 0.07 | (1) Low Life Satisfaction Level (LLS) |
| 1 | 0.25 | |
| 2 | 0.67 | |
| 3 | 1.57 | |
| 4 | 3.91 | |
| 5 | 12.26 | |
| 6 | 24.23 | (2) Medium Life Satisfaction Level (MLS) |
| 7 | 45.26 | |
| 8 | 74.22 | (3) High Life Satisfaction Level (HLS) |
| 9 | 89.22 | |
| 10 | 100.00 | |

*Source:* National Survey of Employment, Unemployment and Underemployment, 2014-2015.

As shown in Table 1, people tend to report high levels of satisfaction with more than 87.7% reporting at least a level of 6 on the 0-10 scale, and only 1.6% of people report lower levels of life satisfaction than 3. The average life satisfaction is 2 on a three-point scale.

### *3.2.2. Variable of interest: Infrastructure*

The labor productivity of activities related to basic infrastructure in year t is obtained from the Directory of firms. The basic infrastructure refers to i. construction of roads and

railways[5], ii. construction of utility projects[6], iii. construction of other civil engineering projects[7]. The number of establishments dedicated to infrastructure can also be used. However, the number hides how big the infrastructure projects are, limiting the analysis of the effective impact of infrastructure on well-being.

In Ecuador, infrastructure activities are present in 175 cantons out of 221. More specifically, road infrastructure activities, utility projects, and Other infrastructure are present in 143 cantons, 103 cantons, and 43 cantons, respectively. In 2015, 138 cantons recorded less than 10 infrastructure projects in spite of the fact that their population lacks basic household services. For instance, the cantons General Antonio Elizalde and Colimes recorded only one infrastructure project despite that 51% and 80% of their populations, respectively, lack sewerage systems. Cantons with more infrastructure projects were Guayaquil (1100), Quito (712), Cuenca (155), and Portoviejo (147). The first three cities, however, have high coverage of sewerage of 91% in Quito, 85% in Cuenca, and 82% in Guayaquil. The resources are mainly devoted to big cities whereas small cities with low coverage of basic infrastructure have less funding which leaves them even more lagged.

In 2014, the labor productivity of basic infrastructure projects was USD$59,709 and in 2015, it decreased to USD$42,333. In particular, the average labor productivity in Other infrastructure activities was lower than the average productivity in road infrastructure and utility infrastructure in both years. As for road infrastructure, in 2015, 46 cantons record higher productivity levels than the average (USD$ 48,917), and 95 cantons recorded lower productivity. Regarding the utility projects, only 37 cantons record higher productivity than the average (USD$ 43,209), and 64 cantons record lower productivity. With respect to Other infrastructure, only 14 cantons record higher labor productivity than the average (USD$ 34,872) and 27 cantons record lower productivity.

## 4. DISCUSSION

Table 2 shows the results of the simple ordered logistic multilevel model in column (1), the multilevel model including individual characteristics in column (2), the multilevel model including infrastructure variables at the cantonal level in column (3) and the multilevel model including interaction terms between urban and infrastructure variables in column (4). For dichotomous variables, the reference groups are in parentheses. Only the significance of the

[5]The activity of construction of roads and railways (F4210) includes the construction of motorways, streets, roads, and other vehicular and pedestrian ways, surface work on streets, roads and highways, bridges or tunnels, construction of bridges, including those for elevated highways, construction of tunnels, construction of railways and subways and construction of airfield runways.

[6]This activity of utility projects includes the construction of distribution lines and related buildings and structures that are an integral part of these systems. These civil engineering constructions are for long-distance pipelines, communication and power lines, urban pipelines, urban communication, and power lines; ancillary urban works, water main and line construction, irrigation systems (canals), and reservoirs. This class also includes the construction of sewer systems, including repair, sewage disposal plants, pumping stations, and power plants.

[7]This activity (F4290) includes the construction of industrial facilities such as refineries and chemical plants, construction of waterways, harbor and river works, pleasure ports, dams, and dykes, dreading of waterways, outdoor sports facilities. This class also includes land subdivision with land improvement such as adding of roads and utility infrastructure.

coefficients is interpreted from these results. Tables 3 and 4 record the interpretable marginal effects using average adjusted predictions of the individual and household variables, and the infrastructure variables, respectively.

**Table 2:** Estimation results of the multilevel ordered logistic model

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | empty model | Indiv. Factors | Context. Factors | Context 2 factors | Context urban |
| *Contextual household variables* | | | | | |
| urban | | | 0.0452 | | 0.0361 |
| | | | (0.026)* | | (0.050) |
| no internet | | | -0.127 | -0.130 | -0.126 |
| | | | (0.023)*** | (0.023)*** | (0.023)*** |
| paved road | | | -0.00998 | -0.00553 | -0.0110 |
| | | | (0.022) | (0.021) | (0.022) |
| sewerage | | | 0.0373 | 0.0525 | 0.0356 |
| | | | (0.026) | (0.025)** | (0.026) |
| pipeline | | | 0.0507 | 0.0565 | 0.0510 |
| | | | (0.034) | (0.034)* | (0.034) |
| *Contextual cantonal variables* | | | | | |
| ln GVApc | | | -0.0109 | -0.0140 | -0.00954 |
| | | | (0.012) | (0.012) | (0.012) |
| ln pop density | | | -0.0110 | -0.00743 | -0.0112 |
| | | | (0.016) | (0.016) | (0.016) |
| ln road act. prodtvty | | | 0.00794 | 0.00819 | 0.00788 |
| | | | (0.003)** | (0.003)** | (0.003)* |
| ln utility projects prodtvty | | | 0.0108 | 0.0109 | 0.0123 |
| | | | (0.002)*** | (0.002)*** | (0.003)*** |
| ln other infr. prodtvty | | | 0.00299 | 0.00315 | -0.00149 |
| | | | (0.002) | (0.002) | (0.003) |
| urban*ln road act. prodtvty | | | | | -0.000136 |
| | | | | | (0.004) |
| urban*ln utility proj prodtvty | | | | | -0.00321 |
| | | | | | (0.003) |
| urban*ln other infr. prodtvty | | | | | 0.00744 |
| | | | | | (0.003)* |
| *Individual factors* | | | | | |
| male (ref. female) | | 0.0817 | 0.0695 | 0.0808 | 0.0816 |
| | | (0.027)** | (0.027)** | (0.027)** | (0.027)** |
| age | | -0.0120 | -0.00941 | -0.0120 | -0.0120 |
| | | (0.003)** | (0.003)** | (0.003)** | (0.003)** |
| age squared | | 0.000103 | 0.0000786 | 0.000103 | 0.000104 |
| | | (0.000)** | (0.000)* | (0.000)** | (0.000)** |
| worked (ref. did not work) | | 0.137 | 0.126 | 0.134 | 0.136 |
| | | (0.026)*** | (0.026)*** | (0.026)*** | (0.026)*** |
| ln income_pc | | 0.0880 | 0.101 | 0.0888 | 0.0877 |
| | | (0.008)*** | (0.008)*** | (0.008)*** | (0.008)*** |
| insurance (ref. no insurance) | | 0.0727 | 0.0748 | 0.0707 | 0.0732 |
| | | (0.019)** | (0.019)** | (0.019)** | (0.019)** |
| sport (ref. no sport practice) | | 0.121 | 0.126 | 0.122 | 0.122 |
| | | (0.021)*** | (0.021)*** | (0.021)*** | (0.021)*** |

| | | | | | |
|---|---|---|---|---|---|
| crime (ref. no crime victim) | | -0.0969 | -0.0926 | -0.0963 | -0.0978 |
| | | (0.041)* | (0.040)* | (0.041)* | (0.041)* |
| (ref. none_alpha) | | 0.0558 | 0.0688 | 0.0578 | 0.0561 |
| primary_educ | | (0.038) | (0.038) | (0.038) | (0.038) |
| secondary_educ | | 0.120 | 0.168 | 0.125 | 0.119 |
| | | (0.043)** | (0.042)*** | (0.043)** | (0.043)** |
| higher_educ | | 0.285 | 0.361 | 0.290 | 0.283 |
| | | (0.049)*** | (0.048)*** | (0.049)*** | (0.049)*** |
| homeowner (ref. no homeowner) | | 0.109 | 0.104 | 0.105 | 0.108 |
| | | (0.021)*** | (0.021)*** | (0.021)*** | (0.021)*** |
| indigenous (ref. mestizo) | | -0.0925 | -0.134 | -0.104 | -0.0983 |
| | | (0.034)** | (0.033)*** | (0.034)** | (0.034)** |
| afro-descendent | | 0.0413 | 0.0380 | 0.0430 | 0.0409 |
| | | (0.047) | (0.047) | (0.047) | (0.047) |
| montubio | | 0.00968 | -0.0121 | 0.0119 | 0.0148 |
| | | (0.056) | (0.056) | (0.056) | (0.056) |
| white | | 0.139 | 0.135 | 0.140 | 0.140 |
| | | (0.068)* | (0.068)* | (0.068)* | (0.068)* |
| other | | 0.290 | 0.285 | 0.297 | 0.294 |
| | | (0.409) | (0.409) | (0.409) | (0.409) |
| married (ref. single) | | 0.0232 | 0.0494 | 0.0219 | 0.0239 |
| | | (0.034) | (0.034) | (0.034) | (0.034) |
| separated | | -0.104 | -0.0985 | -0.103 | -0.102 |
| | | (0.040)** | (0.040)* | (0.040)** | (0.040)** |
| divorced | | -0.0606 | -0.0494 | -0.0604 | -0.0611 |
| | | (0.050) | (0.050) | (0.050) | (0.050) |
| widow | | -0.152 | -0.141 | -0.153 | -0.152 |
| | | (0.042)** | (0.042)** | (0.042)** | (0.042)** |
| free union | | -0.00461 | 0.00695 | -0.00503 | -0.00446 |
| | | (0.036) | (0.036) | (0.036) | (0.036) |
| *Satisfaction variables* | | | | | |
| med. satisf. gov. (ref. low) | | 0.633 | 0.634 | 0.632 | 0.632 |
| | | (0.019)*** | (0.019)*** | (0.019)*** | (0.019)*** |
| high satisf. gov. | | 1.598 | 1.595 | 1.597 | 1.597 |
| | | (0.027)*** | (0.026)*** | (0.027)*** | (0.027)*** |
| med. satisf. soc. (ref. low) | | 1.031 | 1.033 | 1.031 | 1.032 |
| | | (0.021)*** | (0.021)*** | (0.021)*** | (0.021)*** |
| high satisf. soc. | | 2.004 | 2.006 | 2.003 | 2.005 |
| | | (0.027)*** | (0.027)*** | (0.027)*** | (0.027)*** |
| med. satisf. fam. (ref. low) | | 0.757 | 0.762 | 0.756 | 0.756 |
| | | (0.030)*** | (0.030)*** | (0.030)*** | (0.030)*** |
| high satisf. fam. | | 1.458 | 1.467 | 1.457 | 1.456 |
| | | (0.030)*** | (0.030)*** | (0.030)*** | (0.030)*** |
| cut1 | -1.121 | 1.852 | 1.640 | 1.638 | 1.645 |
| | (0.038)*** | (0.108)*** | (0.155)*** | (0.156)*** | (0.156)*** |
| cut2 | 1.132 | 4.913 | 4.705 | 4.702 | 4.711 |
| | (0.038)*** | (0.110)*** | (0.157)*** | (0.157)*** | (0.158)*** |
| Constant | 0.249 | 0.144 | 0.144 | 0.152 | 0.151 |
| | (0.030)*** | (0.020)*** | (0.020)*** | (0.021)*** | (0.021)*** |
| N | 57926 | 57926 | 57926 | 57926 | 57926 |
| chi2 | | 17702.3 | 17740.1 | 17738.3 | 17742.0 |
| p-value chi2 | | 0 | 0 | 0 | 0 |
| Random canton effects | 0.251994 | 0.1441034 | 0.1504437 | 0.151596 | 0.1509448 |

| | | | | | |
|---|---|---|---|---|---|
| LR test | 1407.14 | 562.12 | 555.91 | 558.26 | 544.89 |
| p-value LR test | 0 | 0 | 0 | 0 | 0 |

Standard errors are in parentheses and significance is given by: $*p < 0.05, **p < 0.01, ***p < 0.001$.

The results of the empty multilevel ordinal logistic model show that the heterogeneity of the self-reported life satisfaction is explained by between-canton variation in 7% (0.252/(0.252+3.29)), as in Pontarollo et al. (2020). This means that individuals of the same canton tend to report a similar level of life satisfaction which could be explained by the availability of the same services and amenities that a given canton provides. While life satisfaction is a specific individual measure, regional disparities matter to explain such heterogeneity. The canton-specific impact on life satisfaction is larger in the empty model than in the model including individual (4.2%) and in the model including contextual variables (4.3%). It implies that these variables explain 3% of the heterogeneity. The remaining 4%, which is not explained, might be due to unreported infrastructure related to urban amenities such as hospitals, parks, entertainment centers, etc., or a possible sorting of people that are highly satisfied with their lives living in specific cities, generally, big ones. By means of this methodology, a ranking of the predicted cantonal random effects ($u_{canton(i)}$) with their confidence intervals, is obtained using the empty model. Cantons are, then, ranked according to their level of life satisfaction. There are 95 cantons whose confidence intervals do not overlap the zero line, indicating that the life satisfaction level is significantly different from the average probability. There are 52 cantons that are above the average and 43 cantons below it. Among the cantons with the highest rank (see Table 3 and Figure 2) and therefore the highest level of life satisfaction, we have San Cristobal, Isabela, and Santa Cruz, which are all the cantons of the Galapagos region. Surprisingly, the metropolitan cities of Quito, Guayaquil, and Cuenca are not ranked in the first positions, instead, they are in the 108th, 119th, and 77th positions, respectively. This indicates that big cities, in spite of providing many services and amenities, could cause discomfort to the population due to congestion. Among the cities with the lowest levels of life satisfaction, we have three cities in the rainforest region of the country (Gonzalo Pizarro, Cascales and Putumayo), four coastal cities (Paján, Puebloviejo, Vinces and Muisne) and three cities of the highland region (Nabón, Penipe, and Bolívar).

Regarding the cut points of the parsimonious "empty" model (1), the log-odds of reporting a medium (MLS) and a high level of life satisfaction (HLS) is 1.121 which corresponds to a probability of 75.4% (exp(1.121)/(1+exp(1.121)). Differently put, the probability of reporting a low level of life satisfaction (LLS) is 24.6% (1-0.754). The second cut point is estimated at 1.132 which indicates that the probability of reporting an HLS is 24.4% (exp(-1.132)/(1+exp(-1.132)). The distribution of life satisfaction records 25% of the population in LLS and 25% of the population in HLS.

The results on the socio-economic and demographic variables are in line with the existing literature. As the education level increases the likelihood of reporting an HLS increases from 12% (secondary education) to 28% (tertiary education) with respect to people that do not have any level of formal education. People that invest in human capital can have better opportunities that allow them to reach higher levels of welfare (Helliwell, 2003; Jiang et al., 2012). As the literature for developing countries suggests, income is an important source

of welfare (Veenhoven, 1991; Clark et al., 2008). In the same line, employed individuals, compared to unemployed people, have a 13% higher likelihood of reporting an HLS (Clark and Oswald, 1994; Ravallion and Lokshin, 2001; Graham, 2008). Furthermore, people who play sports are more likely to report an HLS than people who do not play sports. As a recreational activity, sports play an important role in welfare (Ferrer-i Carbonell and Gowdy, 2007). Contrary to Clark et al. (2008), our result shows that the effect of income is four percentage points lower than the effect of leisure activities. Another condition to have an adequate level of life satisfaction is the tenancy of insurance as the likelihood of reporting an HLS 7% higher than people who do not have any insurance.

As the well-being involves surrounding environment of individuals, variables regarding household conditions are analyzed. When a household accounts for sewerage and the water that receives is via pipelines, the individual living there is more prone to report HLS with respect to an individual whose household lacks these services. The significant effects of sewerage and pipelines reduce when including the dichotomous variable urban, which was expected since households located in urban areas are more likely to have those services. By contrast, whether the main access route to the household is paved or not does not matter for the well-being of the individual.

Regarding the cantonal contextual variables, while the gross value added and the population density are not significant, the infrastructure variables have a significant effect on individual life satisfaction. Specifically, road infrastructure and utility projects increase the level of welfare of individuals. To determine whether this effect changes depending on the place where people live, urban or rural, an interaction term with the urban variable is included. The associated coefficient of the interaction term indicates the effect of the different types of infrastructure on urban residents and the coefficient of the simple infrastructure variables indicates their effect on rural residents. The results show that the simple coefficients of construction of roads and utility projects infrastructure are significant, which shows that these types of infrastructure increase the life satisfaction of rural residents. For urban residents, the construction of roads and utility projects do not affect their life satisfaction whereas, for rural residents, these works increase. This result appeals as a satiation point for urban residents as they account for enough basic infrastructure, additional works do not increase their well-being (Stevenson and Wolfers, 2013). As for rural residents, such a satiation point is not achieved with existing basic infrastructure so additional work does increase their well-being. Only the effect of other works of infrastructure (industrial facilities and outdoor sports facilities) is significantly positive for urban residents which indicates that such satiation point regarding these facilities is not yet satiated.

To interpret the magnitudes of the coefficients of the multilevel ordered logistic model, the marginal effects using Average Adjusted Predictions are analyzed in Table 4 for continuous variables and Table 5 for dichotomous variables. It is worth noting that the marginal effects of LLS, MLS and HLS sum zero because as some options become more likely, others become less likely.

As the effect of infrastructure varies by the place where a person lives, the marginal effects of area (urban, rural) at different levels of infrastructure are calculated. The marginal effects of changes from 0 to the mean productivity in logarithm and incremental units are presented in Table 4. For instance, an increase from 0 to 14 ($0 to $16 384) of productivity

**Figure 1: Cantonal random effects**

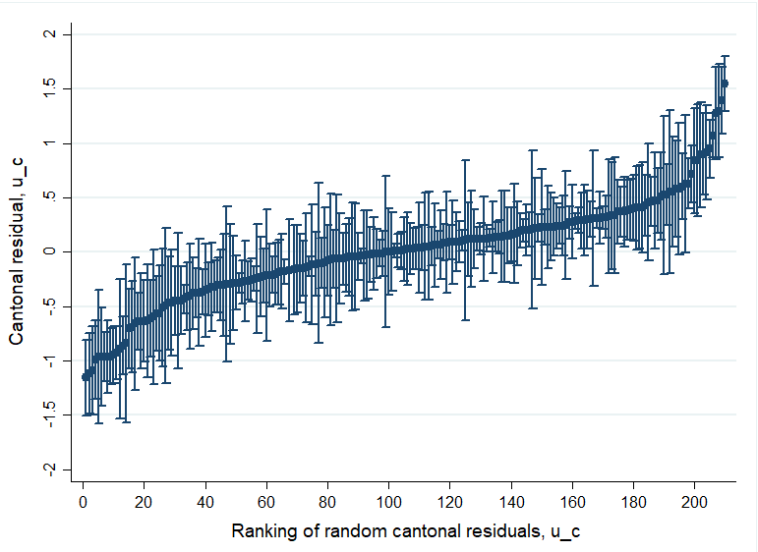
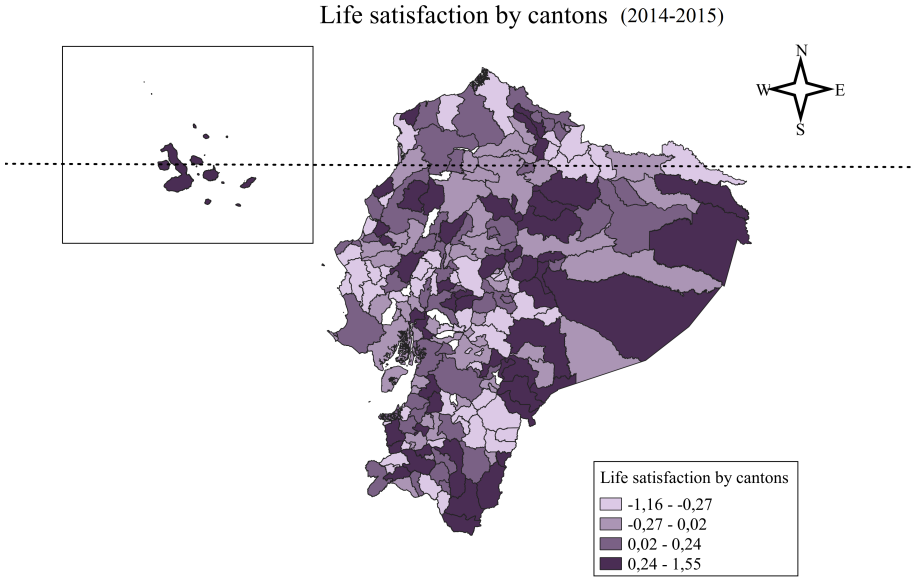



**Figure 2: Map of life satisfaction (cantonal random effects) by cantons**




in the logarithm of road infrastructure activities leads to a higher probability of reporting HLS by 1.55 p.p for rural residents and by 1.54 p.p for urban residents. If the productivity in roads doubles from \$16 384 to \$32 768, the increment in the probability to report HLS is only 0.1 p.p for both rural and urban residents. The differences in welfare increase between rural and urban residents for an increment in this type of infrastructure are not significant. By contrast, remarkable differences between urban and rural residents exist when the productivity of utility projects increases. While an increase from \$0 to \$8192 of productivity

**Table 3:** Ranking of cantonal random effects

| Ranking position | Canton | Province | Predicted cantonal residual |
|---|---|---|---|
| 1 | San Cristóbal | Galápagos | 1.55 |
| 2 | El Carmen | Manabí | 1.40 |
| 3 | Celica | Loja | 1.30 |
| 4 | Isabela | Galápagos | 1.27 |
| 5 | Santa Cruz | Galápagos | 1.07 |
| 6 | Quijos | Napo | 0.95 |
| 7 | Montalvo | Los Ríos | 0.92 |
| 8 | Paquisha | Zamora Chin. | 0.90 |
| 9 | Pucará | Azuay | 0.89 |
| 10 | Aguarico | Orellana | 0.84 |
| ⋮ | ⋮ | ⋮ | ⋮ |
| 201 | Muisne | Esmeraldas | -0.95 |
| 202 | Bolívar | Carchi | -0.96 |
| 203 | Putumayo | Sucumbíos | -0.96 |
| 204 | Vinces | Los Ríos | -0.96 |
| 205 | Penipe | Chimborazo | -0.96 |
| 206 | Nabón | Azuay | -0.97 |
| 207 | Puebloviejo | Los Ríos | -0.99 |
| 208 | Cascales | Sucumbíos | -1.09 |
| 209 | G. Pizarro | Sucumbíos | -1.12 |
| 210 | Paján | Manabí | -1.16 |

in utility projects makes rural residents more likely to report HLS by 2.2 p.p, the same productivity increase makes urban residents more likely to report HLS only by 1.7 p.p. Likewise, the increase of the probability of reporting HLS for rural residents by doubling the productivity of utility infrastructure is higher for rural residents (0.176%) than for urban ones (0.13%). These results might be explained by a decreasing marginal utility as stated by Easterlin (1974), indicating that rural residents with low provision of infrastructure have a large increase in their life satisfaction for increases in utility infrastructure. In addition, utility projects in these areas not only generate a direct effect of improved water quality but also long-term and indirect effects in terms of improved quality of life, job creation, increased property value, and avoided environmental damage (Vucijak and Ceric, 2010). In complement, life satisfaction increases from utility infrastructure are not significant for urban residents as their basic needs might be less unsatisfied than those of rural residents. In fact, poverty by UBN in the urban area was 21.4% in 2019 whereas, in the rural area, it was 61.6%. By contrast, an increase in the productivity of other infrastructure activities from \$0 to \$2048 decreases the probability of reporting HLS for rural residents by 0.23 p.p. and increases that of urban residents by 0.9 p.p. In this regard, other infrastructure activities include industrial facilities such as refineries and chemical plants, construction of waterways, harbor and river works, pleasure ports, dams, and dykes, dreading of waterways, and outdoor sports facilities. This class also includes land subdivisions with land improvements such as adding of roads and utility infrastructure. In general, those facilities are built in peripherical areas that affect rural residents due to pollution and damage to the landscape. Thus, urban

residents, located far away from those facilities, are not negatively affected. They are even more satisfied with the construction of infrastructure for pleasure for their use outside the city.

These findings shed more light on the debate about the differences in life satisfaction across rural and urban places stated by Easterlin et al. (2011). Taking into account specific aspects such as infrastructure clarifies why differences in life satisfaction across rural and urban places exist.

**Table 4:** Marginal effects of area at different levels of productivity by types of infrastructure

| | LLS | | MLS | | HLS | |
|---|---|---|---|---|---|---|
| | rural | urban | rural | urban | rural | urban |
| Productivity of road infrastructure activities | | | | | | |
| From 0 to 14 ($0 - $16 384) | -0.01507 | -0.01456 | -0.00040 | -0.00087 | 0.01546 | 0.01543 |
| From 14 to 15 ($16 384 - $32 768) | -0.00106 | -0.00102 | -0.00007 | -0.00010 | 0.00112 | 0.00112 |
| From 15 to 16 ($32 768 - $65 536) | -0.00105 | -0.00102 | -0.00007 | -0.00010 | 0.00113 | 0.00112 |
| From 16 to 17 ($65 536 - $262 144) | -0.00105 | -0.00102 | -0.00008 | -0.00011 | 0.00113 | 0.00112 |
| Productivity of utility infrastructure activities | | | | | | |
| From 0 to 13 ($0 - $8 192) | -0.02189 | -0.01582 | -0.00041 | -0.00096 | 0.02230 | 0.01678 |
| From 13 to 14 ($8 192 - $16 384) | -0.00164 | -0.00119 | -0.00012 | -0.00012 | 0.00176 | 0.00131 |
| From 14 to 15 ($16 384 - $32 768) | -0.00163 | -0.00119 | -0.00013 | -0.00013 | 0.00176 | 0.00132 |
| From 15 to 16 ($32 768 - $65 536) | -0.00163 | -0.00118 | -0.00014 | -0.00014 | 0.00177 | 0.00132 |
| Productivity of other infrastructure activities | | | | | | |
| From 0 to 11 ($0 to $2048) | -0.00233 | 0.00941 | 0.00013 | -0.00071 | -0.00233 | 0.00941 |
| From 11 to 12 ($2 048 to $4 096) | -0.00021 | 0.00086 | 0.00001 | -0.00008 | -0.00021 | 0.00086 |
| From 12 to 13 ($4 096 to $8 192) | -0.00021 | 0.00087 | 0.00001 | -0.00009 | -0.00021 | 0.00087 |
| From 13 to 14 ($8 192 to $16 384) | -0.00021 | 0.00087 | 0.00001 | -0.00009 | -0.00021 | 0.00087 |

Table 5 presents the predicted probabilities to report low, medium, and high life satisfaction for a change from 0 to 1 of dichotomous variables and 1 unit/standard deviation increase of continuous variables. Regarding household characteristics, internet access constraints reduce the life satisfaction of people. Those individuals living in households without access to

the internet are 1.7 p.p more likely to report LLS with respect to those with access to the internet. This service is even more important for welfare than the water via pipelines and sewerage services. This result is especially interesting since it shows that people value access to the internet more than basic services such as sewerage and tap water. One reason could be the fact that the internet has no substitutes meanwhile sewerage and tap water have been replaced by other forms. For instance, according to the Water and Sanitation Program (2011), on the basis of four big cities in Latin America (Guatemala city-Guatemala, Managua-Nicaragua, Santa Cruz-Bolivia, and Tegucigalpa-Honduras), shows that people in peri-urban places of these cities that do not account for sewerage, use, instead, in-situ sanitation systems such as latrines, septic tanks, and toilets without drainage. Regarding tap

**Table 5:** Average Adjusted Predictions

| | LLS | MLS | HLS |
|---|---|---|---|
| Household variables | | | |
| urban | -0.007** | -0.001* | 0.008*** |
| no_internet | 0.017*** | 0.002*** | -0.018*** |
| sewer | -0.005 | 0 | 0.005 |
| pipelines | -0.007 | 0* | 0.007* |
| individual characteristics | | | |
| male | -0.011*** | -0.001** | 0.012*** |
| worked | -0.018*** | -0.001** | 0.019*** |
| insurance | -0.01*** | -0.001*** | 0.011*** |
| homeowner | -0.014*** | -0.001*** | 0.015*** |
| sport | -0.016*** | 0.002*** | 0.018*** |
| crime | 0.013*** | 0.001** | -0.014*** |
| secondary_educ | -0.016*** | -0.001*** | 0.017*** |
| higher_educ | -0.036*** | -0.005*** | 0.042*** |
| indigenous | 0.013*** | 0.001*** | -0.014*** |
| white | -0.018*** | -0.002* | 0.02*** |
| separated | 0.014*** | 0.001** | -0.015*** |
| widow | 0.021** | 0.001* | -0.021*** |
| free union | 0.001 | 0 | -0.001 |
| age (sd increase) | 0 | 0.001*** | -0.001 |
| ln income pc | -0.011*** | -0.001*** | 0.013*** |
| perception individual variables | | | |
| med. satisf. gov. | -0.083*** | -0.008*** | 0.091*** |
| high satisf. gov. | -0.171*** | -0.101*** | 0.272*** |
| med. satisf. soc. | -0.144*** | 0.007** | 0.137*** |
| high satisf. soc. | -0.217*** | -0.126*** | 0.343*** |
| med. satisf. fam. | -0.095*** | -0.014*** | 0.109*** |
| high satisf. fam. | -0.211*** | 0.007 | 0.204*** |

water, people without this service use water wells or rainwater collectors. This reality is also present in Ecuador. It should be noted that not all people value internet access. According to our statistics, 70% do not have access to it due to different reasons. The main reason is the lack of economic resources (61%). Other reasons are ignorance of how to use the internet (13%), no need or interest (20%), and no coverage (6%). Thus, people without internet access may also lack of other services and urban amenities, which are out of the scope of this study. The access to water via pipelines increases the probability of reporting HLS by only 0.7 p.p. Altogether, these aspects reflect how urbanized are the places where households are. Therefore, the location of the individuals' households plays an important role in determining their welfare.

As for individual characteristics, compared to women, men are less likely to report LLS in 1.1 percentage points, 0.1 p.p more likely to report MLS, and 1.2 p.p more likely to report HLS. Likewise, employed people, in comparison with unemployed people, have a higher probability of reporting HLS by 1.9 percentage points. As people get more education, the probability to report HLS increases from 1.7 p.p (secondary education) to 4.2 p.p (higher education) with respect to people with lower levels of education. People that invest in human capital can improve their standard of living (Helliwell, 2003). When individuals are homeowners, their probability of reporting HLS is 1.5 p.p higher than those who pay rent for housing. Recreation activities are important elements to have a high level of life satisfaction. Thus, people that practice sports are more likely to report HLS by 1.8 p.p than those who do not practice any sport. People that have medical insurance are less likely to report an LLS in 1 p.p.

## 5. CONCLUSIONS

Subjective well-being does not only depend on individual characteristics but also on the context. Thus, the location of the individual matters for the individual's welfare. In Ecuador, the heterogeneity of self-reported life satisfaction is explained by between-canton variation in 7%. This means that individuals of the same canton tend to report a similar level of life satisfaction which could be explained by the availability of the same services and amenities that a given canton provides. By means of the multilevel methodology, cantons are ranked according to their specific effect on welfare. There are 52 cantons with significantly higher levels of life satisfaction than the average and 43 cantons with significantly lower levels of life satisfaction. Interestingly, the main cities of Ecuador are not ranked in the first positions.

Infrastructure proves to have a significant positive effect on life satisfaction. Such effect varies depending on the rural-urban perspective. On the one hand, compared to urban residents, rural residents obtain higher life satisfaction effects of the construction of utility projects, showing a diminishing marginal utility. As the satiation point in this type of infrastructure is not reached in rural areas, their residents report increasing utilities for marginal increases. On the other hand, urban residents would report higher life satisfaction when the productivity of other infrastructure activities such as industrial facilities increases whereas rural residents are negatively affected by these facilities. Household variables are also important determinants of individual welfare. Access to the internet is the prevailing household characteristic that increases the probability to report high levels of life satisfaction,

more than access to water via pipelines and sewerage. This result indicates that people value internet access more than basic services because no substitutes exist for this service whereas substitutes have been found for the lack of sewerage and tapping water. In addition, it is worth noting that the effect of internet access might not be the same across people since some of them have a higher preference for the internet than others. This aspect, which is out of our scope, can be further explored in future research, considering the internet use and need for the internet.

Our findings have two policy implications. First, to reduce the unequal regional infrastructure provision so that all the population is satisfied. And second, to ensure that the benefits of big civil engineering works such as roads, pipelines, irrigation, and sewer systems, among others, reach not only urban but also rural residents of cantons.

While important findings are obtained, this investigation has some limitations. To analyze the role of infrastructure, the productivity of infrastructure activities of the last 5 years is used rather than the stock of infrastructure. Since the focus of this study was the civil engineering infrastructure, healthcare, and associated infrastructure were not considered. However, it definitively constitutes a future line of research. In addition, further research could be conducted to determine the welfare effect of infrastructure for different types of populations in terms of age and occupation.

## REFERENCES

Allen, Treb and Costas Arkolakis. (2022) "The Welfare Effects of Transportation Infrastructure Improvements," *The Review of Economic Studies*. http://doi.org/10.1093/restud/rdac001.

Ballas, Dimitris and Mark Tranmer. (2012) "Happy People or Happy Places? A Multilevel Modeling Approach to the Analysis of Happiness and Well-Being," *International Regional Science Review*, 35(1), 70–102. http://doi.org/10.1177/0160017611403737.

Berry, Brian J. and Adam Okulicz-Kozaryn. (2009) "Dissatisfaction With City Life: A New Look at Some Old Questions," *Cities*, 26(3), 117–124. http://doi.org/10.1016/j.cities.2009.01.005.

Blanchflower, David and Andrew Oswald. (2004) "Well-Being Over Time in Britain and the USA," *Journal of Public Economics*, 88(7-8), 1359–1386. http://doi.org/10.1016/S0047-2727(02)00168-8.

Boltvinik, Julio. (2003) "Welfare, Inequality and Poverty in Mexico," In Middlebrook, Kevin and Eduardo Zepeda, eds., *Confronting Development: Assessing Mexico's Economic and Social Policy Challenges*. Stanford University Press: California, chapter 11.

Carr, Ewan, Mark Elliot, and Mark Tranmer. (2011) "A Multilevel Analysis of the Relationship Between National Economic Conditions, An Individual's Job Insecurity and Well-Being in Western Europe," *CCSR Paper*, 5, 1–18.

Clark, Andrew and Andrew Oswald. (1994) "Unhappiness and Unemployment," *The Economic Journal*, 104(424), 648. http://doi.org/10.2307/2234639.

Clark, Andrew E., Paul Frijters, and Michael Shields. (2008) "Relative Income, Happiness, and Utility: An Explanation for the Easterlin Paradox and Other Puzzles," *Journal of Economic Literature*, 46(1), 95–144. http://doi.org/10.1257/jel.46.1.95.

De Leeuw, Jan and Erik Meijer. (2008) *Handbook of multilevel analysis*. Springer New York, New York. http://doi.org/10.1007/978-0-387-73186-5.

Di Tella, Rafael, Robert MacCulloch, and Andrew Oswald. (2003) "The Macroeconomics of Happiness," *Review of Economics and Statistics*, 85(4), 809–827. http://doi.org/10.1162/003465303772815745.

Diener, Ed and Martin Seligman. (2004) "Beyond Money: Toward an Economy of Well-Being," *Psychological Science in the Public Interest*, 5(1), 1–31. http://doi.org/10.1111/j.0963-7214.2004.00501001.x.

Diener, Ed, Eunkook Suh, Richard Lucas, and Heidi Smith. (1999) "Subjective Well-being: Three Decades of Progress," *Psychological Bulletin*, 125(2), 276–302. http://doi.org/10.1037/0033-2909.125.2.276.

Easterlin, Richard. (1974) "Does Economic Growth Improve the Human Lot? Some Empirical Evidence," *Nations and Households in Economic Growth*, pp. 89–125. http://doi.org/10.1016/b978-0-12-205050-3.50008-7.

Easterlin, Richard, Laura Angelescu, and Jacqueline Zweig. (2011) "The Impact of Modern Economic Growth on Urban-Rural Differences in Subjective Well-Being," *World Development*, 39(12), 2187–2198. http://doi.org/10.1016/j.worlddev.2011.04.015.

Ferrara, Antonella and Rosanna Nisticò. (2015) "Regional Well-Being Indicators and Dispersion from a Multidimensional Perspective: Evidence from Italy," *Annals of Regional Science*, 55(2-3), 373–420. http://doi.org/10.1007/s00168-015-0704-y.

Ferrer-i Carbonell, Ada and John M. Gowdy. (2007) "Environmental Degradation and Happiness," *Ecological Economics*, 60(3), 509–516. http://doi.org/10.1016/j.ecolecon.2005.12.005.

Frey, Bruno and Alois Stutzer. (2002) *Happiness and economics: How the economy and institutions affect human well-being*. Princeton University Press.

Galiani, Sebastian, Paul Gertler, and Ernesto Schargrodsky. (2005) "Water for Life: The Impact of the Privatization of Water Services on Child Mortality," *Journal of Political Economy*, 113(1), 83–120. http://doi.org/10.1086/426041.

Gough, Ian and J. McGregor. (2007) *Wellbeing in Developing Countries: From Theory to Research*. Cambridge University Press. http://doi.org/10.1017/CBO9780511488986.

Graham, Carol. (2008) "Measuring Quality of Life in Latin America: What Happiness Research Can (and Cannot) Contribute," *SSRN Electronic Journal*. http://doi.org/10.2139/ssrn.1820937.

Haughwout, Andrew F. (2001) "Infrastructure and Social Welfare in Metropolitan America," *Economic Policy Review*, 7(3), 1–16.

Helliwell, John F. (2003) "How's Life? Combining Individual and National Variables to Explain Subjective Well-Being," *Economic Modelling*, 20(2), 331–360. http://doi.org/10.1016/S0264-9993(02)00057-3.

Inter-American Development Bank. (2012) *Un Espacio Para el Desarrollo: Los Mercados de Vivienda en América Latina y el Caribe*. Washignton D.C.

Jiang, Shiqing, Ming Lu, and Hiroshi Sato. (2012) "Identity, Inequality, and Happiness: Evidence from Urban China," *World Development*, 40(6), 1190–1200. http://doi.org/10.1016/j.worlddev.2011.11.002.

Knaap, Thijs and Jan Oosterhaven. (2011) "Measuring the Welfare Effects of Infrastructure: A Simple Spatial Equilibrium Evaluation of Dutch Railway Proposals," *Research in Transportation Economics*, 31(1), 19–28. http://doi.org/10.1016/j.retrec.2010.11.004.

Knight, John and Ramani Gunatilaka. (2010) "Great Expectations? The Subjective Well-Being of Rural-Urban Migrants in China," *World Development*, 38(1), 113–124. http://doi.org/10.1016/j.worlddev.2009.03.002.

Levin, Kate Ann, Torbjorn Torsheim, Wilma Vollebergh, Matthias Richter, Carolyn Davies, Christina Schnohr, Pernille Due, and Candace Currie. (2011) "National Income and Income Inequality, Family Affluence and Life Satisfaction among 13 Year Old Boys and Girls: A Multilevel Study in 35 Countries," *Social Indicators Research*, 104(2), 179–194. http://doi.org/10.1007/s11205-010-9747-8.

Ministerio de Desarrollo Urbano y Vivienda. (2015) "Reporte Nacional del Ecuador - Hábitat III," : https://habitat3.org/wp-content/uploads/National-Report-Ecuador-spanish.pdf.

Ngamaba, Kayonda Hubert. (2017) "Determinants of Subjective Well-Being in Representative Samples of Nations," *European Journal of Public Health*, 27(2), 377–382. http://doi.org/10.1093/eurpub/ckw103.

Novak, Matic and Marko Pahor. (2017) "Using a Multilevel Modelling Approach to Explain the Influence of Economic Development on the Subjective Well-Being of Individuals," *Economic Research-Ekonomska Istrazivanja*, 30(1), 705–720. http://doi.org/10.1080/1331677X.2017.1311229.

Pontarollo, Nicola, Mercy Orellana, and Joselin Segovia. (2020) "The Determinants of Subjective Well-Being in a Developing Country: The Ecuadorian Case," *Journal of Happiness*

*Studies*, 21(8), 3007–3035. http://doi.org/10.1007/s10902-019-00211-w.

Popova, Yelena. (2013), "Transport Infrastructure as a Facilitator of Social Development of the Region," In *International Conference Reliability and Statistics in Transportation and Communication*, pp. 134–142.

Popova, Yelena. (2017) "Relations Between Well-Being and Transport Infrastructure of the Country," *Procedia Engineering*, 178, 579–588. http://doi.org/10.1016/j.proeng.2017.01.112.

Ravallion, Martin and Michael Lokshin. (2001) "Identifying Welfare Effects from Subjective Questions," *Economica*, 68(271), 335–357. http://doi.org/10.1111/1468-0335.00250.

Sapkota, Jeet. (2018) "Access to Infrastructure and Human Well-Being: Evidence from Rural Nepal," *Development in Practice*, 28(2), 182–194. http://doi.org/10.1080/09614524.2018.1424802.

Schwartz, Jordan. (2011) *Beyond Growth: Is Investing in Infrastructure Good for People's Well-Being?*

Schyns, Peggy. (2002) "Wealth of Nations, Individual Income and Life Satisfaction in 42 Countries: A Multilevel Approach," *Social Indicators Research*, 60(1-3), 5–40. http://doi.org/10.1023/A:1021244511064.

Smith, Elin, Timurs Umans, and Anna Thomasson. (2018) "Stages of PPP and Principal–Agent Conflicts: The Swedish Water and Sewerage Sector," *Public Performance and Management Review*, 41(1), 100–129. http://doi.org/10.1080/15309576.2017.1368399.

Soares, Rodrigo. (2009) "Life Expectancy and Welfare in Latin America and the Caribbean," *Health Economics*, 18, S37–S54. http://doi.org/10.1002/hec.1460.

Stevenson, Betsey and Justin Wolfers. (2013) "Subjective Well-Being and Income: Is There Any Evidence of Satiation?," *American Economic Review*, 103(3), 598–604. http://doi.org/10.1257/aer.103.3.598.

Stone, Susan and Anna Strutt. (2010) "Transport Infrastructure and Trade Facilitation in the Greater Mekong Subregion," In *Trade Facilitation and Regional Cooperation in Asia*. Edward Elgar Publishing Ltd.: chapter 5, pp. 156–191.

Veenhoven, Ruut. (1991) "Is Happiness Relative?," *Social Indicators Research*, 24(1), 1–34. http://doi.org/10.1007/BF00292648.

Vucijak, Branko and Admir Ceric. (2010) "Approach to Economic Analysis of Water Supply and Sewerage Investment Projects," *Annals of DAAAM and Proceedings of the International DAAAM Symposium*, 21(1).

Water and Sanitation Program. (2011) "Viviendo Sin Alcantarillado Sanitario El Negocio de la Recolección de Lodos Fecales en 4 Ciudades de América Latina," .