SOEP The German Socio-Economic Panel study

851 2016

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SOEP — The German Socio-Economic Panel study at DIW Berlin 851-2016

Entrepreneurs and Freelancers: Are They Time and Income Multidimensional Poor? – The German Case

Joachim Merz and Tim Rathjen

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ISSN: 1864-6689 (online)

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Entrepreneurs and Freelancers: Are They Time and Income Multidimensional Poor? - The German Case

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April 2016

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Abstract

Entrepreneurs and freelancers, the self-employed, commonly are characterized as not only to be relatively rich in income but also as to be rich in time because of their time-sovereignty in principle. Our introducing study scrutinises these results and notions about the well-being situation of self-employed persons not only by asking about traditional single income poverty but also by considering time poverty within the framework of a new interdependent multidimensional (IMD) poverty concept. The German Socio-economic panel with satisfaction data serves as the data base for the population wide evaluation of the substitution/compensation between genuine, personal leisure time and income. The available detailed Time Use Surveys of 1991/92 and 2001/2 of the Federal Statistics Office provide the data to quantify the multidimensional poverty in all the IMD poverty regimes.

Important result: self-employed with regard to single income poverty, single time poverty and interdependent multidimensional time and income poverty in both years are much more affected by time and income poverty than all other active persons defining the working poor. A significant proportion of non-income-poor but time poor of the active population are not able to compensate their time deficit even by an above poverty income. These people are neglected so far within the poverty and well-being discussion, the discussion about the "working poor" and in the discussion about time squeeze and time pressure in general and in particular for the self-employed as entrepreneurs and freelancers.

JEL: D31, D13, J22

Keywords: *Liberal professions (Freie Berufe), entrepreneurs, self-employed, interdependent multidimensional time and income poverty, time and income substitution, extended economic well-being, satisfaction/happiness, CES welfare function estimation, working poor, German Socio-Economic Panel, German Time Use Surveys 1991/02 and 2001/02*

Entrepreneurs and Freelancers:
Are They Time and Income Multidimensional Poor? -
The German Case

Joachim Merz and Tim Rathjen

1 Introduction

Entrepreneurs and freelancers, the self-employed, commonly are characterized as not only to be relatively rich in income but also as to be rich in time because of their time-sovereignty in principle. However, first-time studies have already indicated – although separate for the income and the time dimension – that the empirical situation appears different. Though relatively many self-employed persons are part of the income rich, and high incomes are cause for a particular unequal distribution of income among the self-employed, in Germany and based on income tax microdata for instance, the lower income half of the self-employed in 2003 earned less than the respective half of the employees; their median is far below the employee's median indicating a large low income group of the self-employed.[1] With respect to time: Although longer working hours of self-employed persons are common[2], empirically founded results about the time distribution with a focus on time poverty for self-employed are scarce but see e.g. our further general studies on multidimensional time and income poverty (Merz and Rathjen 2014a,b) and the respective multidimensional polarization (Merz and Scherg 2015).

In general, analysis in the distribution context, of richness and poverty, traditionally have a focus on the income dimension[3], while the time dimension remains widely excluded[4] although the time dimension notably determines the well-being situation and in the context of poverty social participation and social exclusion.

Our study examines the well-being situation of self-employed persons not only questioning income poverty, but also linked interdependently to time poverty, in particular genuine personal leisure time, within the framework of a new interdependent multidimensional poverty concept based on Merz and Rathjen 2014a. The interdependence as the trade-off/substitution between time and income within our concept is evaluated not by experts, but by the German population as a whole. Our approach is embedded in the newer discussion of multidimensional poverty and, besides the interdependence topic, tackles self-employed persons in particular who in this context besides our work have not yet found further regard.[5]

The study is divided as follows: After embedding our approach into the respective background and literature the following chapter discusses our evaluation approach of substitution/compensation of individual time and income by a CES well-being/welfare function, describes the data base for the evaluation estimation, the German Socio-economic Panel (SOEP), and presents the results on substitution of the income and time dimensions. In the following chapter we establish the time, income and interdependent multidimensional

[1] Merz 2001, 2007, 2008, Merz und Zwick 2005

[2] For Finland Hyytinen and Ruuskanen 2007 report that self-employed work longer and have less personal leisure time. For Germany see Merz and Böhm 2008, Merz and Burgert 2004a,b, and Merz, Böhm and Burgert 2009 on working hours arrangements and self-employed income.

[3] See e.g. Hauser 2007, 2008 or Becker 2009.

[4] See, however, the approach to time poverty by Vickery 1977 and Harvey and Mukhopadhyay 2007.

[5] This study is a slightly changed English version of Merz and Rathjen 2012a.

poverty thresholds using detailed time use diary information of the German Time Use Survey (GTUS) provided by the Federal Statistic Office available for 1992 and 2002. The next chapter then presents the interdependent multidimensional poverty results of the self-employed as freelancers and entrepreneurs (traders = "Gewerbetreibende" in Germany) and their dynamics within different multidimensional poverty regimes. The paper concludes with a short summary.

2 Background and Literature

Increasingly, poverty is being recognized as a multidimensional phenomenon with the intention to extend the traditional income-orientated poverty concept (see Kakwani and Silber 2008, Deutsch and Silber 2005, Nolan and Whelan 2007, Groh-Samberg 2009, Lugo and Maasoumi 2008, Bourguignon and Chakravarty 2003, Tsui 2002). Even though this development is an advancement, the work being presented here (based on Merz und Rathjen 2012) can enrich the multidimensional poverty discussion by three central aspects: the time dimension, the quantified interdependence of multidimensional poverty and its application to the self-employed.[6]

Time, poverty and social participation: Beyond income, time is decisive for social participation and, thus, an important indicator of an extended poverty definition (see Sen 1999, 1985, Vickery 1977, Harvey 2007, Bittman 1999, Goodin et al. 2008). Bittman notes within this context: „The ability to participate in [social life] […] is the product of both access to leisure goods and services, and a sufficient quantity of leisure time" (Bittman 1999). Available time in particular makes togetherness possible and is an elementary requirement for social participation. In the sense of Sen's capability approach our poverty concept considers – along with the income dimension – the time dimension and considers genuine personal time as being sensitive for social participation in particular.

Multidimensional poverty concept: Multidimensional poverty concepts usually examine the various poverty dimensions separately and assign somebody to be poor at risk, when there are deficits in a certain number of dimensions (counting approach, see Atkinson 2003, Nolan and Whelan 2007, Cappellari and Jenkins 2007, Groh-Samberg 2009), and thus ignore the interdependence and possible substitution between dimensions. Bourguignon and Chakravarty 2003 and Lugo and Maasoumi 2008 analyse interdependencies between the poverty dimensions based on poverty axioms. In their applications, however, they consider only arbitrarily chosen values of a CES-type well-being function. Our paper use a CES well-being function which is not arbitrarily chosen but will be evaluated by the total German population.

Since the individual well-being[7] is influenced by the balance/trade off between higher income (to purchase goods and services) and (some) leisure, the kind of substitution and interdependency is considered in our multidimensional poverty concept by an empirically based CES-well-being/welfare function with time and income as input variables and well-being as output. Empirically the German population will evaluate the assigned substitution via respondent's satisfaction surveyed by the German Socio-economic panel.

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[6] Besides our contribution to the general poverty and time poverty discussion, the discussion of time stress is also touched. Although time stress is seen as a new social problem (see Bonke und Gerstoft 2005, Sullivan 2007, Rosa 2006, Garhammer 2002b, Linder 1970), however, less is known about consequences on the well-being situation within the frame of a poverty concept.

[7] At least in the microeconomic labour supply context with its consumption/leisure trade off approach.

Self-employed as entrepreneurs and freelancers, „working poor" and empirical foundation: Empirical studies about the self-employed are rare. However, studies are available: international, see e.g. Parker 2004, Hamilton 2000; national, see e.g. Merz 2001, 2007, 2008, Merz and Zwick 2005, Merz, Hirschel and Zwick 2005 and the studies of our Research Institute on Professions (Forschungsinstitut Freie Berufe, FFB, www. leuphana.de/ffb, Leuphana University Lüneburg) with all its work on the self-employed, freelancer and entrepreneurs. With respect to time use[8] we quantify German time poverty – for the self-employed and the active population overall – based on time use diaries with the German nationwide Time Use Surveys (GTUS) along with a population founded interdependent multiple poverty threshold. The results compare the situation of self-employed with that of the employees and provide an insight into the dynamics of interdependent multidimensional poverty. With the focus on employment our analysis is at the same time a contribution to the current discussion of the „working poor"[9]

3 Interdependence/Substitution of Time and Income

3.1 Theoretical Background – CES Well-being Function

The interdependence, the substitution/compensation between input factors for a certain output is of longstanding interest within the production function discussion.[10] We borrow this approach and will estimate a CES (constant elasticity of substitution) production function – which we refer to as a CES well-being function – with personal leisure (L) and income (I) as input variables and well-being ($u = f(I,L)$) as output:

$$(1) \qquad u = f(I,L) = \gamma \cdot \left(\delta \cdot I^{-\rho} + (1-\delta) \cdot L^{-\rho} \right)^{-\frac{\nu}{\rho}}$$

with the substitution elasticity $\sigma = \frac{1}{1+\rho}$, the substitution parameter ρ, the constant γ, the returns to scale υ and the input coefficients δ as distribution parameter.

We interpret the individual well-being function as a welfare function, which based on econometrically estimated relations will be a population wide – and not expert based – evaluation of an assigned substitution/compensation of time and income.

One possibility for an efficient OLS estimation of the non-linear CES-function was shown by Kmenta 1967 based on a first and second order approximation in a Taylor series expansion around the substitution coefficient $\rho = 0$ respectively around the substitution elasticity $\sigma = 1$ with

$$(2) \qquad \ln u = \ln \gamma + \upsilon\delta \ln I + \upsilon(1-\delta) \ln L - \frac{1}{2} \rho\upsilon\delta(1-\delta)\left[\ln I - \ln L\right]^2 + \varepsilon$$

The Taylor expansion approach at the same time can be regarded as an approach for a more general production/well-being function.

Summarizing coefficients the reduced form estimation is using

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[8] For an overview of time use research in general see Merz 2011.

[9] See e.g. Nollmann 2009, Andreß und Lohmann 2008.

[10] For a detailed discussion of the production function approach see e.g. Fandel 2005.

(3) $$\ln u = \alpha_0 + \alpha_1 \ln I + \alpha_2 \ln L + \alpha_3 \left[\ln I - \ln L\right]^2 + \varepsilon$$

with ε as an iid error term.

Given the estimated regression coefficients α the structural CES parameters can be determined by[11]

(4) $$\alpha_0 = \ln \gamma \quad \Leftrightarrow \quad \gamma = e^{\alpha_0}$$

(5) $$\alpha_1 = \upsilon\delta \quad \text{and} \quad \alpha_2 = \upsilon(1-\delta) = \upsilon - \upsilon\delta \quad \Rightarrow \quad \alpha_2 = \upsilon - \alpha_1 \quad \Leftrightarrow \quad \upsilon = \alpha_1 + \alpha_2$$

$$\Rightarrow \quad \alpha_1 = (\alpha_1 + \alpha_2)\delta \quad \Leftrightarrow \quad \delta = \frac{\alpha_1}{\alpha_1 + \alpha_2}$$

(6) $$\alpha_3 = -\frac{1}{2}\rho\upsilon\delta(1-\delta) \quad \Leftrightarrow \quad \rho = (-2)\frac{\alpha_3}{\upsilon\delta(1-\delta)}$$

$$\Rightarrow \rho = (-2)\frac{\alpha_3}{(\alpha_1 + \alpha_2)\frac{\alpha_1}{\alpha_1 + \alpha_2}(1 - \frac{\alpha_1}{\alpha_1 + \alpha_2})} = (-2)\frac{\alpha_3}{\alpha_1 - \frac{\alpha_1^2}{\alpha_1 + \alpha_2}}$$

This is the further used estimation approach for evaluation and empirical identification of individual well-being $u = f(I, L)$ and the substitution between income and time.

3.2 Information Used for Estimation the CES Well-being Function Using the SOEP

The German Time Use Studies (GTUS) 1991/92 and 2001/02 of the Federal Statistic Office primarily are the surveys at hand for detailed analyses of individual time use.[12] However, these databases contain no information on a general life satisfaction as an indicator for individual well-being, say. So for the CES well-being estimation we use another survey, the German Socioeconomic Panel (SOEP) but will come back to the GTUS as the base for the final multiple dimensional poverty results.

The SOEP is a representative panel survey that has been carried out annually since 1984 now by the German Institute of Economic Research (DIW) (Wagner et al. 2009, www.diw.de/soep). From 1992 until 2002 – both survey periods comparable to the GTUS — the number of persons questioned rose due to the expansion of the panel sample from 17.842 to 31.087.

Because the interdependence or substitution/compensation of time and income is primarily concerned and important for the working population, our CES well-being estimation focus on the active population which promises more reliable results than those of the whole population. Following this argument we further focus on persons with daily working hours of equal and more than 5 hours. The final database then consists of 6,654 people in 1992 and 10,831 people in 2002.

The variables used for estimation are defined as follows:

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[11] See Hoff 2002, Hoff 2004 for further aspects of the CES-function estimation. Further details of the approach here are given in Merz and Rathjen 2009.

[12] For a recent overview of time use and time budget analyses see Merz 2011.

Income: As a central resource income allows the acquisition and consumption of well-being-generating goods and services. The unit of observation commonly is the household and household net income is the joint disposable income for expenditures.

To consider the comparability of various household structures, different needs and household size effects, a net equivalence income is regarded within the poverty discussion and in our subsequent analyses. The net equivalence income equates the household net income divided by a household equivalence scale (sum of weights of the individual household members). Internationally the new OECD-scale has established itself. It orders the weight of one to the household head, the weight 0.5 to all additional household members 15 years and older and all others with 0.3.

Time: Available time – besides income – in particular is important for social participation. With reference to social participation possibilities we use the following time concept: it is the remaining available genuine personal leisure time, left over after work time, household work time, child care, household obligations, sleep, personal hygiene or health activities. We argue that time poverty is present when this remaining genuine personal leisure time – like for personal hobbies, playing soccer with others etc. – is below a certain level and no or restricted time is left for social accompanying. In the empirical analyses we have taken correlative information from the SOEP question according to the average time for „hobbies and other free-time activities“ of a typical weekday (question 11 of the SOEP questionnaire 2002).

The household situation is the basis for the income concept within poverty analyses. The question arises whether personal leisure should be considered as well in the household context. We argue, that genuine personal leisure time is not re-allocatable between household members and is strictly personally linked. Thus, we regard time not at the household but at the personal level.[13]

***Well-being*:** As a proxy for individual well-being we use the SOEP information on general life satisfaction (well-being/happiness: “Lebenszufriedenheit”) with an eleven point scale from „not at all satisfied“ to „very satisfied“ (question 135 of the SOEP questionnaire 2002). Such a life satisfaction question to measure well-being is increasingly being used in the well-being and happiness discussion: see Frey und Stutzer 2002 and 2005 for an overview on the happiness discussion, Diener 2009 on the „science of well-being“ and subjective well-being, Kahnemann and Krüger 2006 on the development in measuring subjective well-being, or fundamental Easterlin 1974, Freeman 1978 und Hamermesh 2004 on the use of subjective variables in economics. For a discussion within SOEP and general satisfaction/well-being also see Mayraz, Wagner and Schupp 2009.

3.3 Estimation Results: Evaluation of the General Well-being Level and Substitution Between Time and Income with SOEP data

The estimation of the CES well-being function yields to the regression results presented in Table 1. The respective variables of the estimation are highly significant[14] and confirm the

[13] To further support our argument take an example: In a two-person-household, consisting of wife and husband, only the wife is employed and gets an above-average income with her above average time input for the employment. Since both household members rely on that income, it would be inappropriate to judge the non-working husband as being income poor; the argument, why income poverty should be measured on the household level. However, it would also be inappropriate to judge the husband as being time poor only because his wife has a time intensive working schedule. Thus, time in contrast to income preferably should be considered at the individual level when poverty is discussed.

[14] With the exemption of the ‚kmenta_correction’-variable Kmenta's (1971, p. 509-512) for 1992.

substitution relationship between time and income (Table 1). The measure of determination is low, however comparable with the results of other cross-section analyses (e.g. Goodin 2008, 58).

Table 1: Reduced form regression results of the CES well-being function estimation for 1992 and 2002

1992 (in Prices from 2002)

Dependent Variable: ln utility	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
(Constant)	1,301	,056		23,320	,000
ln net equivalence income	,065	,014	,100	4,769	,000
ln genuine leisure	,032	,014	,130	2,318	,020
kmenta_correction	,003	,002	,082	1,419	,156
n	6650				
R^2 / adj R^2	1,9% / 1,9%				
F	42,973				
Sig.	0,000				

2002

Dependent Variable: ln utility	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
(Constant)	1,267	,033		37,913	,000
ln net equivalence income	,056	,009	,123	6,347	,000
ln genuine leisure	,052	,010	,180	5,153	,000
kmenta_correction	,004	,001	,123	3,167	,002
n	10827				
R^2 / adj R^2	3,7% / 3,7%				
F	138,761				
Sig.	0,000				

Source: SOEP 1992 and 2002; own calculations.

With the derived structural coefficients via the equations (4) to (6) for 1992 and 2002 the estimated CES well-being functions are

$$(7) \qquad u_{1992} = 3,673 \cdot \left(0,670 \cdot I_i^{\,0,280} + 0,330 \cdot L_i^{\,0,280}\right)^{-\frac{0,097}{-0,280}}$$

$$(8) \qquad u_{2002} = 3,550 \cdot \left(0,519 \cdot I_i^{\,0,297} + 0,481 \cdot L_i^{\,0,297}\right)^{-\frac{0,108}{-0,297}} .$$

Thursby and Lovell (1978, 370) determined that the estimated CES parameter of the Kmenta-Approximation is only consistent under certain circumstances. Thus, the distortion of the estimated parameters increases with increasing intervals of substitution parameters $\rho = 0$ or rather of substitution elasticity $\sigma = 1$. A rule of thumb from Hoff (2004, 301) on this problem states that ρ the value +0,1 until +0,2 should not be exceeded. This requirement is fulfilled for both estimations. Furthermore, the results of this estimation only then correlate with the true parameters when the natural logarithm from the ratio of the input factors $\ln(I/L)$ lies within the convergence radius of $\left|1/(\rho\delta)\right|$. Also when assuming extreme values, for example when we take 6,000 Euros as net equivalence income per month and only 30 minutes of personal leisure time per day from the estimation of 2002, the result is $\ln(I/L) = \ln(6000/30) = 5,298$ and thus the value that lies within the convergence radius of $\left|1/(\rho\delta)\right| = \left|1/\left((-0,297)\cdot 0,519\right)\right| = 6,487$. A further assessment measurement focuses on the returns to scale: The Translog-approximation collapses quickly under the CES structure, when the returns to scale exceed one. These conditions are also fulfilled with calculated returns to scale of $\upsilon = 0,097$ for 1992 and $\upsilon = 0,108$ for 2002 and the quality of the estimation is again confirmed.

To conclude, the goodness of estimation criteria support the chosen translog approximation and CES well-being function estimation. The estimated coefficients show a significant substitution of genuine personal leisure time and equivalized household net income.

Substitution/compensation of personal leisure time and income 1992 and 2002

The estimated CES well-being functions (7) and (8) show returns to scale of $\upsilon_{1992} = 0,097$ and $\upsilon_{2002} = 0,108$ as well as substitution elasticities of $\sigma = \frac{1}{1+\rho} = 1,389$ for 1992 and $\sigma = 1,422$ for 2002 (Table 2).

The **returns to scale** for 1992 characterise an increase in well-being of 6.95% when the genuine leisure time and income are doubled. The effect is greater for 2002 with 7.77% but the difference seems to be of minor importance[15].

Table 2: CES Well-being Function, Substitution Elasticity and Returns to Scale for 1992 and 2002

	1992	2002
CES Well-being Function	$u = 3,673 \cdot \left(0,670 \cdot I_i^{0,280} + 0,330 \cdot L_i^{0,280}\right)^{\frac{0,097}{-0,280}}$	$u = 3,550 \cdot \left(0,519 \cdot I_i^{0,297} + 0,481 \cdot L_i^{0,297}\right)^{\frac{0,108}{-0,297}}$
Substitution Coefficient	$\rho = -0,280$	$\rho = -0,297$
Substitution Elasticity	$\sigma = \frac{1}{1+\rho} = 1,389$	$\sigma = 1,422$
Returns to Scale	$\upsilon = 0,097$	$\upsilon = 0,108$

Source: SOEP 1992 and 2002; own calculations.

The **substitution elasticity** $\sigma = \frac{1}{1+\rho}$ measures the elasticity of substitution between personal leisure time (L) and income (I) as a percentage change in the factor ratio (L/I) dependent on the percentage change in slope of the indifference curves[16]. Or, simply said, the substitution elasticity is a measure of the curvature of the indifference curves and ranges between perfect substitution ($\rho = -1, \sigma = \infty$) and complementary ($\rho = \infty, \sigma = 0$, the Leontief case).[17]

Perfect Substitute ($\sigma = \infty$): The input factors personal leisure time and income can be completely substituted by each other.

Leontief case ($\sigma = 0$): The input factors personal leisure time and income cannot be substituted. People would prefer a certain ratio of personal leisure time and income. Based on

[15] Returns to scale k: $f(k \cdot I, k \cdot L) = u \cdot k^{\nu}$ with k as a scalar.

[16] Marginal rate of substitution, ratio of marginal products (partial gradients).

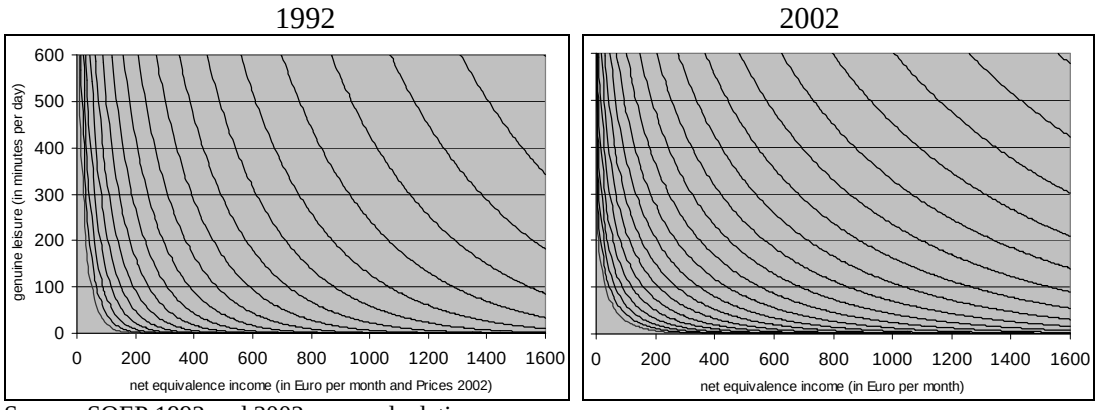
[17] With a constant substitution the substitution elasticity is constant along the straight-line starting from zero; the ratio of personal leisure time and income is constant.

this optimal factor ratio they are not willing to give up a part of the input factor, no matter how much compensation they acquire from the other input factor.[18]

In the 10-year-observation the substitution elasticity of $\sigma = \frac{1}{1+\rho} = 1,389$ for 1992 increased to $\sigma = 1,422$ for 2002. Thus, we are closer to the perfect substitution situation, although marginal. The substitution between leisure time and income has become more elastic. One could argue, that leisure time has become more valuable to the population because a certain decrease in income is more acceptable for compensation.

Figure 1 presents the indifference curves of the estimated CES well-being functions for the years 1992 and 2002. With the increase in substitution elasticity the substitution ability between personal leisure time and income increases, the indifference curves are less „curved", more „flat". All together, these changes can be interpreted as an increase in the importance of genuine leisure time as opposed to net equivalence income.

Figure 1: Indifference curves of the CES Well-being Function Estimation



Source: SOEP 1992 and 2002; own calculations.

4 Interdependent Multidimensional Poverty Regimes

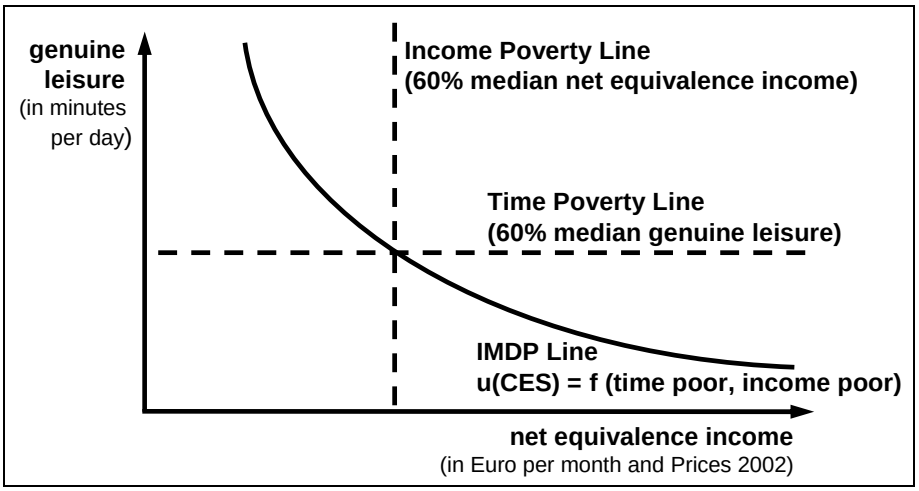
4.1 Time, Income and Interdependent Multidimensional Poverty Concept

After quantifying the substitution/compensation of personal leisure time and income as a population evaluation above, the following question arise: what is the interdependent multidimensional (IMD) poverty line, i.e. which indifference curve will serve as the IMD poverty threshold from Figure 1.

Income Poverty: The majority of conventional income-based poverty concepts in the EU count a person as being poor at risk when the equivalence household net income is below 60% of the median net equivalent income of all (Bundesregierung 2005, XV). Figure 2 shows that in our approach a person is assigned to be income poor when (s)he is left of that income poverty level (at the x-axis).

[18] Or in other words: If an individual has relatively much personal leisure time und relatively less income, more personal leisure time does not raise well-being. And accordingly: If an individual has relatively much income and relatively less personal leisure time, more income does not raise well-being.

Figure 2: Defining the Interdependent Multidimensional Poverty Line and Respective Regimes



Source: own presentation

Time Poverty: For the definition of time poverty in the anglo-saxon hemisphere Bittman (1999, 14) refer to a median concept as well: "A commonly employed standard used to benchmark [income] poverty [..] is 50 per cent of the median. [..] Applying an analogous standard (50 per cent of the median leisure time) [..] we can get some idea of what social situation produces the most severe kinds of time poverty". Analogue but according EU standards we refer to the 60%-median line, however and as mentioned, in reference to the personal situation and according to genuine personal leisure. Affected individuals are those who are below the personal leisure time poverty threshold in Figure 2 (at the y-axis).

Interdependent Multidimensional Poverty: Now the question is, which indifference curves from Figure 2 should be the interdependent multidimensional (IMD) poverty threshold. A person who neither is time nor income poor (regime 6 in Figure 2), also according to the IMD poverty concept, should not be counted as poor. The indifference curve being searched for, therefore, cannot cross regime 6 in Figure 2. That a person who is time as well as income poor (regime 1 in Figure 2), should be counted as poor, also according to the IMD poverty concept, is likewise revealing. The indifference curve being searched for cannot cross regime 1 either and, thus, cross the intersection of the single time and income poverty thresholds. In other words: People with a well-being level below that assigned well-being level of the population are counted to be interdependent multidimensional time and income poor.

4.2 Time, Income and Multidimensional Poverty with GTUS time Use Diary Data – Definitions

As with the estimation of the CES well-being function the socio-economic panel (SOEP) can be used to determine the time and income poverty threshold. However, the time-use-surveys (GTUS) of 1991/92 and 2001/02 provide two surveys with more detailed time-use information based on time use diaries, which we draw upon in the following.

The two time use surveys of 1991/92 and 2001/02 were carried out by the Federal Statistic Office as representative samples for Germany. Participants were asked to note their daily routines subsequently in diaries in their own words and three times during the week, two working days and a Saturday or Sunday. In addition to the then coded diaries the participants completed a person and household questionnaire. For 1991/92 and for our analysis 6,845

households with 15,366 persons and 30,732 diaries are available. In 2001/02 5,171 households with 11,962 persons and 35,813 diaries form our data base.

After individuals with daily working hours of less than 5 hours were eliminated for our empirical analysis (see above), the final database for 1991/92 consisted of 3,242 households, 5,059 persons and 9,922 diaries and for 2001/02 of 1,890 households, 2,871 persons and 8,147 diaries.

Net equivalence Income: The monthly net equivalence income was computed from household information. The prices from 1991/92 were adjusted to the 2001/02 situation

Personal Leisure: The personal leisure time per day was defined as the sum of all activities allotted to a category from Table 3.

Table 3: Personal Leisure Activities for 1991/92 and 2001/02

1991/92	2001/02
• "Contact/Conversations/ Sociality" (Activities 611-640, 699) • "Media Use/Free-time Activities" (Activities: 711-740, 799)	• "Social Life and Entertainment" (Activities 500-531) • "Participation in athletic activities e.g. outdoor activities" (Activitites: 600-649) • "Hobbys and Games" (Activities 700-739) • "Mass Media" (Activities: 800-849)

Source:GTUS 1991/92 and 2001/02 own diagram.

By incorporating the use of mass media such as watching television into the personal leisure time, a relatively high time poverty value can be expected. However, meanwhile, the use of mass media is an essential part of personal leisure activity and an activity with familial social participation; our argument to incorporate this activity.

4.3 Time, Income and IMD Poverty Lines in Germany

Using the above databases a median equivalized net household income per month of 1,109.64 Euros[19] is resulting for 1991/92 and 1,322.58 Euros per month for 2001/02. The single income poverty threshold (60%) thus is 665.78 Euros for 1991/92 and 793.55 Euros for 2001/02 (see Figure 3).[20] All income data are adjusted for price inflation by a 19.2% increase.

The median for personal leisure time is 265 minutes in 1991/92 and 310 minutes in 2001/02 per day, resulting in a time poverty level (60%) of 159 minutes for 1992/92 and 186 minutes for 2001/02 per day.[21]

[19] Price adjustment: in prices of 2002

[20] Based on the Sample Survey on Income and Expenditure of the Federal Statistical Office of Germany, an income poverty threshold of 938 Euro net equivalized household income per month is calculated in the second Poverty and Richness Report of the Federal Administration (Bundesregierung 2005, 6). It is noted that the size of the calculated threshold depends on the applied equivalence scale, mean value and database. It is mentioned that other studies come to a poverty threshold of 604 Euro. Our threshold of 793,55 Euro for 2002 seems to be plausible against that background.

[21] The calculations in Table 3 depend on the whole population here to achieve comparability to the traditional income poverty concepts.

The increase of personal leisure time as well as the time poverty threshold over the ten years period is 17% and is somewhat lower as the increase in the respective income by 19.2%.

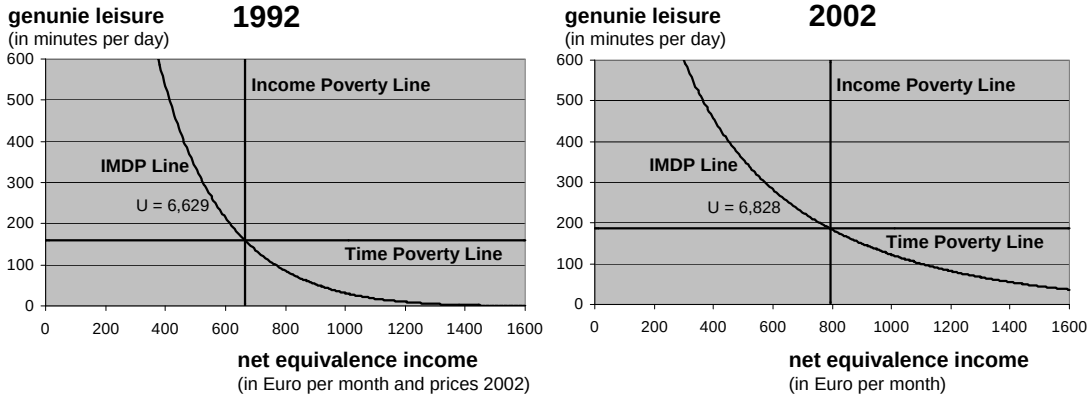
The assigned IMD poverty threshold at the intersection of the single time and income thresholds is about a well-being level of 6.629 in 1991/92 and 6.828 in 2001/02 based on the estimations of the SOEP data (see Figure 3):

$$(9) \qquad u_{1992}^{poor} = f(I^{poor}, L^{poor}) = 3,673 \cdot \left(0,670 \cdot 665,78^{0,280} + 0,330 \cdot 159^{0,280}\right)^{-\frac{0,097}{-0,280}} = 6,629$$

$$(10) \qquad u_{2002}^{poor} = f(I^{poor}, L^{poor}) = 3,550 \cdot \left(0,519 \cdot 793,55^{0,297} + 0,481 \cdot 186^{0,297}\right)^{-\frac{0,108}{-0,297}} = 6,828$$

Figure 3: Time, Income and interdependent multidimensional Poverty Regimes for 1991/92 and 2001/02 in Germany

	1991/92	2001/02
median net equivalent income (in Euro per month and prices 2002)	1,109.64	1,322,58
median genuine leisure (in minutes per day)	265	310
Income Poverty Line (I^{poor}) (60% median net equivalent income)	665.78	793.55
Time Poverty Line (L^{poor}) (60% median genuine leisure)	159	186
$u^{poor} = f(I^{poor}, L^{poor})$	6.629	6.828



Source: GTUS 1991/92 and 2001/02; own calculations; total population.

If a person is below this assigned IMD poverty level by the German population then (s)he will be counted as being interdependent multidimensional time and income poor.

5 Results: Dynamics of Time, Income and Interdependent Multidimensional Poverty in Germany

Given these thresholds each sample person then is belonging to one of the six multidimensional poverty regimes out of Figure 2, making descriptive and multivariate analysis of a person's socio-economic background in the various poverty regimes possible. Chapter 4.1 describes general results for the active population and the working poor. Chapter 4.2 focuses on the self-employed. Note in general, as in traditional income poverty analysis, it

is not important if on the individual level a person voluntarily allocates himself into one of the poverty regions. It is the assigned situation under a certain poverty threshold which yields the respective head count ratio.

5.1 Working poor, Active Population and IMD Poverty

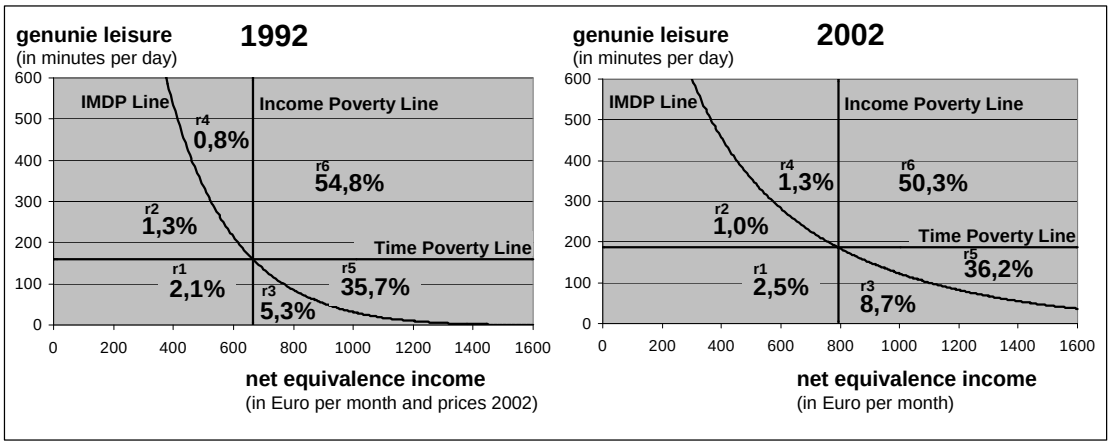
Income poverty: Within the total working population, the head count ratio of the income poor active population, the so called „working poor", rose from 4.2% (1992) as a percentage of all active persons (regime 1: 2.1%, regime 2: 1.3%, regime 4: 0.8%) to 4.8% in 2002 (see Figure 4, Table 4).[22]

Time poverty: Time poverty grew about 4.2 percent points from 43.1% to 47.3% (regime 1, 3 and 5) within that ten years period.[23]

Income poor as well as time poor: 2.1% respectively 2.5% of all working persons.

Interdependent multidimensional (IMD) poverty increased by 3.5 percentage points from 8.7% to 12.2% (regimes 1, 2 and 3).

Figure 4: Results of Time, Income and IMD Poverty – Active Population



Source: GTUS 1991/92 and 2001/02; own calculations; active population.

Thus, poverty of the active population increased in all dimensions in the 1990s until 2001/02 but particularly in the time dimension: income poverty increased by 0.6 percentage points; time poverty increased by 4.2 percentage points and particularly the interdependent multidimensional (IMD) time and income poverty increased by 3.5 percentage points.

Our interdependent multidimensional (IMD) poverty concept allows compensation between time and income judged by the population. Accordingly, a deficit in one dimension not necessarily is compensated by the other dimension in the same magnitude. The compensation effects are visible in the above single time respective income poverty line, regimes 3, 5 and 2, 4 (see also Figure 5).

Regime 5 persons, for instance, are assigned to be able to compensate their time deficit by income.

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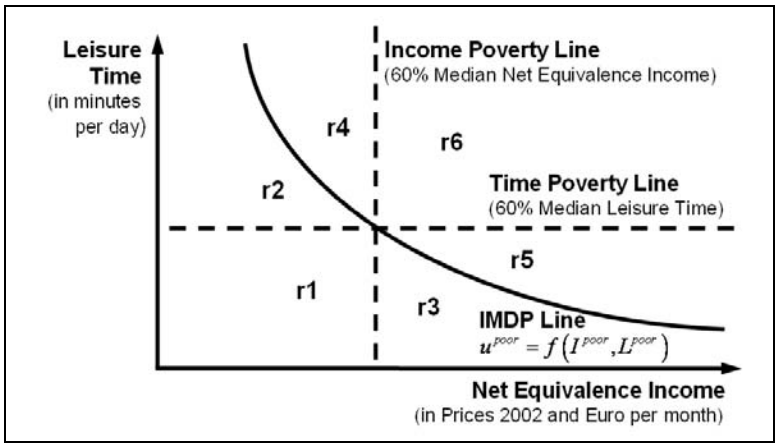
[22] The results are confirmed by other studies focussing on the „working poor" (see e.g. Rhein 2009, 4). Remember, a working poor person is due to the household base measurement of poverty.

[23] Analysis within this chapter are based on the working population. Hence a relatively high percentage of time poor people and a relatively low – but remarkable – percentage of income poor people results.

Figure 5: IMD Poverty Regimes



Source: Own figure.

Regime 3 persons, in contrast, are also time, but not income poor. However, income – though above the single income poverty line – is not high enough to compensate for the time deficit, resulting in IDM poverty.

Remarkably, within the 10 years period the percentage of the regime 3 persons dramatically rose from 5.3% to 8.7% in 2002.

Regime 2 persons are income but not time poor, they are assigned not to compensate income deficits by higher time and thus are IMD poor.

This regime has a poverty quota of 1.0% (2002), which is similar to the area in which poverty income can be compensated by higher leisure time with a poverty quota of 1.3% (regime 4).

A substitution situation below the income poverty line is discussible since income at and below the poverty threshold already describes a money valued socio-cultural minimum. Nevertheless, some compensation is assigned by the total population evaluation. Certainly the compensation of income by time in regime 4 (no more IMD poor but single income poor) with 1.3% (2002) has a much lower quantitative importance than the compensation of time by income above the income poverty line with 36.2% (regime 5) which emphasizes the overall importance of income. Nevertheless, it is remarkable that genuine personal leisure time is assigned to be so valuable that the time deficit cannot be compensated by above poverty income for 8.7% (2002) of the active population; and, this head count ratio raised remarkably from 5.3% to 8.7% within the ten years period of investigation.

Compared to the single income poverty threshold situation altogether, our new IMD poverty approach reduces single income poverty by 1.3% (regime 4) but adds 8.7%; a net balance of +7.4% (4.5% in 1992) additional working poor who are neglected in the poverty debate so far.

With Table 4 the occupational status and its resulting poverty head count ratio in all poverty regimes is given. Without going into detail it will be visible that in all poverty regimes and in the aggregates income poverty, time poverty and IMD poverty, there are distinct differences between the respective working groups. In particular, the self-employed shows a different picture which is of special interest in our study and in the following chapter.

Further results for socio-economic and socio-demographic groups such as gender, age, education, weekly work load, nationality of the household and family structure and region for 2002 are discussed in Merz and Rathjen 2012.

Table 4: Time-, Income and Interdependent Multidimensional Poverty –Occupational Status, Germany 1992 and 2002

in %*	Poverty Sectors												Income Poverty		Time Poverty		IMD Poverty	
	1		2		3		4		5		6							
	1992	2002	1992	2002	1992	2002	1992	2002	1992	2002	1992	2002	1992	2002	1992	2002	1992	2002
Occupational Status																		
Self-employed	2.3	8.8	2.2	1.7	7.1	11.6	0.9	1.5	40.4	37.9	47.1	38.5	5.4	12.0	49.8	58.3	11.6	22.1
Civil servants	0.1	0.0	0.0	0.0	2.4	4.1	0.4	0.1	33.9	41.2	63.3	54.4	0.4	0.3	36.4	45.3	2.4	4.3
White collar worker	1.2	0.7	0.4	0.4	5.7	6.8	0.4	0.5	40.2	41.4	51.8	50.2	2.3	1.6	47.1	49.0	7.7	7.9
Blue collar worker	2.9	2.2	1.6	1.0	5.0	10.7	1.0	2.1	31.9	32.0	57.6	51.9	5.5	5.3	39.9	45.0	9.5	14.0
Other occupation	4.1	6.3	3.7	4.2	5.6	10.8	2.9	3.9	24.1	18.6	59.6	56.2	10.7	14.4	33.8	35.8	13.4	21.3
Total	**2.1**	**2.5**	**1.3**	**1.0**	**5.3**	**8.7**	**0.8**	**1.3**	**35.7**	**36.2**	**54.8**	**50.3**	**4.2**	**4.8**	**43.1**	**47.3**	**8.7**	**12.2**

* in % of all in the respective status; IMD Poverty = Interdependent Multidimensional Poverty

Source: GTUS 1991/92 and 2001/02, own calculations; active population.

5.2 Self-employed, Freelancers and Entrepreneurs and IMD Poverty

As to our general question about time and income poverty of the self-employed, the main answer and astonishing result is that self-employed persons are more strongly affected by poverty in any regime than any other group of the active population: income poverty (1992: 5.4%; 2002: 12.0%), time poverty (1992: 49.8%; 2002: 58.3%) and interdependent multidimensional (IMD) poverty (1992: 11.6%; 2002: 22.1%). This holds not only for 1992 but also ten years later for 2002. Furthermore, the increase of all three poverty regimes within the ten year period is higher than that of all active persons (Tables 4 and 5).

Table 5: Time, Income and Interdependent Multidimensional Poverty of Self-employed and Active Population, Germany 1992 and 2002

Poverty Regimes	**Self-employed**		Index	**Active Population**		Index
	in %		1992=100	in %		1992=100
	1992	2002		1992	2002	
Income Poverty (1, 2, 4)	5.4	12.0	*222* ***	4.2	4.8	*114* **
Time Poverty (1, 3, 5)	49.8	58.3	*117* ***	43.1	47.3	*110* ***
IMD Poverty (1, 2, 3)	11.6	22.1	*191* ***	8.7	12.2	*140* ***
Time- and Income Poverty (1)	2.3	8.8	*383* ***	2.1	2.5	*119* **
IMD Poverty > Income Poverty (3)	7.1	11.6	*163* ***	5.3	8.7	*164* ***

In % of all self-employed respective All Working; Significance level of proportion test: 5%=*, 1%=**, 0,1%=***
IMD Poverty = Interdependent Multidimensional Poverty
Source: GTUS 1991/92 and 2001/02, own calculations; self-employed and active population.

The number of income poor self-employed as well as time poor self-employed increased sharply. On top, the hard core, time as well income poverty (regime 1), rises from 2.3% in 1992 to 8.8% in 2002 almost quadrupled, even though from a relatively low level and remarkably underlines the particular poverty importance for the self-employed.

The increase in single income poverty within the self-employed is of its own importance; their income poverty head count ratio is more than doubled within the observed 10 years. Income poverty also is the driving factor for the almost twofold increase of interdependent multidimensional (IMD) poverty of the self-employed, although time poverty with an increase of 17% – and higher than the 10% increase for all active population – beyond all compensation effects is important too for the astonishing increase in IMD poverty of the self-employed.

A closer look to the compensation areas provides the following: **Regime 3 poverty**, with self-employed who despite an above poverty income are assigned not to compensate their

time deficit, is remarkably higher for the self-employed than for the active population on average: with 7.1% (1992) and 11.6% (2002) poverty is considerably greater than for all working groups together with 5.3% (1992) and 8.7% (2002).

The relatively higher poverty head count ratios in all the IMD poverty regimes as well as the distinct above average increase of IMD poverty within ten years answers our general question by yes: compared to other working groups the self-employed in particular indeed are time and income poorer than the other working groups.

Together with the mentioned high income self-employed persons, a particular polarization within the self-employed[24] has to be recorded with a remarkable proportion of time and income poor self-employed.

Behind these results there may be many factors, such as an increase in outsourcing of certain services, an increase of pseudo self-employment ("Scheinselbständigkeit") and even an increase in working pressure especially for the self-employed because of a growing globalisation and harder competition.

Freelancers, entrepreneurs an IMD poverty

Strong differences in the income distribution within the group of the self-employed were already apparent from other analyses (e.g Merz 2001, 2007). This large heterogeneity among the self-employed in regard to their poverty situation is going to be also apparent with the following results (Table 6).

If we sub-divide the self-employed in freelancers (liberal professions) and entrepreneurs (traders) – empirically only possible for 2002 – then entrepreneurs are particularly affected by interdependent multidimensional (IMD) poverty. The head count ratio of interdependent multidimensional poor entrepreneurs is about 29.4% while the head count ratio of freelancers (liberal professions) is decidedly lower with 11.3%.

Time sovereignty within the self-employed seems to play a larger role for freelancers since their time poverty is lower than that of entrepreneurs.

Income poverty of freelancers with 7.2% is lower than that of entrepreneurs which is more than twofold higher (15.3%).

If each poverty regime is inspected the picture of poorer entrepreneurs compared to freelancers becomes even more clearer: the income as well as time poor entrepreneurs, the hard core of income and time poor people (regime 1) with 11.7%, as opposed to 4.6% for freelancers are much more strongly affected by both poverty dimensions: genuine personal leisure time and income.

[24] The polarization of self-employed single income is a result e.g. by Merz 2007

Table 6: Time, Income and Interdependent Multidimensional (IMD) Poverty of Freelancers (Liberal Professions) and Entrepreneurs, Germany 2002

Poverty Regimes	2002 Free-lancers	2002 Entre-preneurs	Index	2002 Self-Employed	Overall
	%	%	Freelancers = 100	%	%
Income Poverty (1, 2, 4)	7.2	15.3	*213* ***	12.0	*4.8*
Time Poverty (1, 3, 5)	48.5	65.0	*134* ***	58.3	*47.3*
IMD -Poverty (1, 2, 3)	11.3	29.4	*260* ***	22.1	*12.2*
Time *and* Income Poverty (1)	4.6	11.7	*254* ***	8.8	*2.5*
IMD Poverty > Income Poverty (3)	6.3	15.2	*241* ***	11.6	*8.7*

Signficance test of proportion differences: 5%=*, 1%=**, 0,1%=***
IMD-poverty = Interdependent Multidimensional poverty
Source: GTUS 1991/92 and 2001/02; own calculations.

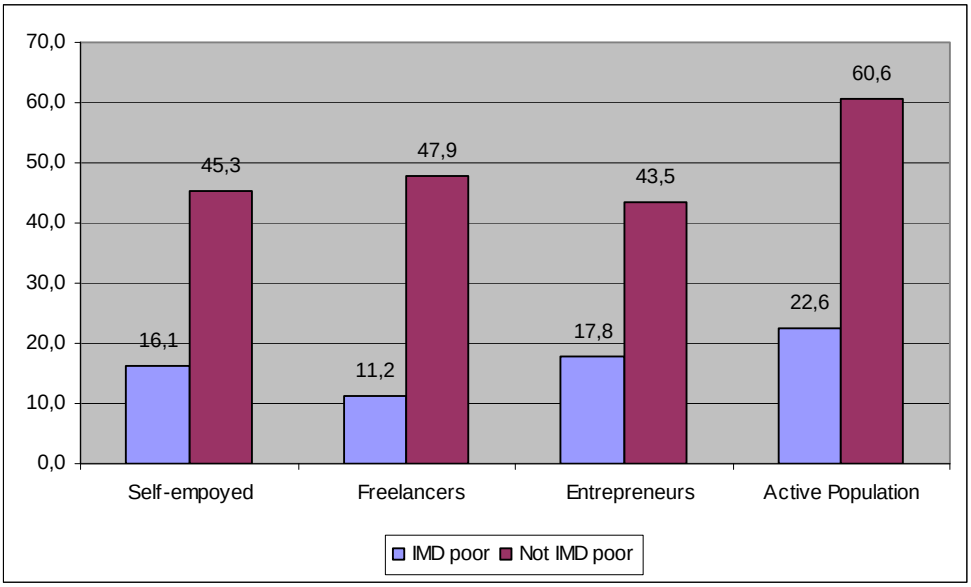
Thus, although freelancers in all poverty regimes of multidimensional interdependent time and income poverty are less affected than entrepreneurs, there is still no relaxed situation among the all in all heterogeneous group of freelancers. The head count ratio of the so-called hard core poor freelancers with 4.6% is clearly higher than that of all working groups with 2.5%. Also, there are relatively more freelancers affected by single income poverty with 7.2% compared to the total average of all active population with 4.8%.

The results show that income and time poverty is a quantitative important phenomenon among the self-employed. In particular, the group of entrepreneurs are strongly affected by income and time poverty, although freelancers with regard to the hard core of time as well income poverty show a higher poverty head count ration than the working population together.

5.3 IMD Poverty and Social Participation

At the beginning of this paper we argued that a restricted genuine personal leisure time is expected to restrict also social participation, an important dimension in the capability poverty approach by Amartya Sen. As with Figure 6 the average time spent with others besides household members – being together with a social companion, participating in social life – indeed is considerably lower among the interdependent multidimensional (IMD) poor compared to the non IMD poor.

Figure 6: IMD Poverty and Social Participation 2002: Average Time (in minutes) Spent With Others (Besides Household Members) Within Genuine Personal Leisure Time – Self-employed as Freelancers and Entrepreneurs, active population



IMD-poverty = Interdependent Multidimensional Poverty
Source: GTUS 2001/02; own calculations

Time poverty as measured by genuine personal leisure time, therefore, indeed reduces societal involvements as well as social and cultural participation.

6 Concluding Remarks

Our analysis of time and income poverty among the self-employed for the first time presents results that enhance the traditional income-oriented poverty concept by the time dimension of genuine, personal leisure time within an interdependent multidimensional poverty approach. Considering time as genuine personal leisure time, the aspect of social participation possibilities in the sense of the capability poverty approach by Amartya Sen is taken into account within our multidimensional poverty concept.

With a population wide evaluation of the interdependence between personal leisure time and income we include the substitution/compensation which is assigned by the population. Empirically we estimated a CES well-being function with SOEP data to capture the assigned compensation and analyzed the multidimensional poverty situation within an interdependent framework with available German time use diary data 1992 and 2002.

Results Active Population and the Working Poor

The empirical analysis shows that poverty measured as the respective head count ratio among the active population has increased considerably with regard to all time and income poverty regimes within the ten years period under investigation:

- Single income poverty from 4.2% to 4.8%

- Single time poverty from 43.1% to 47.3%
- Income as well as time poverty from 2.1% to 2.5%
- Interdependent multidimensional poverty from 8.7% to 12.2%

Furthermore, a substantial proportion of the working poor are assigned not to compensate their time deficit by a higher income. These people, though they earn more than the single income poverty threshold, have such an important time deficit which cannot be substituted even by an income above the income poverty threshold. Their head count ratio rised from 5.3% to 8.7% in 2002.

In particular this group has not been considered in previous income-focused poverty analyses, although they are particularly deprived in the area of genuine personal leisure time and social participation possibilities, a dimension which plays an increasingly role in the poverty discussion in general.

Time and Income Poverty among Self-Employed as Freelancers and Entrepreneurs

Already the above results for the active population are treading on new ground. Furthermore, and for the first time we focus on the time and income poverty situation of the self-employed as freelancers (liberal professions) by detailed empirical results for Germany.

The main result: self-employed with respect to their single income poverty, single time poverty and interdependent multidimensional (IMD) time and income poverty are far more affected by poverty in both years than any other group within the active population.

In addition, the increase of the head count ratios in all the poverty regimes for the investigated ten years period is comparatively higher for the self-employed than that of the other working groups and higher than the overall average.

If we subdivide the self-employed in freelancers (liberal professions) and entrepreneurs (traders), then entrepreneurs are particularly affected by poverty in all poverty regimes including interdependent multidimensional (IMD) poverty.

Even though freelancers in all poverty regimes of multidimensional interdependent time and income poverty are less affected than entrepreneurs, there is still no relaxed situation among the all in all heterogeneous group of freelancers. The head count ratio of the so-called hard core poor freelancers e.g. with 4.6% is clearly higher than that of all working groups with 2.5%. Also, there are relatively more freelancers affected by single income poverty with 7.2% compared to the total average of all active population with 4.8%.

Many factors may play a role to the revealed fact that the self-employed are particularly and increasingly affected by time and income poverty, for example an increase in pseudo self-employment being still dependent though self-employed, an increase in working and time pressure in particular for self-employed within a growing globalisation and harder competition.

The question at the beginning – in contrast to some common opinion – whether self-employed persons are time and income poor, can now based on our results with a quantitative significant proportion be answered with a clear „yes“.

Furthermore, time poverty has an effect on social participation: Time spent with persons outside the household/family is remarkably restricted when somebody is IMD poor compared to the non IMD poor.

This applies not only for the active population in total but even stronger for the self-employed as freelancers and entrepreneurs.

With our concept of interdependent multidimensional poverty counting for substitution/compensation between time and income the IMD poverty threshold is evaluated by the German population – and not by experts – we enhanced the multidimensional poverty discussion. The results support our approach and quantifies the dynamics among the working poor.

The results of our study not only point out the alarming development of the „working poor" in general and that of the self-employed in particular, they also call for a greater consideration of the time dimension within sciences, business and politics for any targeted analysis and policies fighting against poverty.

In general, to neglect the time dimension in the economic and socio-political discussion in times of increasing time stress and work load would neglect a substantive and important aspect of individual and societal well-being.

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