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Modelling Dynamics of Sen's Capability Dimensions: A New Approach

ABSTRACT

Sen (1999) introduced dynamics into the capability approach in his book "Development as Freedom". There has been hardly any work, except for Pugno (2017), on capability dynamics since then. The study of Pugno (2017) is theoretical and does not derive policy implications in terms of freedom, functioning, and conversion efficiency. The lack of empirical work in this area is largely due to the unavailability of panel data at the household or individual level to study dynamics. To solve this problem, we have developed a methodology based on bootstrapping to study the dynamics of data available at a point in time. We then apply this methodology to explore the dynamics of capability dimensions in various policy scenarios using district-level data from the Pakistan Socio-Economic Survey (PSES, 2002). First, we measure sense-of-achievement, sense-of-freedom-to-achieve, and sense-of-ability-to-achieve to quantify Sen's functioning, freedom, and conversion efficiency for the overall functioning of "being achieved". Most districts (61.4%) are found to fall in the policy region where it is required to focus on freedom with the increasing emphasis on efficiency as functioning increases. It means that freedom provides a precondition for efficiency and functioning in these districts. Further, a comparison of HDI with capability dimensions at various policy focus regions reveals that the level of HDI does not alter the policy focus region. It means that human development has no correspondence with capability dimensions. Hence a separate focus is required to enhance capability dimensions.

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1. INTRODUCTION

Measuring well-being has been one of the challenging topics in economics. Initially, economists used material-based indicators, like Gross Domestic Product (GDP), as measures of well-being. Although there is a lot of criticism on GDP, it is being used as a measure of human well-being because of its simplicity (Hasan and Khan, 2015). Mahbub ul Haq proposed a human development index (HDI) as an alternative to GDP to measure human well-being. After 1990, economists shifted their thinking to people-centered development instead of material-centered.[1] For example, Stiglitz *et al*. (2009) emphasize measuring the wellbeing of people instead of measuring economic production.

Sen (1985b) criticises material-based assessment approaches of well-being as these approaches do not consider diversity rather assume homogeneity of human being and are focusing on what individuals possess or reveal to prefer rather on an individuals' abilities or disabilities. Further, these approaches do not show the true well-being of the individuals in terms of possessions and preferences rather are subject to adaptability, i.e., individuals adjust to their circumstances. Sen (1984, 1985a, 1985b, 1987a, 1987b, 1990, 1992, 1993, 1999) was the pioneer of the capabilities approach. Later, Nussbaum (2000, 2005) further developed the capabilities approach.[2] The capabilities approach is a normative framework to assess the social arrangements and wellbeing of an individual and to design policies for social change and justice. It revolves around three main concepts, functioning, conversion efficiency, and freedom, required for justice and measurement of well-being. Besides, means (resources) and conversion factors are two other concepts that interact with functioning, freedom, and conversion efficiency.

Sen (1999) in his book "Development as Freedom" introduced dynamics into the capabilities approach. Using insights from the work of Sen (1999), Pugno (2017) develops a theoretical framework on endogenizing capability dynamics. However, Pugno (2017) deals with dynamics theoretically and does not derive policy implications in terms of freedom, functioning, and conversion efficiency. The lack of empirical work on this topic is largely due to the unavailability of panel data as mostly data is available at a point of time at the household and individual level. To solve this problem, we develop a methodology based on bootstrapping to study dynamics using the data available only at a point in time. Generally, theoretical modeling does not have an empirical input. However, bootstrapping can be used to understand the distributional properties of regression estimates. Hitherto, theoretical modeling focuses only on modeling the relationship between variables and ignores any information contained in the relationship between coefficients. However, our approach, based on bootstrapping, allows us to study and model the relationship between coefficients and helps us to derive policy implications in terms of impacts of change in a capability dimension on partial effects.

The specific objectives of the study are:

- to quantify Sen's functioning, freedom, and conversion efficiency for the overall functioning of "being achieved"
- to explore the dynamics of capability dimensions in various policy scenarios using district-level data for Pakistan

The rest of the paper is organized as: section 2 describes the concepts used in Sen's capabilities approach, section 3 explains indicators and data, section 4 explains the methodology, section 5 presents results and their implications and the last section 6 concludes the paper with policy implications.

[1] When first Human Development Report (1990) was published.

[2] See, for example, Robeyns (2005, 2011) for the theoretical survey and philosophical discussion on the capabilities approach.

2. SEN's CAPABILITIES APPROACH: BASIC CONCEPTS

Functioning, conversion efficiency, and freedom are key concepts of Sen's capabilities approach. Functioning is the sum of the "beings and doings" of a person. A person can be in either state of being or in a state of doing. The state of beings includes being-healthy, being-educated, being-sheltered, being-nourished, being-happy, etc. On the other hand, doings include traveling, studying, voting in an election, caring for a child, donating money to charity, taking part in the debate, and so on. It can be stated that functioning is the achievement achieved by a person. The state of being can be called a "stock", whereas the state of doing can be considered as a "flow". For example, the flow of exercise (the doing of exercise) adds to the stock of health (being-healthy). Similarly, reading adds to being-literate. However, this distinction between stock and flow may not be too simple in practice. Functioning either results from the choice of or constraint on a person. The functions that result from the choice of a person, are called "refined functioning" while the functions that arise due to the constraint are simply called "functioning".

Freedom represents the range of choices and degree of autonomy available to a person.[3] It has both instrumental and intrinsic value. Evaluation based on freedom provides an encompassing measure of wellbeing. Sen (1990) discusses freedom as a focal personal feature for ethical judgment on the lives of persons and compares it to primary goods and liberties (Rawls), rights (Nozick), resources (Dworkin), among others. Sen (1990) distinguishes between *means* and what people can obtain from these *means* and argues:

> *"Since the conversion of these primary goods and resources into freedom to select a particular life and to achieve may vary from person to person, equality in holdings of primary goods or resources can go hand in hand with serious inequalities in actual freedoms enjoyed by different persons". (p.115)*

In the capabilities approach, the notion of individual freedom has an opportunity aspect as well as the process aspect. The opportunity aspect is the advantage available to a person relative to others (Sen, 1985a) and his/her ability to achieve what he/she values irrespective of the process through which that achievement comes about. On the other hand, the process aspect is concerned with the process of choice itself (Sen, 2009). Opportunity aspects and process aspects are called by Sen "Capability" and "Agency" respectively. To achieve a functioning, it is the responsibility of a society to provide freedom as mentioned by Sen (1992):

> *"In dealing with responsible adults, it is more appropriate to see the claims of individuals on the society (or the demand of equity or justice) in terms of freedom to achieve rather than actual achievements. If the social arrangements are such that a responsible adult is given no less freedom (in terms of set comparisons) than others, it is possible to argue that no unjust inequality may be involved". (p.148)*

However, it does not mean that individuals do not have a responsibility to change their status for a better life. According to Sen (1999):

> *"The people have to be seen, in this perspective, as being actively involved – given the opportunity – in shaping their own destiny, and not just as passive recipients of the fruits of cunning development programs". (p. 53)*

The possession of commodities does not correctly represent the opportunity-freedom as Sen (2002) argues:

[3] Here we mean positive freedom. Sen (1987b), among others provides detail discussion on positive and negative freedom.

> *"[…] opportunity-freedom cannot be sensibly judged merely in terms of possession of commodities but must take note of the opportunity of doing things and achieving results one has reason to value". (p.519)*

Capability is a freedom-oriented concept as explained by Qizilbash (2011),

> *"[…] term "capability" refers to a range of lives from which a person can choose one and that if one has to list things which make a life good these are best understood as (valuable) functioning. The capability approach – as I understand it – sees wellbeing in terms of an evaluation of functioning – and the quality of life is seen in terms of the freedom to choose between lives". (p. 27)*

Due to difficulty in the measurement of freedom, most of the empirical studies focused on measuring "functioning" and left "process freedoms" in operationalizing the capabilities approach. Further, they have focused more on individual dimensions, in particular functioning or freedom, of capabilities and use objective indicators to quantify capabilities.[4] A 12-questions General Health Questionnaire (GHQ), which contained information related to the freedom aspect of "being achieved", is used by the German Socio-Economic Panel Survey (GSOEP) and British Household Panel Survey (BHPS).[5]

Conversion efficiency can be defined as the ability of a person to convert his/her resources into functioning given his/her freedom. It is influenced by individual/personal, social, and environmental conversion factors (Kuklys, 2005; Robeyns, 2005). Robeyns (2011) illustrates these conversion factors with the help of an example as:

> *"How much [conversion efficiency] a bicycle [a resource] contributes to a person's mobility [a functioning] depends on that person's physical condition (a personal conversion factor), the social mores including whether women are socially allowed to ride a bicycle (a social conversion factor), and the availability of decent roads or bike paths (an environmental conversion factor)". (p. 6)*

3. DATA AND INDICATORS

We utilize data from the Pakistan Socio-Economic Survey (PSES-2002) in our empirical analysis. It is the first survey which contains information on all aspect of capabilities. Therefore, to the best of our knowledge, the current study is the first to analyze all dimensions of capabilities. Due to the reasons discussed below in section 4, we focus on the capabilities of a single functioning, "being achieved". We measure capabilities in the dimensions of (1) functioning, (2) freedom, and (3) conversion efficiency based on subjective indicators given in the questionnaire about mental wellbeing in PSES.[6] These indicators are (1) a sense of achievement which measures functioning, (2) a sense of freedom to achieve measuring freedom, and (3) a sense of ability to achieve which measures conversion efficiency.

Along with twelve questions about mental wellbeing given in British Household Panel Survey, PSES adds nine more questions that are important for measuring achievement (functioning), freedom to achieve, and ability to achieve (conversion efficiency). Questions of the BHPS help to measure the sense of freedom only, while the additional nine questions in the PSES help to measure achievement and the ability to achieve, which are important dimensions of capabilities ignored by other surveys. We quantify all three

[4] Except for few such as Anand *et al*. (2011).
[5] To measure the freedom aspect of capabilities, Anand *et al*. (2011) developed their own survey instrument.
[6] According to Kuklys (2005) "There is no requirement that indicators have to be objective when evaluating welfare according to the capabilities approach." (p. 34)

dimensions of capabilities using different questions given in PSES. Questions posed under each indicator adequately serve the purpose of "being achieved in a generalized sense as discussed in the following subsections.

3.1 Sense of Freedom to Achieve (R)

It comprises three senses of freedom namely freedom of action, freedom of decision making, and freedom of problem-solving. These senses are approximately defined by the questions[7] (1) Have you recently felt that you are playing a useful part in things? (2) Have you recently felt capable of making decisions about things? (3) Have you been able to face your problems? given in the PSES survey.[8]

Up to what extent people can engage in useful activities they value is captured through the sense of freedom to act and participate. The question about playing a useful part in things shows one's freedom to do useful activities that matter to one's interests like seeking goals, performing religious duties, or fulfilling social responsibilities. The question about the capability of making decisions reflects the degree of freedom of an individual in decision making. Question regarding freedom is important due to many reasons. First, it is important in the process of a democratic election. An election process can be shown transparent amidst imposed implicit decisions on most voters by, for example, feudal lords, particularly in rural areas. Although it affects their sense of freedom in decision making, yet it is not reflected in any objective criterion. Second, freedom in decision-making also has a concern with the issues related to gender and ethnicity. Females are not encouraged or even allowed to make decisions about their careers in some societies which adversely affects the "freedom to achieve" of women. Similarly, in some regions, minority ethnic groups do not have the freedom to proceed in their preferred careers. On the other hand, a minority elite class is given favor in some systems. This affects the sense of freedom in the non-elite (the majority) class. As written documents and laws do not discriminate between the elite and the non-elite classes, therefore, this fact cannot be captured by an objective criterion. This biasedness cannot be overcome by providing equal freedom to all due to the presence of unequal and unjust initial endowment as mentioned by Burchardt (2009):

> *"But here the choice is not independent of previous conditions of inequality. Identical capability sets do not afford the same real chance, in practice, of achieving valuable functionings, and the reason for this difference is aspirations formed in previous unequal and unjust conditions". (p. 9)*

Finally, the third question reflects the ability of decision-making by an individual in an adverse situation.

3.2 Sense of Ability to Achieve (E)

"Sense of ability to achieve" is a proxy used for the physical and psychological ability of an individual to convert his/her material and non-material resources into achievement. Accomplishment is one of the five components[9] in the field of positive psychology (Seligman, 2011). "Sense of ability to achieve" is captured by the questions[10] (1) Do you normally accomplish what you want to? (2) Do you feel you can manage situations even when they do not turn out as expected? (3) Do you feel confident that in case of a crisis you will be able to cope with it? given in PSES. These questions address the sense of ability at three levels of difficulty – from a normal situation to a situation of crisis.

3.3 Sense of Achievement (F)

[7] Answers to these questions are ranging from "More so than usual" to "Much less usual" with four options.
[8] "The process aspect, being concerned with the freedom of the person's decisions, must take note of both (a) the scope for autonomy in individual choices, and (b) immunity from interference by others" (Sen, 2002).
[9] The other four are: positive emotion, engagement, relationships, and meaning and purpose.
[10] Answers to these questions are in Likert scale with four options ranging from "Most of the time" to "Hardly ever"

For quantification of "sense of achievement" questions[11] (1) Do you think you have achieved the standard of living and the social status that you had expected?[12] (2) How do you feel about the extent to which you have achieved success and are getting ahead?[13] (3) Do you feel life is interesting? are utilized from the PSES survey. The first question covers access to a decent standard of living - one of the dimensions (in a subjective way) of the Human Development Index (HDI). However, information regarding the level of satisfaction with the standard of living is also added to HDI. This level of satisfaction considers aspirations and feelings about the relative standard of living. The second and third questions support these feelings.

4. METHODOLOGY

Like most developing countries, we do not have a long panel of household or individual-level data to study dynamics. The data is available at a point in time only. To solve this problem, we have developed a methodology to study dynamics using the data available only at a point in time. The proposed methodology has three steps: bootstrapping of selected/supposed econometric model, theoretical modeling of relationships between estimated coefficients, and drawing policy emphasis regions under various scenarios.

4.1 Bootstrapping

This section builds up an econometric model to understand the interaction between different dimensions of capabilities. It assumes functioning as a function of freedom and conversion efficiency as

$$F=f(R, E)$$

Since the variables F, R, and E are ordinal with four categories, therefore OLS is not applicable. However, we convert the ordinal data into continuous using the methodology suggested in Hasan *et al*. (2016). In the first step of this method, we convert our discrete variables (F, R, and E) into continuous random variables by a method of simulation. In the second step, random numbers are generated from continuous probability distribution within the setting of a discrete probability distribution[14]. We then estimate the above relationship by the OLS method.[15] One thousand random samples are drawn with replacement from the data and obtain bootstrap estimates of α and β from the following equation.

$$F = a R + b E + \varepsilon \qquad \varepsilon \sim N(0, \sigma^2) \qquad (1)$$

Where ε is a random error term which is assumed to be normally distributed with zero mean and variance σ^2. The bootstrap estimates show a negative relationship between the coefficients (partial effects) of freedom (a) and efficiency (b):[16]

$$a = \alpha - \beta b \quad (\alpha > 0, \beta > 0) \qquad (2)$$

[11] Answers to these questions, with four options, ranging from "Very much" to "Not so much"

[12] Since Achievements (Functioning) are different aspects of living conditions, they are, in a sense, more directly related to living conditions (Sen, 1987a)

[13] "[…] opportunity-freedom cannot be sensibly judged merely in terms of possession of commodities but must take note of the opportunity of doing things and achieving results one has reason to value" (Sen, 2002).

[14] For more detail see Hasan *et al*. (2016).

[15] Though we can use ordered logit or Probit models in this situation, but we prefer to use the OLS method because of the restrictive assumptions of ordered choice models as discussed in Hasan *et al*. (2016).

[16] This relationship between partial effects also holds in case of all districts as shown by the bootstrapping results for each district (see Appendix).

This relationship is used to understand the theoretical dynamics of the model to derive some policy lessons. It identifies different policy regions (E, R, RE, and ER)[17] under alternative scenarios and applies it to the data. The study finds that most of the districts fit the low-freedom- opposed to low efficiency- scenario and most of them are located in the RE policy region.

4.2 Theoretical Modelling

Substituting equation (2) in the deterministic form of equation (1) gives the following general expressions for a and b in terms of the ratio of capability dimensions:

$$a = \frac{\alpha(E/R)-\beta(F/R)}{(E/R)-\beta} \tag{3}$$

$$b = \frac{(F/R)-\alpha}{(E/R)-\beta} \tag{4}$$

Dividing equation (3) by (4) gives the ratio of partial effects of R and E.

$$\frac{a}{b} = \frac{\alpha(E/R)-\beta(F/R)}{(F/R)-\alpha} \tag{5}$$

Change in the ratio of partial effects due to change in E, R and F are given below in equations 6, 7, and 8 respectively.

$$\frac{\partial(a/b)}{\partial E} = \psi_1 = \frac{(\alpha/R)}{(F/R)-\alpha} = \frac{\alpha}{F-\alpha R} \tag{6}$$

$$\frac{\partial(a/b)}{\partial R} = \psi_2 = \frac{\alpha(\beta F-\alpha E)}{(F-\alpha R)^2} \tag{7}$$

$$\frac{\partial(a/b)}{\partial F} = \psi_3 = \frac{(F-\alpha R)(-\beta)-(\alpha E-\beta F)}{(F-\alpha R)^2} = \frac{\alpha(\beta R-E)}{(F-\alpha R)^2} \tag{8}$$

Assuming both α and β to be positive and $\left((F/R)-\alpha\right)$ non-zero then ψ_1 could be positive when $(F/R) > \alpha$ and $(F/R) < \alpha$. ψ_2 could be positive when $(F/E) > (\alpha/\beta)$, $\psi_2 = 0$ when $(F/E) = (\alpha/\beta)$ and $\psi_2 < 0$ when$(F/E) < (\alpha/\beta)$. ψ_3 could be > 0 when $(E/R) < \beta$ and $\psi_3 = 0$ when $(E/R) = \beta$ and $\psi_3 < 0$ when $(E/R) > \beta$.

4.3 Policy regions

Policy emphasis depends on a district level of efficiency relative to freedom (E/R) and the level of achieved functioning (F).

i) A district with relatively lower achieved functioning (F) having a lower (larger) ratio of efficiency to freedom (E/R) then a threshold should target (ER) policy focus primarily on efficiency (E) with the increasing emphasis on freedom (R) as functioning (F) increases because targeting RE would further decrease F.

ii) A district with relatively better-achieved functioning (F), in region ER (RE), having a ratio of efficiency to freedom (E/R) less (more) than the minimum threshold should target both policy focus on efficiency (E) and policy focus on freedom (R) with the increasing emphasis on freedom (efficiency). This is because the effectiveness of targeting efficiency (freedom) declines as

[17] E, R, RE and ER representing policy focus on E, policy focus on R, policy focus primarily on R with increasing emphasis on E as F increases, and policy focus primarily on E with increasing emphasis on R as F increases, respectively.

functioning increases and that of freedom (efficiency) increases. This is like having decreasing returns to policy. As functioning improves and crosses to region III (see Figure 1), the policy emphasis should be completely shifted to R(E) as the diminishing returns to targeting E(R) lead to a negative effect on F.

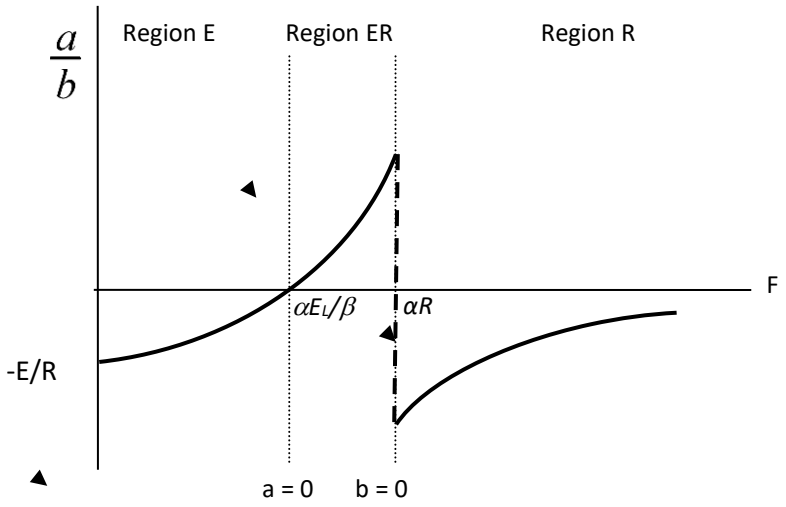

Figure 1: Policy emphasis regions for the low-efficiency scenario ($E/R < \beta$ which implies $\partial(a/b)/\partial F>0$)

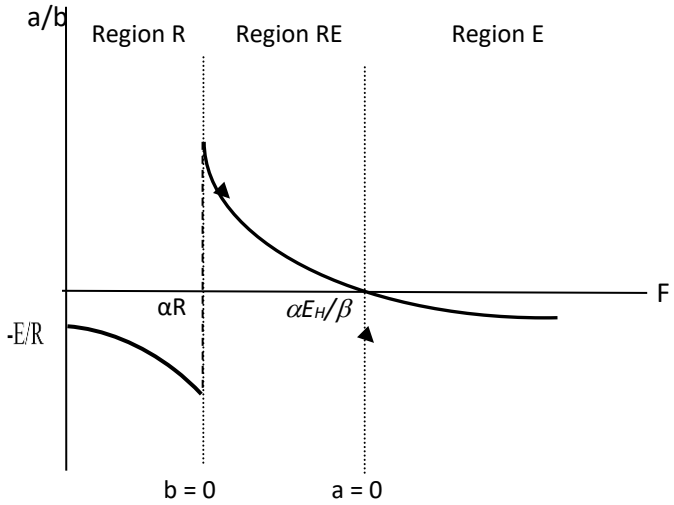

Figure 2: Policy emphasis regions for the low-freedom scenario ($E/R>\beta$ which implies $\partial(a/b)/\partial F<0$)

Appropriately targeted policies in different scenarios are summarized below in Table 1a and Table 1b.

Table 1a: Scenario 1: If we target E (when $E/R<\beta$ and R is fixed) $F=\alpha E/\beta$ would increase at a slower rate than E. As a result

	$E/R<\beta$		
	F	Sign of a and b	Appropriate Policy Target
Region E (Low *F*)	$F<\alpha E/\beta$	a < 0 b > 0	E
Region ER (middle *F*)	$\alpha R>F>\alpha E/\beta$	a > 0 b > 0	E and R with the increasing emphasis on R as *F* increases
Region R (High *F*)	$F>\alpha R$	a > 0 b < 0	R

Table 1b: Scenario 2: If you target R (when $E/R>\beta$ and E is fixed) $F=\alpha E/\beta$ would increase at a faster rate than E. As a result

	$E/R>\beta$		
	F	Sign of a and b	Appropriate Policy Target
Region R (Low *F*)	$F<\alpha R$	a > 0 b < 0	R
Region RE (Middle *F*)	$\alpha R<F<\alpha E/\beta$	a > 0 b > 0	R and E with the increasing emphasis on E as *F* increases
Region E (High *F*)	$F>\alpha E/\beta$	a < 0 b > 0	E

The above analysis is applied to all the districts and policy emphasis region is identified for each district.

5. RESULTS AND DISCUSSION

From the above analysis and discussions, it is concluded that there are four policy target regions, (1) policy focus on efficiency (E), (2) policy focus on freedom (R), (3) policy focus primarily on freedom with the increasing emphasis on efficiency as functioning increases (RE) and (4) policy focus primarily on efficiency with the increasing emphasis on freedom as functioning increases (ER). We repeat the bootstrapping exercise at district level data and compute α and β for each district. Based on the values of α and β together with levels of efficiency (E) and freedom (R), we sort 57 districts into different policy regions as shown in Table-A1of Appendix. Results show that thirty-five (61.4%) districts fall in policy region RE that is policy focus primarily on freedom with the increasing emphasis on efficiency as functioning increases. It means that freedom is a precondition for efficiency and functioning in these districts. Sixteen (28%) districts are found to fall in policy region E that is policy focus on efficiency and six (10.5%) districts in policy region R, the policy focus on freedom. There is no (0%) district in the region ER that is policy focus primarily on efficiency with the increasing emphasis on freedom as functioning increases.

Our results show that majority of the districts have low freedom. This could be due to pressure groups in the democratic election process in these districts because of the presence of feudal landlords and politically influential personalities. These pressure groups not only affect the right of voting of the common people according to their free will but also influence the capability to make decisions in various situations. As Mahbub-ul-Haq also showed dissatisfaction with the situation and said: “In blunt terms, Pakistan’s capitalistic system is still one of the most primitive in the world. It is a system in which economic feudalism prevails.”

Finally, we compare the HDI18 ranking of a district with its "policy region" to check whether the "policy region" depends on the level of HDI or not. Results are given in Table- A1 of the Appendix shows that whether a district has a high or low rank in HDI, the policy conclusions will remain the same. This implies that human development does not matter in qualitative capability dimensions of life. This is understandable since capability dimensions are more concerned with the power and cultural structure of society. Since most of these districts are predominately rural areas, feudal lords have complete authority and autonomy over their people which have a large impact on the capabilities of these people.

6. CONCLUSION

There is hardly any research work to study the dynamics of the capability approach, introduced by Sen (1999), due to the unavailability of suitable data. We have developed a methodology based on bootstrapping in this paper and were able to study dynamics using data available at a point of time only. Using district-level data from Pakistan Socio-Economic Survey (PSES), our results revealed that most districts were in the policy region where the focus on freedom with the increasing emphasis on efficiency was required with the increase in functioning. We also found that human development has no correspondence with capability dimensions.

Our results show that majority of the districts are classified as low freedom. So, improving the freedom of these people would mean giving them the rights they deserve. Due to the presence of pressure groups, peoples are not free to make decisions in different situations. These people need freedom from servitude as mentioned by Danis Goulet in three core values of development.

Low freedom may also be due to a low level of education and illiteracy. Improving education levels and literacy may improve the overall freedom of these districts. The low level of education can also be linked to the system of landlords which does not encourage better and higher levels of education in fear of opposition to the status quo. To improve the capabilities dimension with a special focus on increasing freedom of the peoples, land reforms should be implemented and reduce the concentration of wealth and power in few hands in the country. As we also found that human development does not matter in qualitative capability dimensions of life, therefore, a separate focus is required to enhance capability dimensions.

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Appendix A: Policy targets at the district level (The Appendix reports the values for F, E, R, α, and β, and their ratios, and identify the policy region a district falls in. E, R, RE, and ER)

Low-Efficiency districts E/R < β Policy									
District (HDI/Rank)	**F**	**E**	**R**	**α**	**β**	**E/R**	**αE/β**	**αR**	**Region**
MARDAN (0.519/32)	0.82	0.67	1.13	0.81	0.91	0.60	0.60	0.92	E
PESHAWAR (0.531/24)	0.81	0.64	1.09	0.82	0.84	0.59	0.63	0.89	E
DADU (0.535/21)	0.95	0.73	0.96	0.80	0.86	0.76	0.67	0.77	R
KOHAT (0.537/19)	0.89	0.81	1.18	0.65	0.73	0.69	0.72	0.76	R
BANNU (0.465/55)	0.76	0.48	0.93	0.58	0.65	0.51	0.42	0.54	R
KALAT (0.412/74)	1.17	0.98	1.18	0.88	0.99	0.83	0.87	1.03	R
Low Freedom districts E/R>β Policy									
District (HDI/Rank)	**F**	**E**	**R**	**α**	**β**	**E/R**	**αE/β**	**αR**	**Region**
OKARA (0.528/29)	0.68	0.68	0.78	0.73	0.77	0.87	0.64	0.57	E
GUJRAT (0.543/16)	1.08	1.07	0.97	0.76	0.90	1.10	0.91	0.74	E
SIALKOT (0.555/14)	1.15	0.96	0.91	0.77	0.82	1.05	0.90	0.70	E
BAHAWALPUR (0.501/40)	1.33	1.15	1.13	0.58	0.54	1.02	1.23	0.65	E
BAHAWALNAGAR (N/A)	1.45	1.11	0.83	0.38	0.37	1.34	1.12	0.31	E
JACOBABAD (0.393/77)	0.55	0.45	0.79	0.57	0.48	0.57	0.54	0.45	E
SHIKARPUR (0.417/72)	0.98	0.65	0.82	0.66	0.58	0.79	0.73	0.54	E
SUKKUR (0.486/47)	0.89	0.76	0.87	0.68	0.65	0.88	0.80	0.59	E
LARKANA (0.435/67)	0.98	0.82	1.11	0.61	0.63	0.73	0.79	0.68	E
SANGHAR (0.461/56)	0.60	0.54	0.66	0.54	0.49	0.82	0.60	0.36	E
NAWAB SHAH (0.481/49)	0.85	0.69	0.59	0.60	0.53	1.17	0.78	0.36	E
D.I. KHAN (0.425/69)	1.17	0.96	1.08	0.21	0.37	0.89	0.53	0.22	E
QUETTA (N/A)	1.23	1.39	1.38	0.53	0.60	1.00	1.22	0.73	E
LORALAI (0.556/13)	1.32	1.57	1.60	0.52	0.72	0.98	1.14	0.83	E
RAWALPINDI (0.576/9)	1.18	1.33	1.31	0.94	1.00	1.01	1.26	1.24	R
KHAIR PUR (0.449/63)	0.90	0.73	1.21	0.76	0.39	0.60	1.42	0.92	R
ATTOCK (0.507/37)	1.08	1.34	1.05	0.71	0.54	1.28	1.77	0.74	RE
JHELUM (0.703/1)	1.21	1.25	1.25	0.70	0.69	1.00	1.27	0.87	RE
ISLAMABAD (0.612/6)	1.26	1.20	1.46	0.69	0.37	0.82	2.22	1.00	RE
SARGODHA (0.535/22)	0.96	0.98	1.03	0.65	0.47	0.95	1.35	0.67	RE
MIANWALI (0.537/20)	1.10	1.22	1.20	0.67	0.55	1.01	1.49	0.80	RE
KHUSHAB (N/A)	1.04	1.03	0.98	0.45	0.44	1.05	1.07	0.44	RE
BHAKKAR (0.581/7)	1.27	1.25	0.95	0.44	0.27	1.32	2.03	0.41	RE
LAHORE (0.558/12)	1.03	1.28	1.12	0.59	0.54	1.15	1.40	0.66	RE
KASUR (0.577/8)	0.88	0.94	1.04	0.54	0.50	0.90	1.00	0.56	RE
SHEIKHUPURA (0.621/4)	0.81	0.91	1.05	0.47	0.33	0.87	1.26	0.49	RE
GUJRANWALA (0.529/25)	1.04	0.99	0.87	0.55	0.44	1.14	1.23	0.48	RE
FAISAL ABAD (N/A)	0.80	0.95	0.90	0.62	0.59	1.06	0.99	0.56	RE
T.T. SINGH (N/A)	0.83	0.91	0.91	0.58	0.62	1.00	0.85	0.53	RE
JHANG (0.529/27)	0.74	0.90	0.61	0.63	0.48	1.48	1.19	0.38	RE
MULTAN (0.494/44)	0.95	1.18	0.99	0.52	0.51	1.19	1.20	0.52	RE
VEHARI (0.508/36)	1.13	0.95	0.74	0.54	0.41	1.28	1.24	0.40	RE
SAHIWAL (0.541/17)	0.89	1.00	0.88	0.68	0.73	1.13	0.93	0.60	RE
D.G. KHAN (0.471/53)	1.22	1.38	1.20	0.75	0.67	1.15	1.55	0.90	RE

Appendix A continued...

Low Freedom districts	**E/R>β Policy**								
District (HDI/Rank)	**F**	**E**	**R**	**α**	**β**	**E/R**	**αE/β**	**αR**	**Region**
LEIAH (N/A)	1.04	1.34	1.02	0.54	0.40	1.31	1.80	0.55	RE
MUZAFFARGARH (0.459/59)	0.95	1.04	1.04	0.54	0.50	1.00	1.11	0.56	RE
RAJANPUR (N/A)	1.06	1.16	0.87	0.70	0.67	1.33	1.22	0.61	RE
R.Y. KHAN (0.541/18)	1.15	1.14	0.77	0.48	0.44	1.47	1.25	0.37	RE
HYDERABAD (0.532/23)	0.57	0.67	0.76	0.48	0.53	0.88	0.61	0.37	RE
BADIN (0.459/60)	0.79	0.83	1.03	0.63	0.41	0.80	1.27	0.65	RE
THARPARKAR (0.343/88)	1.03	0.79	1.15	0.58	0.41	0.68	1.12	0.67	RE
THATTA (0.447/64)	0.80	0.80	1.00	0.36	0.31	0.80	0.96	0.37	RE
MIRPUR KHAS (0.522/31)	1.03	0.66	1.29	0.67	0.41	0.51	1.09	0.86	RE
KARACHI (0.618/5)	1.34	1.29	0.98	0.53	0.47	1.31	1.44	0.52	RE
DIR (0.413/73)	0.73	0.57	0.79	0.65	0.49	0.72	0.75	0.51	RE
SAWAT (0.442/66)	0.67	0.97	0.83	0.55	0.40	1.16	1.32	0.46	RE
MANSEHRA (0.459/58)	0.99	1.04	1.02	0.46	0.14	1.02	3.37	0.47	RE
ABBOTTABAD (0.598/6)	0.91	0.99	1.12	0.48	0.35	0.88	1.38	0.54	RE
KARAK (0.484/48)	0.80	0.66	0.97	0.25	0.16	0.69	1.04	0.24	RE
SIBI (0.411/75)	1.06	1.26	1.40	0.42	0.46	0.90	1.15	0.59	RE
MEKRAN (N/A)	1.02	0.90	0.97	0.66	0.35	0.92	1.72	0.65	RE