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Group Risk Parity Strategies for ETFs Portfolios

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This research aims to compare different strategies that a non-professional investor in exchange-traded funds (ETFs) could employ to reach a good performance both from profits and from a risk perspective. In recent years, especially after the 2008 crisis, a new technique to evaluate the risk has become more popular, the so-called risk parity, which seeks to equalise the contributions to risk of the portfolio constituents. Our study analyses 17 variants of risk parity portfolio design for groups with the minimum variance strategy and equally weighted portfolio over a pool of 56 ETFs—listed on the Italian Stock Exchange—of eight different categories of specialisation. Empirical results confirm the usefulness of the group risk parity strategies in improving outcomes regarding diversification of risks among classes with good out-of-sample performance with respects to the target models.

Keywords: group risk parity, portfolio selection, exchange-traded funds, group constraints, bound constraints, passive investing, Italian Stock Exchange

Introduction

In the last 10 years, investing in profitable products—trying, in the meantime, to maintain the investment risk at an acceptable level—has been an arduous task because of low-interest rates and high shares prices volatility in most of the worldwide stock exchanges. In this environment, the risk-free asset became a false investment opportunity (in particular in Europe) for whom was searching to get a positive real rate of return; the most powerful tool to reduce risk—as a core principle of investing suggests—is portfolio diversification. Retail investors have different types of investment to choose from to spread out risk, but for some of them, the minimum amount of capital to build a diversified portfolio is relevant and the liquidity is limited.

Exchange-traded funds (ETFs) are baskets of securities that commonly track the performance of a benchmark index and are traded on exchange markets, like individual stocks. Choosing among many assets classes, with a limited outlay of capital, thanks to low investment thresholds, and with higher liquidity than mutual funds, they permit everybody to diversify their investment at low costs. In any case, after the 2008 financial crisis, the holding of ETFs has increased enormously in portfolios managed by institutional investors (hedge funds, pension funds, insurers, private banks, and wealth managers); and new and innovative ETFs with different underlying assets and different characteristics (e.g., environmental, social, and governance ETFs) have been launched on the markets, enlarging investment opportunities for retail investors, too. Nowadays, anyone

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with a brokerage account can invest together with the professionals at lowering fees.

Several studies in the literature examine whether these investments provide a cost-effective benefit for the investors. Tsai and Swanson (2009) showed that ETFs provide greater diversification benefits. Huang and Lin (2011) proved the reasonability of the international diversification strategy. Also, they pointed out that the same expected returns and the same diversification levels can be attained through ETFs instead of investing in the target market indices. The study by Buetow and Henderson (2012) confirmed these findings. Roll (2013) suggested that ETFs representing different asset classes may be the best proxies for the unobservable market risk drivers, thus representing the best diversification potential for investors. Accordingly, Puelz, Carvalho, and Hahn (2015) proposed a portfolio selection procedure that uses a Bayesian regression model to identify a reduced number of ETFs representing the major dimensions of risk in the market.

The paper contributes to this body of research by analyzing various risk-based portfolio optimization strategies with the goal to propose some investment approaches for the householder who uses ETFs as the unique financial instrument to build diversified portfolios (different geographical areas, different asset classes, and different styles) and has no quantitative model to forecast the future market conditions. For this type of investors, constructing portfolios in such a way to receive the maximum profits with the minimum possible risk could result inappropriate and better results can be obtained through models that specifically concentrate on the risk structure of the investment (Roncalli, 2013). Moreover, risk-based strategies have provided a systematic way to outperform capitalisation-weighted benchmarks with the maximum level of diversification in the past, uncertain market (Qian, 2005; Khuzwayo, 2011; Braga, 2015). Due to its popularity among practitioners and the effectiveness in portfolio allocation with multi-asset classes (Bai, Scheinberg, & Tutuncu, 2016) and with equities (Lohre, Neugebauer, & Zimmer, 2012; Siu, 2014), we assess the usefulness of the risk parity paradigm in ETFs investing. The idea is to equalise the sources of risk of a portfolio to control and possibly reduce losses. In particular, we focus on risk parity strategies over groupings of ETFs with the objective to find the more effective in term of the risk contribution from groups instead of individual assets. The requirement of risk parity at the group level dictates the choice of assets from a top-down perspective. In this manner, investors can implicitly limit the number of positions taken and reduce further transaction costs.

Another aspect we investigate is the role of constraints at the group and individual level in forming optimal portfolios balancing the group risk parity and sparsity objectives. To this end, a set of 56 ETFs listed on the Italian Stock Exchange is analysed. The flexibility of the proposed strategies allows providing better out-of-sample results than the naïve portfolios and minimum variance portfolios.

The Exchange Traded Funds Asset Class

Since 70s theory suggests to investors to diversify their portfolios (Merton, 1971; Cass & Stiglitz, 1970) to include all the risky assets available; and—depending on the individual risk aversion—to combine bonds and the market portfolio. However, empirical studies which analysed household portfolios found different investors' behaviors compared to the theoretical suggestions, even if they do not arrive at a single explanation. Some of them find that diversification increases with either investor wealth or income (Kelly, 1995; Polkovnichenko, 2005; Goetzmann & Kumar, 2008), but other factors affecting investors behaviours could be age, financial sophistication, size of the account balance, portfolio size, labour income, and the ratio of current wealth to income (Calvet, Campbell, & Sodini, 2007; Ivković, Sialm, & Weisbenner, 2008; Goetzmann & Kumar 2008; Kumar, 2009; Roche, Tompaidis, & Yang, 2013).

An investment vehicle launched around 25 years ago in the USA—called Exchange Traded Fund (ETF)—is becoming one of the fastest-growing segments of the investment management business (Hill, Nadig, & Hougan, 2015) completely changing the asset management industry (Itzhak, Franzoni, & Moussawi, 2017). ETFs are index-based investments grounded on the efficient market theory (Malkiel, 1995; Sharpe, 1965) and quantitative science to portfolio construction (Markowitz, 1952; Bogle, 2015). Depending on their asset classes target, ETFs are usually divided into (1) equity exchange-traded funds exchange-traded funds; (2) fixed income exchange-traded funds; (3) commodity exchange-traded funds; (4) currency exchange-traded funds; (5) alternatives exchange-traded funds; (6) leveraged and inverse exchange-traded funds; and (7) leveraged and inverse exchange-traded funds.

Global ETF assets, which totalled just $417b in 2005, had reached $4.4t by the end of September 2017—a cumulative average growth rate (CAGR) of around 21% (EY, 2017). However, passive investments—of which ETFs are the most relevant and innovative—are expected to grow strongly in the next years, becoming a favourite instrument vehicle in index-based strategies of actively managed portfolios (Hill et al., 2015). In any case, the possibility to invest in mutual funds or ETFs not implies that householders prefer to invest in diversified portfolios instead of holding individual stocks (Roche et al., 2013).

The new regulatory environment after the financial crisis (2008 and forwards), especially in the European Union, convinced institutional investors to use ETFs as a substitute for derivatives and individual assets. The new European rules in term of compensation (with the banning of payment of "retrocession" commission) and transparency for financial institutions and insurance companies could favour the use of ETFs thanks to their liquidity, low fees, transparency, and potential higher tax efficiency (Lettau & Madhavan, 2018; Abner, 2016). Tax efficiency can be obtained, under certain fiscal systems, thanks to the creation and redemption mechanism enabling the transfer of assets without generating tax consequences for all investors (Abner, 2016). At once, the model portfolios using passive investments and the rise of robo-advisors are also longer-term trends that support ETFs use and adoption (Lettau & Madhavan, 2018).

Like any other investment, ETFs are subject to risks: For plain vanilla unlevered funds, the main risk is the price volatility in the basket of underlying securities. Thanks to the creation/redemption mechanism, the arbitrage works to keep the price of an exchange-traded fund close to the intrinsic value of an ETF's holdings in the underlying market (Lettau & Madhavan, 2018). Different is the case of synthetic exchange-traded funds, usually affected by counterparty risk because they enter into swap positions with professional investors.

ETFs are an essential way for retail investors to access to many financial market segments, in a liquid, tax efficient, cost-effectiveness, restricted bid/ask spread, and limited capital employment way. Products offered by issuers could be very different: At the beginning, they were typical buy-and-hold (passive) investment instruments, but nowadays, some of them follow an active approach, adapting to changing market conditions, using leverage and derivatives.

ETFs are now the preferred vehicle for factor-based strategies (Hill et al., 2015) that should be able to create an "alpha" (an extra return compared to a benchmark) that could not be obtained by passive investors. Their aptitude to be good funds managers is measured by their ability to minimise the tracking error concerning the index (Itzhak et al., 2017).

Different are the categories of ETFs investors could invest in, with different styles and underlying assets to track. Table 1—in the absence of a standardised classification—reports the most relevant categories usually

employed by practitioners. ETNs are not listed in Table 1 because they are issued and backed by major, high credit rating banks as senior debt notes, even if sometimes they are considered as ETFs.

Table 1

A Possible Classification of Different Types of ETFs

Types of ETFs	What do they track?
Market index	Major either national or international market indexes
Currency	A specific foreign currency or a basket of currencies
Sector/Industry	Usually, a certain index which represents a specific industry
Commodity	The commodity price, using derivatives contracts with commodities as underlying assets
Style	A certain investment style (e.g., growth vs. value stocks) or market cap style (e.g., large vs. small)
Bond	Investments in corporate or government bonds, either at national or international level
Real estate	An index that measures the performance of REITs or other specialised vehicles in real estate investments
Inverse	With short positions, permit to get an inverse reaction to the movement of the underlying asset
Leveraged	They increase the exposure to the price movement of the underlying asset (index, investment product)
Actively managed	They not only track an underlying asset with passive behaviour, but they try to beat its performance
Dividend	A dividend index, which includes dividend-paying stocks in the whole market, in some sectors, in some geographic locations
Innovative	Particular indexes, such as the VIX Index (a measure of market expectation of near-term volatility of S & P 500 index option prices). Alternatively, ETFs which use particular strategies to obtain their goals

The Equal Risk Contribution Paradigm in Portfolio Selection

The seminal work of Markowitz (1952) represents the cornerstone in quantitative portfolio management and the mean-variance analysis is became a key issue in portfolio selection. However, this model has several drawbacks that make difficult its application in practice. A commonly cited pitfall is the sensitivity to the changes in the inputs, in particular, due to the estimation errors associated with the expected values of the assets returns. The forecasts based on historical information, in fact, can be inaccurate predictors of the future behaviour of the assets returns, and optimal portfolios constructed using these predictors can, therefore, be inefficient (Best & Grauer, 1991). Also, optimal portfolios tend to suffer from concentration in the largest constituents. Hence, from a risk management perspective, the risk associated with small assets may have a great impact on the total risk.

Recently, several allocation strategies have been proposed to reduce these problems by utilising only the information on the assets' volatilities and their correlations (Roncalli, 2013). In this paper, we focus on the so-called risk parity approach, according to which one aims to achieve the diversification in the sense of the portfolio risk instead of the capital allocation. Formally, let us assume we operate in a market with n risky assets and denote by $x = (x_1, \dots, x_n)^T$ and $r_{i,t}$ the vector of portfolio weights and the rate of return of asset i at time t, with $t = 1, \dots, T$, respectively. Using volatility as the measure of risk, we define the marginal risk contribution of asset i as the ratio $\mathrm{MRC}_i = \frac{(Cx)_i}{x^T C x}$, where C is the covariance matrix of the rates of returns of the assets. The quantity $\mathrm{TRC}_i = x_i \frac{(Cx)_i}{x^T C x}$ defines the total risk contribution of asset i to the portfolio risk.

Assuming that short selling is not allowed, the unique solution to the following system of equations and inequalities

$$\begin{cases} x_i \frac{(Cx)_i}{x^T Cx} = x_j \frac{(Cx)_j}{x^T Cx} \ \forall i,j \\ \sum_{i=1}^{n} x_i = 1 \\ x_i \geq 0 \ i = 1, \dots, n \end{cases}$$

is said a risk parity (RP for short) portfolio (Maillad, Roncalli, & Teïletche, 2010).

In our context, an investor could refer to a basket of hundreds, or even thousands, of ETFs. However, the RP approach, as defined above, implicitly assumes to invest in all the assets, thus resulting unpractical. Useful in this case is the variant called group risk parity (GRP) that diversifies the portfolio risk at the group level (Bai et al., 2016), allowing null weights among the components of the RP portfolio.

Assuming that assets are classified into l groups, $G_1, \dots, G_l$, such that (1) each asset belongs to only one group; and (2) we invest in all the groups, the total risk contribution of the *s*-th group is given by the sum of the total risk contributions of its elements, i.e., $\text{TGRC}_i = \sum_{i \in G_s} x_i \frac{(Cx)_i}{x^T Cx}$. Then, following the suggestions of Gluzicka (2017), we say that a portfolio allocation is optimal in GRP terms if it is a solution of the optimization problem

$$\min_x \sum_{a=1}^{l} \sum_{b=1}^{l} \left(\sum_{i \in G_a} x_i \frac{(Cx)_i}{x^T Cx} - \sum_{j \in G_b} x_j \frac{(Cx)_j}{x^T Cx} \right)^2$$

$$\sum_{i=1}^{n} x_i = 1$$

$$0 \leq \sum_{k \in G_s} x_k \leq U_s \ s = 1, \dots, l$$

$$0 \leq x_i \leq u_i \ i = 1, \dots, n$$

where U_s and u_i are upper bounds on the weight of the *s*-th group and of the *i*-th asset, respectively.

The introduction of group constraints and buy-in thresholds is necessary since minimising violations of risk parity between groups alone is not sufficient for producing interesting investment portfolios (Siu, 2014). Consider, for instance, the solution of the above optimisation problem with one asset randomly selected from each group. This portfolio satisfies the GRP paradigm but is unlikely to have any real-world attractiveness.

Portfolio Strategies Used in the Comparisons

The first methodology, the naïve equally-weighted portfolio (EW), assumes that risks and returns cannot be predicted (Lee, 2011), thus assigns the same weight to all the assets, i.e., $x_i = \frac{1}{n}$, with $i = 1, \dots, n$. EW represents the portfolio with the maximum diversification in terms of capital allocation. Investors acting their decisions according to the EW model are exposed in the same measure to the largest as well as to the smallest assets in the portfolio.

From an out-of-sample perspective, the EW strategy is a suitable test benchmark since it has shown impressive performance with respect to other models on several experiments (DeMiguel, Garlappi, & Uppal, 2007).

The second target model is the minimum variance portfolio (minV), which is made up of the least volatile joint collection of assets (Clarke, De Silva, & Thorley, 2011) and is located on the left-most position of the mean-variance efficient frontier.

In the case of no-short selling, it is the solution to the following optimisation problem:

$$\min_{x} x^T C x$$
$$\sum_{i=1}^{n} x_i = 1$$
$$x_i \geq 0 \; i = 1, \dots, n$$

This strategy leads to portfolios that are diversified in terms of marginal risk contributions. It leads to concentrated portfolios even if it dominates other strategies from the perspective of low volatility.

Data and Methodology

In this section, we examine the behaviour of the EW, MinV, and GRP portfolio selection models on an investible universe of 56 ETFs quoted on the Italian Stock Exchange market with an accumulation plan of investment. They have been selected among the ETFs with a Morningstar rating classification at 04/05/2018 (Morningstar, 2018). As reported in the last column of Table 1A in Appendix, these funds can be classified into the following categories:

- Euro Corporate Bonds;
- Eurozone Government Bonds;
- Eurozone Large-Cap Equities;
- Eurozone Large-Cap Blend Equities;
- US Large-Cap Blend Equities;
- Japan Large-Cap Equities;
- Emerging Markets Equities;
- Global Large-Cap Blend Equities.

The pie chart in Figure 1 shows that the Government Bonds form the largest class of funds with 19 constituents (representing 34% of the data set) while the Eurozone and Japan Large-Cap Equities are the smallest classes with four ETFs each one (corresponding to the 7% of the data set per group). The remaining classes consist of five to seven elements. It can be noted that grouping the ETFs only in terms of Bond and Equity, the proportions of the two macro-categories are comparable (26 Bonds against 30 Equities).

Thanks to these characteristics, we also analyse how granularity may influence the optimal asset allocation for the GRP strategy, pointing out the relation with the buy-in thresholds and group constraints, which clamp the investment choices. To this end, two variants of risk parity models are compared, the first involving the Bond/Equity classification and the second for the finer grouping with eight classes.

The weekly prices of the funds have been obtained from Bloomberg for the period from January 2013 to May 2018, yielding a total of 277 observations.

We use a rolling time window procedure to rebalance optimal portfolios at regular calendar intervals in order to highlight the different effects of the market changes on the behaviour of the strategies (Eakins & Stansell, 2007). We solve the optimisation problems for overlapping windows built by moving forward in time with predefined step size. The optimal portfolio found with respect to an in-sample period is held unchanged

for the following out-of-sample period. Successively, the in-sample window is updated by removing the oldest data and including the most recent information. This procedure is repeated until the last available week. In our analysis, the in-sample and the out-of-sample windows involve 104 and four observations respectively. These parameter choices are typical settings for portfolio selection problems (Hitaj & Zambruno, 2016).

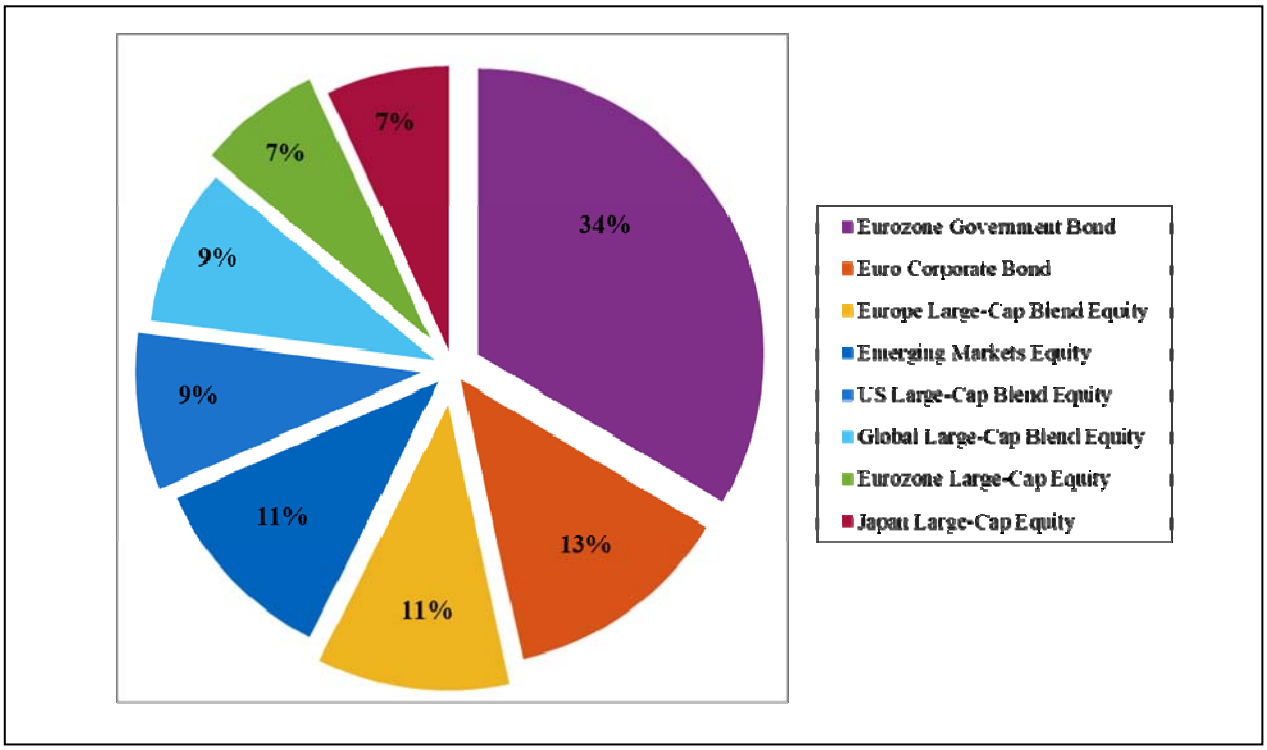

Figure 1. Pie chart of the pool of ETFs used in the empirical study.

Covariance Matrix Estimation

Since the implementation of the described risk-based strategies solely concerns with the structure of risk in the reference market, we only have to specify the covariance matrix of returns. Due to its effectiveness in reducing the estimation error as well as in lowering the out-of-sample variance of portfolios, we consider the Bayesian shrinkage estimator proposed by Ledoit and Wolf (2003). It is defined as the optimal weighted average of the single-index covariance matrix F by Sharpe (1965) and the sample covariance matrix C as follows

$$\hat{C} = \alpha F + (1 - \alpha)C$$

where α represents the shrinkage intensity. A closed-form solution for the optimal value of α is provided by Ledoit and Wolf (2004). Following the suggestions of the same authors, we consider the equal-weighted portfolio including all the 56 ETFs as the market index. Note that in our dynamic setting, the covariance matrix estimates F, C, as well as the shrinkage intensity α are updated in each in-sample window.

Performance Measures

The analysis of the models consists of two parts, namely an in-sample and an out-of-sample one. Regarding the former, it focuses on the allocation structure of the risk as well as of the capital for the optimal portfolios.

Let us denote by Q and $x_q = \left(x_{1,q}, \dots, x_{n,q}\right)^t$ the number of rebalances realized and the vector of portfolio weights at the rebalancing time q. Then, the total risk contribution of the i-th asset at time q is defined as $\mathrm{TRC}_{i,q} = \frac{x_{i,q}\left(\hat{C}_q x_q\right)_i}{x_q{}^t \hat{C}_q x_q}$, with $i = 1, \dots, n$, where $\hat{C}_q$ is the estimated covariance matrix for the q-th in-sample window. For the in-sample analysis, we consider the following performance measures.

The average on all the rebalancing times of the highest total risk contributions

$$\mathrm{maxRC} = \frac{1}{Q}\sum_{q=1}^{Q} \max_i \mathrm{TRC}_{i,q}$$

This measure gives an indication of the risk concentration at the individual level.

The average on all the rebalancing times of the normalised version of the Herfindahl index for the distribution of the total risk contributions

$$\mathrm{NHRC} = \frac{1}{Q}\sum_{q=1}^{Q} \frac{1 - \sum_{i=1}^{n}\left(\mathrm{TRC}_{i,q}\right)^2}{1 - \frac{1}{n}}$$

In this manner, the term in the outer summation is 0 when all the risk is concentrated in one single asset and is 1 when all the assets have the same percentage of risk contribution. Thus, a portfolio with a higher value for NHRC will be preferred.

The average on all the rebalancing times of the normalised version of the Herfindahl index for the distribution of the weights, which is defined as

$$\mathrm{NHX} = \frac{1}{Q}\sum_{q=1}^{Q} \frac{1 - \sum_{i=1}^{n}\left(x_{i,q}\right)^2}{1 - \frac{1}{n}}$$

measures the concentration of weights. Similar to the NHRC indicator, the term in the outer summation is 0 when all the capital is concentrated in one single asset and is 1 for the equal-weighted portfolio. Thus, the highest diversified portfolio presents the highest NHX value.

The average on all the rebalancing times of the highest group risk contributions takes into account the risk concentration at the group level and is calculated as

$$\mathrm{maxGRC} = \frac{1}{Q}\sum_{q=1}^{Q} \max_k \mathrm{TGRC}_{k,q}$$

where $\mathrm{TGRC}_{k,q}$ represents the total global risk contribution of the k-th group of assets, with $k = 1, \dots, G$.

The average on all the rebalancing times of the normalised version of the Herfindahl index for the distribution of the total group risk contributions is defined by

$$\mathrm{NGHRC} = \frac{1}{Q}\sum_{q=1}^{Q} \frac{1 - \sum_{k=1}^{G}\left(\mathrm{GRC}_{k,q}\right)^2}{1 - \frac{1}{G}}$$

and measures the risk diversification among the groups. The meaning of this indicator is similar to NHRC.

The group counterpart of the diversification index NHX is given by

$$\text{NGHX} = \frac{1}{Q}\sum_{q=1}^{Q}\frac{1-\sum_{k=1}^{G}\left(\sum_{i\in G_k} x_{i,q}\right)^2}{1-\frac{1}{G}}$$

where G_k is the k-th group of assets. The meaning of this statistics is similar to NHX; now, the concentration measure is provided at the group level.

Another information we consider in the comparisons is the number of assets with positive weight. In order to take into account the evolution of rebalances, the average value is used

$$\text{AnStocks} = \frac{1}{Q}\sum_{q=1}^{Q}\sum_{i=1}^{n}\mathbb{I}\left(x_{i,q}\neq 0\right)$$

where $\mathbb{I}(\cdot)$ represents the indicator function, combined to the standard deviation (STDnStocks). Sparser portfolios are preferable.

Let us denote by t_0 and T the last in-sample and the last out-of-sample time respectively and let us indicate the portfolio rates of return for each model in the out-of-sample period with $r_t^{out}, t = t_0+1,\dots,T$. The following performance measures are used in the out-of-sample analysis.

The Sharpe ratio (Sharpe, 1965), which evaluates the compensation earned per unit of portfolio total risk. It is defined as the ratio between the annualised average μ^{out} of r_t^{out}, and the annualized sample standard deviation σ^{out} as follows

$$SR = \frac{\mu^{out}}{\sigma^{out}}$$

Higher values of SR are preferable.

The downside risk is measured by the maximum drawdown, which represents the maximum loss from a peak to a trough before a new peak is attained. More precisely, let us consider the cumulative out-of-sample portfolio returns, which correspond to the values of wealth after t periods

$$W_t = W_{t-1}(1+r_t^{out})$$

with $t = t_0+1,\dots,T$ and $W_{t_0-1}=1$, then the drawdowns are defined as

$$DD_t = -\frac{W_t - \max\limits_{t_0+1\le s\le t} W_s}{\max\limits_{t_0+1\le s\le t} W_s}$$

The maximum drawdown, which corresponds to the largest loss achieved over the out-of-sample, is

$$MDD = \max_{t_0+1\le s\le t} DD_s$$

Finally, to get an impression of the transaction costs involved, we calculate the average turnover over the out-of-sample period as defined in DeMiguel et al. (2007)

$$TO = \frac{1}{Q}\sum_{q=1}^{Q}\sum_{i=1}^{n}\left|x_{i,q+1}-x_{i,q}\right|$$

in which Q is the number of rebalances realised, $x_{i,q}$ is the portfolio weight of asset i at time q and $x_{i,q+1}$ is the portfolio weight after rebalancing. The value of this statistic equals the average monthly amount of buy and sells transactions as a percentage of the portfolio value. Thus, a greater value of TO indicates a more expensive investment strategy.

Empirical Analysis

The study starts with a comparison among the equally weighted strategy (EW), the minimum variance strategy (minV) and risk parity strategy for only two macro investment categories (bond and equity) without regarding of the different specialisation of our sample of ETFs. Tables 2 and 3 display the in-sample and out-of-sample results.

Table 2

In-Sample Two-Group Strategies Results

Strategy name	MaxRC	NHRC	NHX	MaxGRC	NGHRC	NGHX	AnStocks	STDnStocks
EW	0.0392	0.9864	1	0.9572	0.1635	0.9949	56	0
minV	0.9126	0.1669	0.1669	0.9986	0.0055	0.0056	6.1860	1.3512
RP2G	0.4145	0.8049	0.9342	0.5002	1	0.2759	21.8372	5.1078

Table 3

Out-of-Sample Two-Group Strategies Results

Strategy name	TO	SR	MDD
EW	0	0.6482	0.1324
minV	0.0358	-0.3213	0.0144
RP2G	0.3647	0.2699	0.0447

The equally weighted strategy (EW) includes all the ETFs used in the study which were classified either as bond or equity. This strategy shows a very good performance (the Sharpe ratio is 0.6482), no change in the portfolio composition is required (turnover equals to 0) but the maximum drawdown is quite high (0.1324), and the risk concentration at group level is very high (0.9864), even if the maximum risk concentration on a specific ETF is very low (0.0392). In practice, as Figure 2 shows, most of the risk is caused by equity (0.9572), even if bond and equity groups are equally weighted. On the other side, the minimum variance portfolio (minV) presents a very strong concentration in a single assets group (bond ETFs, with a weight close to 100%) and a limited diversification among ETFs (the total number of EFTs is around 6-7 and the maximum risk concentration is 0.9126), a negative performance (SR=-0.3212) but a low maximum drawdown compared to EW.

The risk parity strategy we found is able to balance the risk contribution of the two assets categories (50% bond ETFs, 50% equity ETFs) with a restricted number of ETFs (between 22 and 27 with a strong concentration on bond EFTs) and a positive performance. The SR of this strategy (0.2699) is lower than the results obtained with the EW strategy and requests a certain turnover in the portfolio composition (that causes costs). However, it can reduce the maximum drawdown drastically, limiting volatility of portfolio results for the householder we consider as our target investor.

As the second step, we focus our attention at the eight investment categories EFTs we are studying and can be classified into. The idea is to detect the results of the EW strategy obtained using all the ETFs classes as a benchmark and to identify other strategies that work better. It means we are looking for strategies which permit to replicate the benchmark in term of risk contribution and return but with a lower number of EFTs, allowing to reduce the effort required when a broad portfolio is managed, especially from the perspective of a non-professional investor.

Tables 4 and 5 show the results of the 16 strategies we used, combining different constraints in term of maximum weight for each ETFs category and each single ETF constituents the portfolio. From Table 4, Table 5, and Figure 3, we can observe that for each sub-set of strategies (same U_s, but different u_i), the number of ETFs in portfolio decreases any time we relax the constraint on the maximum weight for each ETF (higher u_i). It goes together with an increase in the maximum risk concentration on a specific ETF and a lowering in the maximum group risk concentration. Also, the turnover usually increases reducing the bounds on the weight of a specific ETF.

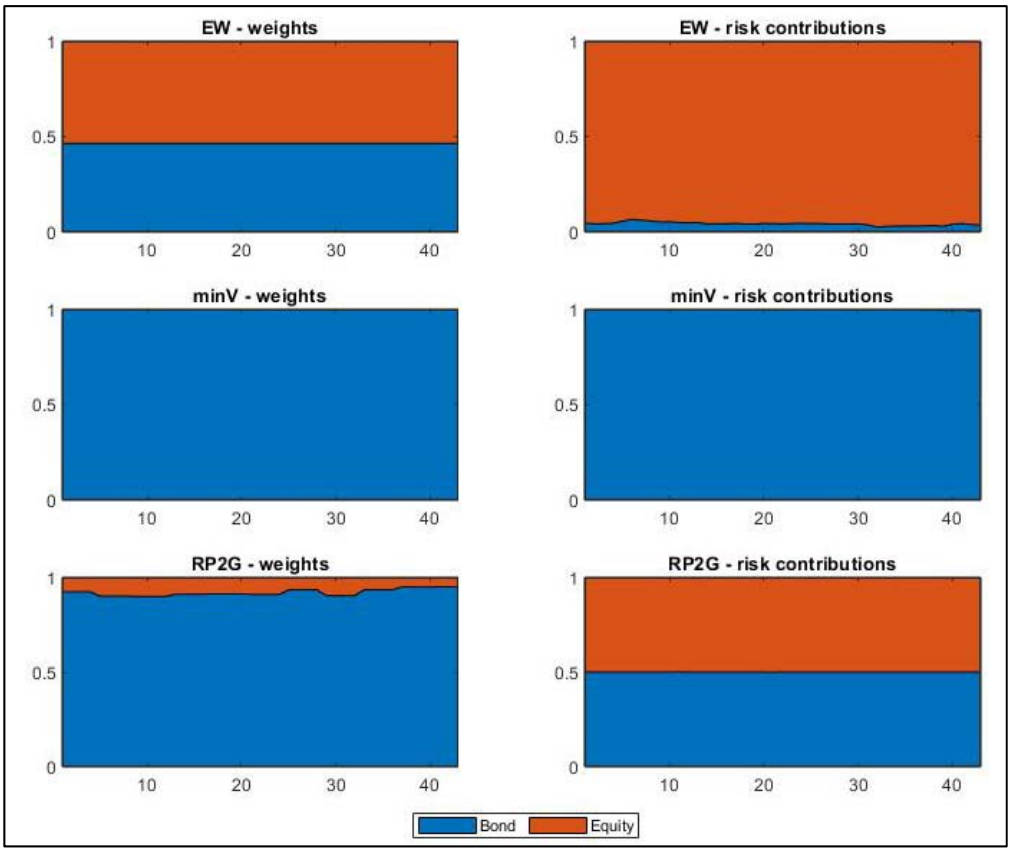

Figure 2. Evolution of Bond/Equity group weights (left) and risk contributions (right) for EW, minV, and RP2G portfolios.

Table 4

In-Sample Eight-Group Strategies Results

Strategy name	Constraints	maxRC	NHRC	NHX	maxGRC	NGHRC	NGHX	AnStocks	STDnStocks
$RP8G_1$	U_s = 15%, u_i = 2%	0.0395	0.9859	0.9974	0.2040	0.9603	0.9787	49.9535	1.7778
$RP8G_2$	U_s = 15%, u_i = 5%	0.0801	0.9561	0.9703	0.1674	0.9660	0.9963	23.1395	0.9043
$RP8G_3$	U_s = 15%, u_i = 10%	0.1486	0.9114	0.9344	0.1654	0.9696	0.9959	15.5116	0.7273
$RP8G_4$	U_s = 15%, u_i = 100%	0.1650	0.8805	0.8945	0.1657	0.9717	0.9953	9.7674	1.3090
$RP8G_5$	U_s = 20%, u_i = 2%	0.0395	0.9860	0.9978	0.2039	0.9606	0.9755	50.9535	2.1345
$RP8G_6$	U_s = 20%, u_i = 5%	0.0912	0.9513	0.9706	0.1623	0.9728	0.9816	24.1163	0.8130
$RP8G_7$	U_s = 20%, u_i = 10%	0.1478	0.9023	0.9273	0.1593	0.9786	0.9813	15.1395	0.9043
$RP8G_8$	U_s = 20%, u_i = 100%	0.1561	0.8888	0.8799	0.1573	0.9820	0.9811	9.7674	1.3266
$RP8G_9$	U_s = 30%, u_i = 2%	0.0410	0.9849	0.9980	0.1742	0.9667	0.9571	51.0930	0.2905

(Table 4 to be continued)

$RP8G_{10}$	U_s = 30%, u_i = 5%	0.1209	0.9419	0.9711	0.1447	0.9907	0.9061	25.0698	0.9250
$RP8G_{11}$	U_s = 30%, u_i = 10%	0.1385	0.9102	0.9338	0.1390	0.9948	0.9061	14.4884	1.5756
$RP8G_{12}$	U_s = 30%, u_i = 100%	0.1342	0.9058	0.8521	0.1346	0.9969	0.9062	11.7907	2.8165
$RP8G_{13}$	U_s = 100%, u_i = 2%	0.0464	0.9822	0.9983	0.1631	0.9713	0.9109	53.3953	0.4889
$RP8G_{14}$	U_s = 100%, u_i = 5%	0.1080	0.9507	0.9740	0.1306	0.9998	0.7367	35.4186	11.9791
$RP8G_{15}$	U_s = 100%, u_i = 10%	0.1095	0.9674	0.9488	0.1255	1.0000	0.6922	44.3023	6.0137
$RP8G_{16}$	U_s= 100%, u_i = 100%	0.1159	0.9613	0.8963	0.1256	1.0000	0.6404	39.3721	4.0636

Table 5

Out-of-Sample Eight-Group Strategies Results

Strategy name	Constrainstains	TO	SR	MDD
$RP8G_1$	U_s = 15%, u_i = 2%	0.0285	0.6183	0.1534
$RP8G_2$	U_s = 15%, u_i = 5%	0.0878	0.6305	0.1663
$RP8G_3$	U_s = 15%, u_i = 10%	0.0950	0.5936	0.1620
$RP8G_4$	U_s = 15%, u_i = 100%	0.0890	0.5724	0.1585
$RP8G_5$	U_s = 20%, u_i = 2%	0.0313	0.6405	0.1498
$RP8G_6$	U_s = 20%, u_i = 5%	0.1027	0.6378	0.1440
$RP8G_7$	U_s = 20%, u_i = 10%	0.0931	0.5984	0.1401
$RP8G_8$	U_s = 20%, u_i = 100%	0.0770	0.5875	0.1388
$RP8G_9$	U_s = 30%, u_i = 2%	0.0167	0.6531	0.1364
$RP8G_{10}$	U_s = 30%, u_i = 5%	0.0881	0.6461	0.0985
$RP8G_{11}$	U_s = 30%, u_i = 10%	0.1370	0.6092	0.0957
$RP8G_{12}$	U_s = 30%, u_i = 100%	0.1494	0.5807	0.0948
$RP8G_{13}$	U_s = 100%, u_i = 2%	0.0294	0.6602	0.1170
$RP8G_{14}$	U_s = 100%, u_i = 5%	0.0832	0.7111	0.0447
$RP8G_{15}$	U_s = 100%, u_i = 10%	0.1723	0.7385	0.0373
$RP8G_{16}$	U_s = 100%, u_i = 100%	0.1847	0.6655	0.0342

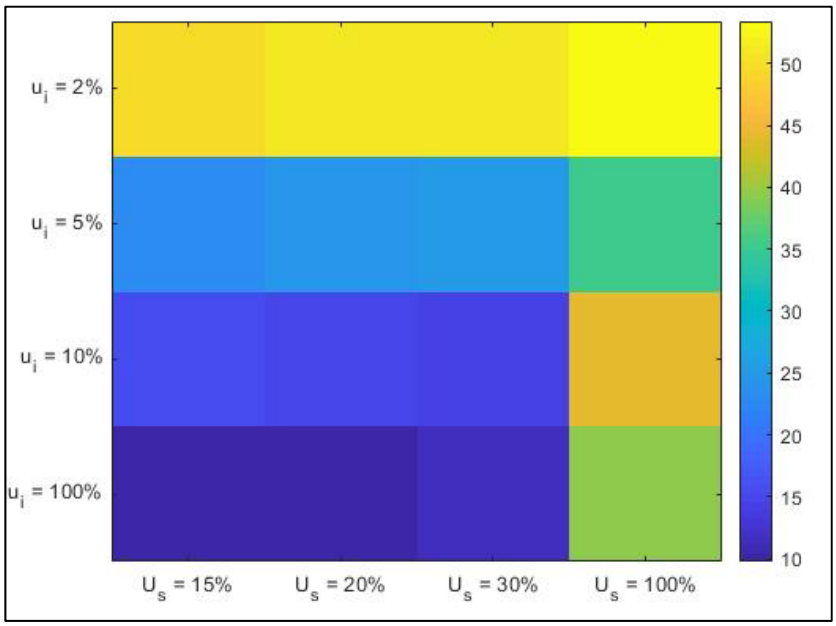

Figure 3. Colour matrix is representing the average number of ETFs with a positive weight for each variant of the eight groups risk parity strategy.

Analysing the different strategies more in detail, we can observe that the strategy $RP8G_{16}$ represents the group risk parity without any bound: The maximum risk contribution of every single ETF is 0.1159, and the risk contribution of each ETF category is closed to the previous value (0.1256). The Sharpe ratio for this strategy is high (0.6655), and the result is obtained with a subset of the total ETFs under scrutiny (AnStocks = 39.3721, STDnStocks = 4.0636), which permits to reduce the MDD. In terms of constituents of this portfolio, Eurozone Government Bond ETFs and Euro Corporate Bond ETFs present the higher weights, with other categories that are only limited represented in the portfolio (see Figure 4).

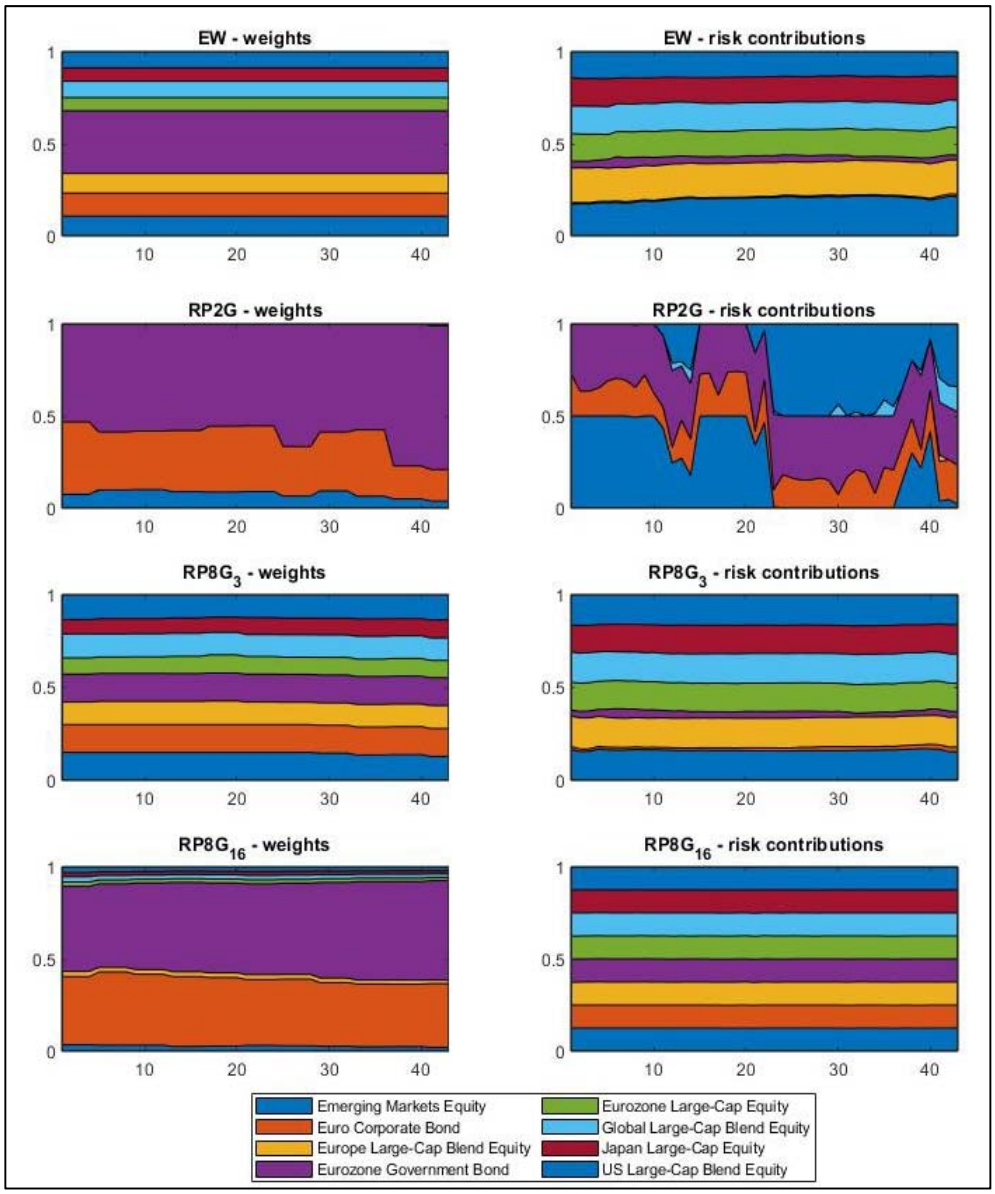

Figure 4. Evolution of group weights (left) and group risk contributions (right) for EW, RP2G, $RP8G_3$, and $RP8G_{16}$ portfolios when the pool of ETFs is divided into eight classes.

We can observe from Figure 4 that strategy $RP8G_2$ presents some relevant particularities: Even if the portfolio is composed mainly by Eurozone Government Bond ETFs and by Euro Corporate Bond ETFs, the

most relevant equity category is Emerging Markets Equity EFTs. Even if equity ETFs weight poorly on the portfolio, around 50% of its risk contribution is caused by Emerging Markets Equity EFTs.

The same Figure 4 permits to consider a singular strategy ($RP8G_3$) that presents an upper limit at 15% for each ETF category and an upper limit at 10% for each specific ETF. With this strategy, any ETF category is represented (and there is no dominance of bonds investment) with a not so different weight among categories, such as the risk contribution is well-distributed among categories. For this strategy, the maximum risk concentration is at the upper level compared to other strategies (maxRC = 0.1486), such as the maximum group risk contribution (maxGRC = 0.1654). However, the number of EFTs required by the strategy is limited (AnStocks = 15.5116) with a limited standard deviation, the turnover is limited (TO = 0.0950), and the Sharpe ratio is very good (SR = 0.5936). It happens at expenses of a quite relevant maximum drawdown (MDD = 0.1620).

Figure 5 draws all the performances of the 19 different strategies we described in Tables from 2 to 5. Overall, the equally weighted (EW) presents high volatility but shows a very good performance, even if it is not the best one; many other strategies are similar in term of performance even if are less effective in terms of risk contribution.

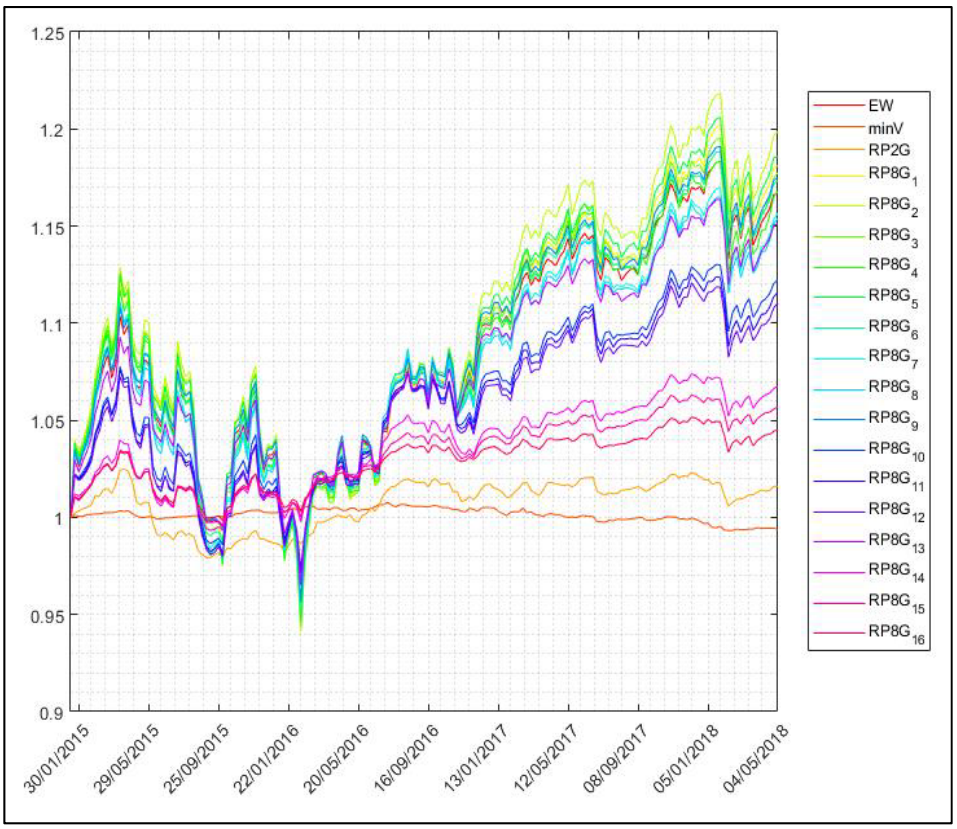

Figure 5. Cumulative out-of-sample portfolio returns for all the portfolio models compared in the empirical study.

Figure 6 compares the performance of some of the most relevant strategies. The minimum variance strategy (minV) presents a poor performance, but—in some periods—even better than the RP2G, the strategy that combines bond and equity instruments with a balanced risk contribution. EW is—as already told—the benchmark in term of performance. Strategy $RP8G_3$ permits to reach a very similar result with a lower number

of ETFs (around 15 against 56) and a better diversification thanks to the lower maximum group risk contribution (0.1654 vs. 0.9572). The turnover is only slightly higher for the RP8G3 strategy compared to EW strategy (0.095 vs. 0), but the maximum drawdown is higher (MDD = 0.1324 for EW and MDD = 0.1620 for $RP8G_3$).

Handling the bounds on the groups and on the individual assets, we obtained a strategy that presents very good characteristics permitting an investor to diversify better than with the EW strategy, with lower effort in managing the portfolio (thanks to the lower number of products required to build it) and a performance in line with EW strategy.

Figure 6. Cumulative out-of-sample portfolio returns for the EW, minV, RP2G, and two selected risk parity strategies for eight groups of ETFs.

Conclusions and Future Works

In this article, we deal with the problem of managing a portfolio of investment in the perspective of a householder investor who wants to control the risk using ETFs and the group risk parity strategy. Further, we investigate the role of granularity and bounds on the groups and the individual weights in portfolio diversification and risk contribution. The numerical experiments over a basket of selected ETFs have put in evidence that it is possible to identify optimal portfolios that benefit of both capital and risk diversifications with a limited number of individual ETFs able to represent all the different categories of ETFs we employed. Next step will be to investigate the effectiveness of group risk parity for institutional investors that usually have to select portfolios composed by a reduced number of constituents from a large basket of financial instruments, even involving thousands of items.

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Appendix

Table 1A

List of ETfs Used in the Analysis

Fund name	ISIN code	Bloomberg ticker	Category
Amundi ETF Govt Bond EuroMTS Broad Investment Grade 10-15 UCITS ETF EUR	FR0010754143	C10	Eurozone Government Bond
Amundi ETF Govt Bond EuroMTS Broad Investment Grade 3-5 UCITS ETF EUR	FR0010754168	C33	Eurozone Government Bond
Amundi ETF Govt Bond EuroMTS Broad Investment Grade 5-7 UCITS ETF EUR	FR0010754176	C53	Eurozone Government Bond
Amundi ETF Govt Bond EuroMTS Broad Investment Grade 7-10 UCITS ETF EUR	FR0010754184	C73	Eurozone Government Bond
Amundi EURO Corporate Ex Financials IBOXX UCITS ETF-C EUR	LU1681040140	AXFI	Euro Corporate Bond
Amundi EURO Corporate Financials IBOXX UCITS ETF-C EUR	LU1681040066	AFIN	Euro Corporate Bond
Amundi EURO STOXX 50 UCITS ETF-C EUR EUR	LU1681047236	C50	Eurozone Large-Cap Equity
Amundi Govt Bond Highest Rated Euromts Investment Grade UCITS ETF-C EUR	LU1681046691	AM3A	Eurozone Government Bond
iShares € Govt Bond 3-7yr UCITS ETF EUR (Acc) EUR	IE00B3VTML14	CSBGE7	Eurozone Government Bond
iShares Core EURO STOXX 50 UCITS ETF EUR (Acc) EUR	IE00B53L3W79	CSSX5E	Eurozone Large-Cap Equity
iShares Core MSCI Japan IMI UCITS ETF USD (Acc) EUR	IE00B4L5YX21	SJPA	Japan Large-Cap Equity
iShares Core MSCI World UCITS ETF USD (Acc) EUR	IE00B4L5Y983	SWDA	Global Large-Cap Blend Equity
iShares Core S&P 500 UCITS ETF USD (Acc) EUR	IE00B5BMR087	CSSPX	US Large-Cap Blend Equity
iShares MSCI EM UCITS ETF USD (Acc) EUR	IE00B4L5YC18	SEMA	Emerging Markets Equity
iShares MSCI EMU UCITS ETF EUR (Acc) EUR	IE00B53QG562	CSEMU	Eurozone Large-Cap Equity
iShares MSCI Europe UCITS ETF EUR (Acc) EUR	IE00B4K48X80	SMEA	Europe Large-Cap Blend Equity
iShares MSCI Japan UCITS ETF USD (Acc) EUR	IE00B53QDK08	CSJP	Japan Large-Cap Equity
iShares MSCI USA UCITS ETF USD (Acc) EUR	IE00B52SFT06	CSUS	US Large-Cap Blend Equity
iShares Nikkei 225 UCITS ETF JPY (Acc) EUR	IE00B52MJD48	CSNKY	Japan Large-Cap Equity
Lyxor Euro Corporate Bond ex Financials UCITS ETF Acc EUR	FR0010814236	CBEF	Euro Corporate Bond
Lyxor Euro Corporate Bond UCITS ETF Acc EUR	FR0010737544	CRPE	Euro Corporate Bond
Lyxor EUROMTS 5-7Y Investment Grade (DR) UCITS ETF—C-EUR EUR	LU1287023003	EM57	Eurozone Government Bond
Lyxor EUROMTS 7-10Y Investment Grade (DR) UCITS ETF—C-EUR EUR	LU1287023185	EM710	Eurozone Government Bond
Lyxor EuroMTS Highest Rated Macro-Weighted Govt Bond 1-3Y (DR) UCITS ETF Acc EUR	FR0011146315	AAA13	Eurozone Government Bond
Lyxor EuroMTS Highest Rated Macro-Weighted Govt Bond 3-5Y (DR) UCITS ETF Acc EUR	FR0011146349	AAA35	Eurozone Government Bond
Lyxor EuroMTS Highest Rated Macro-Weighted Govt Bond 5-7Y (DR) UCITS ETF Acc EUR	FR0011146356	AAA57	Eurozone Government Bond
Lyxor MSCI All Country World UCITS ETF C-EUR EUR	FR0011079466	ACWI	Global Large-Cap Blend Equity

(Table 1A to be continued)

Lyxor MSCI Emerging Markets UCITS ETF C-EUR EUR	FR0010429068	EMKT	Emerging Markets Equity
Lyxor EuroMTS 3-5Y INVESTMENT GRADE (DR) UCITS ETF—Acc	LU1650488494	EM35	Eurozone Government Bond
Lyxor EuroMTS All-Maturity Investment Grade (DR) UCITS ETF—Acc	LU1650490474	EMG	Eurozone Government Bond
Lyxor EuroMTS Highest Rated Macro-Weighted Govt Bond (DR) UCITS ETF—Acc EUR	LU1287023342	EMAAA	Eurozone Government Bond
Ossiam Emerging Markets Minimum Variance NR UCITS ETF 1C (EUR) EUR	LU0705291903	EMMV	Emerging Markets Equity
Ossiam iSTOXX™ Europe Minimum Variance NR UCITS ETF 1C (EUR) EUR	LU0599612842	EUMV	Europe Large-Cap Blend Equity
Ossiam STOXX® Europe 600 Equal Weight NR UCITS ETF 1C (EUR) EUR	LU0599613147	S6EW	Europe Large-Cap Blend Equity
Ossiam US Minimum Variance ESG NR UCITS ETF 1C (EUR) EUR	LU0599612685	SPMV	US Large-Cap Blend Equity
Ossiam World Minimum Variance NR UCITS ETF 1C (EUR) EUR	LU0799656698	WOMV	Global Large-Cap Blend Equity
SPDR® MSCI ACWI IMI UCITS ETF EUR	IE00B3YLTY66	IMIE	Global Large-Cap Blend Equity
SPDR® MSCI Emerging Markets UCITS ETF EUR	IE00B469F816	EMRG	Emerging Markets Equity
SPDR® MSCI Europe UCITS ETF EUR	IE00BKWQ0Q14	EROX	Europe Large-Cap Blend Equity
UBS ETFs plc—MSCI Emerging Markets SF UCITS ETF (USD) A-acc EUR	IE00B3Z3FS74	EMGEAS	Emerging Markets Equity
Xtrackers Euro Stoxx 50 UCITS ETF 1C EUR	LU0380865021	XESC	Eurozone Large-Cap Equity
Xtrackers II EUR Corporate Bond ex Financials UCITS ETF 1C EUR	LU0484968655	XB4N	Euro Corporate Bond
Xtrackers II EUR Corporate Bond UCITS ETF 1C EUR	LU0478205379	XBLC	Euro Corporate Bond
Xtrackers II EUR Covered Bond Swap UCITS ETF 1C EUR	LU0820950128	XLIQ	Euro Corporate Bond
Xtrackers II Eurozone Government Bond 3-5 UCITS ETF 1C EUR	LU0290356954	X35E	Eurozone Government Bond
Xtrackers II Eurozone Government Bond 5-7 UCITS ETF 1C EUR	LU0290357176	X57E	Eurozone Government Bond
Xtrackers II Eurozone Government Bond 7-10 UCITS ETF 1C EUR	LU0290357259	X710	Eurozone Government Bond
Xtrackers II Eurozone Government Bond UCITS ETF 1C EUR	LU0290355717	XGLE	Eurozone Government Bond
Xtrackers II iBoxx Eurozone Government Bond Yield Plus Swap UCITS ETF 1C EUR	LU0524480265	XY4P	Eurozone Government Bond
Xtrackers MSCI Emerging Markets Swap UCITS ETF 1C EUR	LU0292107645	XMEM	Emerging Markets Equity
Xtrackers MSCI Europe UCITS ETF 1C EUR	LU0274209237	XMEU	Europe Large-Cap Blend Equity
Xtrackers MSCI Japan UCITS ETF 1C EUR	LU0274209740	XMJP	Japan Large-Cap Equity
Xtrackers MSCI USA Swap UCITS ETF 1C EUR	LU0274210672	XMUS	US Large-Cap Blend Equity
Xtrackers MSCI World Swap UCITS ETF 1C EUR	LU0274208692	XMWO	Global Large-Cap Blend Equity
Xtrackers S & P 500 Swap UCITS ETF 1C EUR	LU0490618542	XSPX	US Large-Cap Blend Equity
Xtrackers Stoxx Europe 600 UCITS ETF 1C EUR	LU0328475792	XSX6	Europe Large-Cap Blend Equity

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The Relationship Between Poverty and Agricultural Growth in Countries Within Central and Eastern Europe

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The paper aims to analyze the relationship between economic growth and increasing agricultural productivity at macroeconomic level, relationship that determines a decrease of poverty. Data sets are analyzed using econometric methods in order to test the cointegration relationships. The results of the data show that, in Romania's case, the added value of agriculture has no significant impact on the evolution of the country's GDP, so also the impact on raising the standard of living is marginal. To increase productivity and profitability of agriculture requires a complex approach: a financial system to support development of the sector by providing specific financial products and services, the reorganization/retechnologization of farms, encouraging young people to invest in agriculture, ownership structure of agricultural land.

Keywords: added value, poverty, production, labor force

Introduction

Agriculture is a very important factor in reducing global poverty, is the primary production sector in most poor countries, in terms of percentage of GDP and almost always in terms of the number of people engaged in this activity (IDA, 2009).

To reduce poverty, to improve living standards and food security is necessary to focus efforts on the development and efficiency of small-scale farming.

Sustainable development of the agricultural sector will lead to job growth in rural areas, increasing the remuneration of these jobs, reducing the gap between living standards in urban and in rural areas, reducing migration of rural youth in urban and fighting poverty.

In order to observe the evolution of the agricultural sector in the emerging countries of Central and Eastern Europe, the author has studied the case of Poland, Romania, Bulgaria, and Hungary. These countries were selected because of the similar economic structure and the common agricultural history. Former communist countries in which agriculture is practiced centralizedly, went to a market economy by implementing specific land reform. In all these states is still practical large-scale, subsistence agriculture, which perpetuates poverty in rural areas.

Literature Review

The growth in agriculture can fuel economic development, through direct and indirect mechanisms. Extreme poverty continues to be a rural phenomenon despite increasing urbanization. World agricultural

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productivity, especially in poor countries, is essential to global food security and the fight against poverty and hunger (Von Braun, 2008).

While economic growth is essential for poverty reduction, it is found that this does not cause a rapid reduction of poverty (Nwafor, Ehor, Chukwu, & Amuka, 2011).

Poverty reduction has been achieved by increasing productivity. Agriculture provides jobs to disadvantaged people with low skills and low levels of education (Grewal & Ahmed, 2011).

The contribution of agriculture to economic growth decreases as emerging countries focus on development of other sectors. However, agriculture is in this case an important factor in ensuring increased living standards and food safety (DFID, 2005).

Seventy-five percent of the world population lives in rural areas and is mostly dependent on agriculture. In these conditions, agriculture is very important in ensuring global economic growth, poverty reduction, and environmental sustainability (UNDP, 2012).

Methodology

Data

Data sets are composed of annual historical data for 1995-2014. Data source is EUROSTAT (http://ec.europa.eu/eurostat/data/database), World Bank (http://data.worldbank.org) and FAOSTAT (http://faostat3.fao.org/home/E).

Analytical Framework

Non-agricultural activities and additional revenues are an important part of income in rural areas. This additional revenue ensures human survival, without allowing an increase in living standards. The discrepancy between the incomes of large urban and rural areas has made much of the young rural population to migrate to urban areas.

Another problem in rural areas is the high level of unemployment. Due to the low level of financial support to the unemployed workforce, about 50%-65% of them can be classified as the poor.

In the analyzed countries, family farms and small-sized farms are prevalent, as in countries with developed agriculture there is no this kind of division of property. However, we must take into account the important social role that these micro farms have in the survival of the poor. In periods of transition, characterized by unemployment, high inflation, lack of capital, poor and insufficient social systems, subsistence farming has provided livelihood for a significant part of the population, as a supplement for small pensions.

Table 1

Agricultural Structure

Countries	Labor input in agriculture	Input unpaid labor	Input paid labor
Bulgaria	299.0	221.0	78.0
Hungary	445.3	320.6	124.8
Poland	1,937.1	1,809.0	128.1
Romania	1,444.0	1,279.0	165.0

Source: EUROSTAT, data as of 2014.

In developed countries, many farmers lease land for agriculture. In countries like Belgium, France, and Germany, farmers are renting more than 60% of the land they cultivate, while the average leased land in the

countries of the European Union is 40% (Lerman, Csaki, & Feder, 2002).

Also in emerging countries the lease mechanism works, although the number of farms practicing leasing is small. The farms operating with lease land are significantly larger in surface than the wholly property farms.

Technical and structural problems arising in rural areas of emerging countries analyzed are:

- Lack of jobs in an area other than agriculture;
- Low wages in rural areas and in agriculture;
- Lack of funding specific to agriculture;
- Difficulties in ensuring selling of farm products in the markets due to lack of transport means, lack of infrastructure or/and very long distances;
- Small quotas of milk as a major asset in the subsistence.

The effects of agricultural reform and land restitution manner differed from country to country. Thus, in Romania's case the land was divided into a number of small farms, low tech, without financial support from the state or the financial sector (67% of total agricultural area). An important part of the young labor force migrated to cities due to the disparity between living standards in rural and urban areas.

Hungary recorded a strong initial decrease in agricultural production and a greater decrease in occupancy workforce. The transition from collectivism to a market economy was limited so they are still large farms (50%-80% of all farms).

Bulgaria has registered a sharp drop in production and workforce productivity. Most of the land was partitioned to individual owners (about 50% of agricultural land).

In the case of Poland agrarian reform was implemented more effectively. Polish farms proved more profitable, with a larger average surface and using a higher level of technology. Also, support was provided by the authorities during and after achieving this reform. Profitability increased significantly after 2005, when Poland began intensive farming the land, characterized by the use of chemicals.

With the development of support programs for agricultural sector, including the issuance of guarantee funds loans in agriculture subsidies to farmers, EU development funds to rural areas, programs to encourage young people to return to villages, have increased the level of investment and funds raised. To these were added and the easing of bank loans to the agricultural sector.

Agricultural land surface and quality are important factors influencing productivity and ensure the competitiveness of natural agricultural production.

Analyzing the evolution of agricultural land area[1] (% of total area of the country), we see that it decreased in all four states observed (see Figure 1). Many lands have been abandoned or set aside from the agriculture circuit.

Land structure is also very important for the efficiency of agriculture. The share of arable land in total area decreased during the period studied, in all four countries: from -4% in Bulgaria, 22% for Poland.

In case of the studied emerging markets, we see an increasing volatility of the crops and cereal production as well as a decrease of animal production. This is due to the lack of an irrigation system, as well as insufficient investments from private investors and authorities.

As a result of the programs that support agricultural development, sustained by the European Union, in the last years we see an improvement of investments in the sector: SMEs and other forms of collaboration that

[1] Agriculture land—land with perpetual crops and pastures, excluded (definition according to the World Bank).

attract capital, in order to develop economical viable farms, a growing interest from the local financial institutions for lending to the agriculture sector, programs to support young farmers.

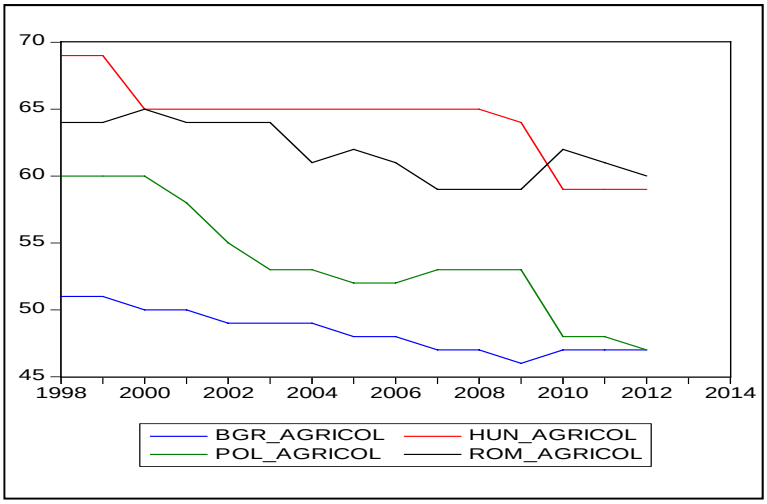

Figure 1. Evolution of agricultural land surface (% total). Source: EUROSTAT.

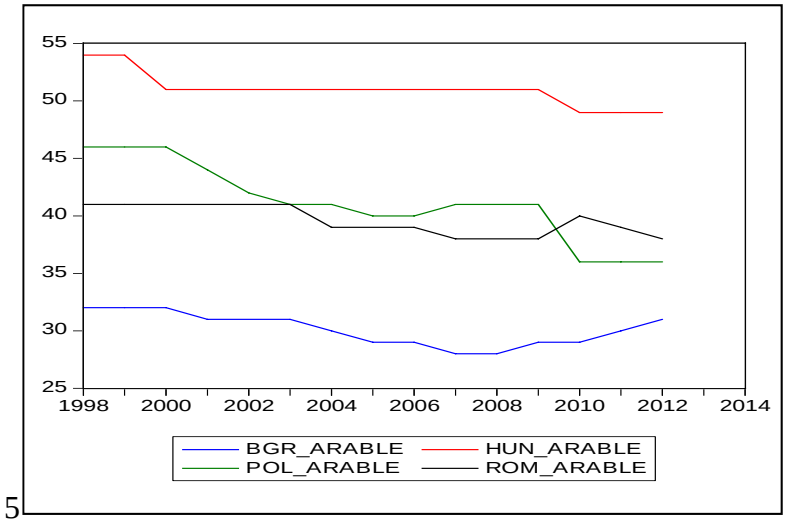

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Figure 2. Evolution of arable land area (% total). Source: EUROSTAT.

In case of Poland, the value of agricultural production registered an upward trend, without major slips. This is due to the level of technology and investments that are higher than in the rest of the emergent markets. A better irrigation system, modern machineries, and the usage of chemicals generated an increase of productivity per hectare, regardless of the cyclical weather. Less fragmented agricultural lands, the existence of markets and infrastructure generated more investments in the sector.

The labor force in the agricultural sector registered a decline, especially in Romania. This is due not only to the rural-urban migration, but also to an important migration of the labor force from the emerging markets to the developed markets. The main driver of this phenomenon is the gap between the living standards and employment between the emergent and developed economies. Large parts of the income earned by the migrant people that work in the developed markets helped to the development of the rural area generating an increase of consumption, investment, and decrease of the level of unemployment, especially in poor areas.

Figure 3. Structure of agricultural production in Bulgaria. Source: EUROSTAT.

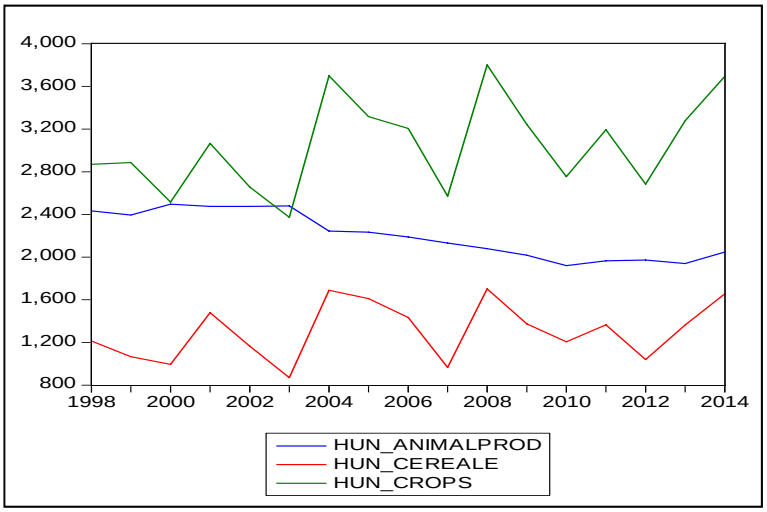

Figure 4. Structure of agricultural production in Hungary. Source: EUROSTAT.

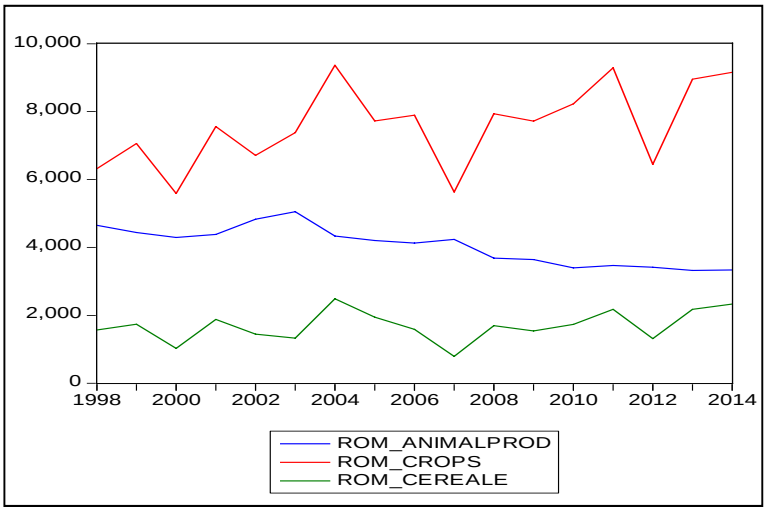

Figure 5. Structure of agricultural production in Romania. Source: EUROSTAT.

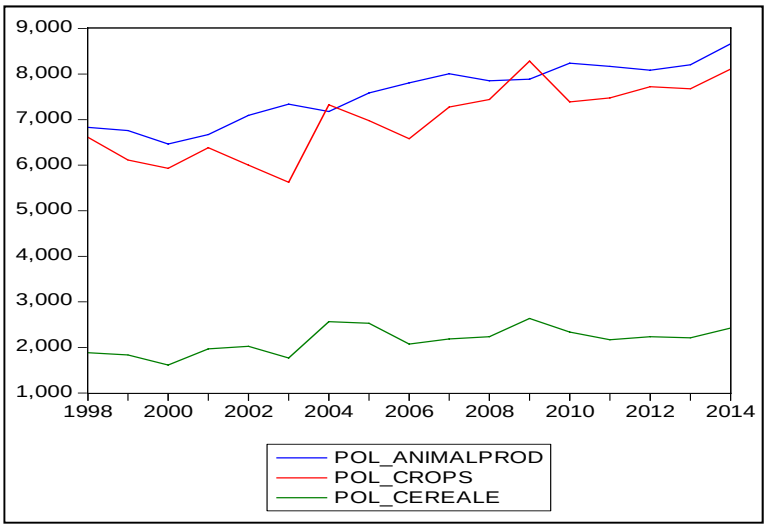

Figure 6. Structure of agricultural production in Poland. Source: EUROSTAT.

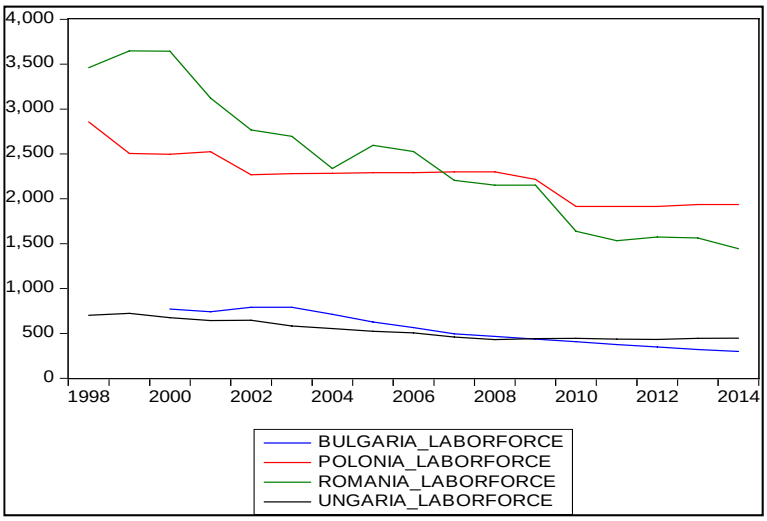

Figure 7. Labor force—total input of labor force in the agricultural sector. Source: EUROSTAT.

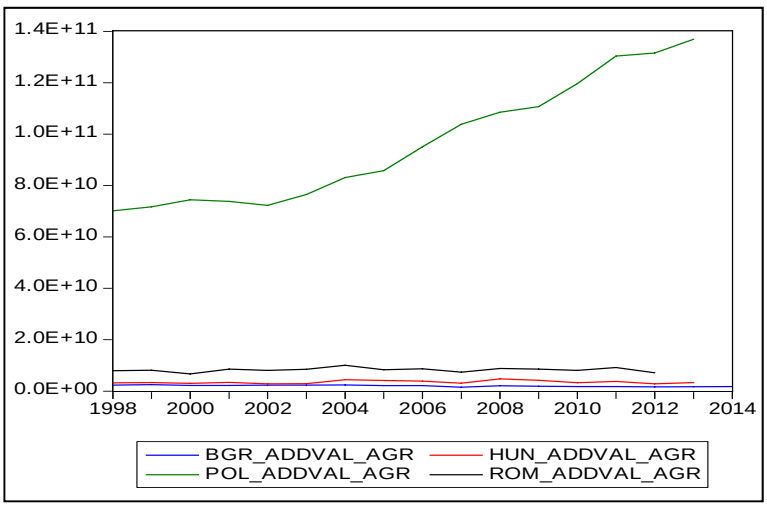

Figure 8. Added value of the agriculture. Source: EUROSTAT.

With the exception of Poland that managed to obtain an important increase of the added value generated by agriculture within the GDP, for the rest of the studied countries, the level remained approximatively the same. This result demonstrates the efficiency of the model implemented by Poland that managed to streamline the agricultural sector.

Conclusion

The impact of agriculture on real GPD growth is marginal. As the value of the GDP increases, the impact of agriculture in GDP decreases. Nevertheless, we must keep in mind that a competitive agriculture has a very important impact in poverty alleviation. In order for the impact of the agricultural added value to grow on the Romanian economic development, a change in the present production model is required.

In later years we can see an improvement of the productivity and profitability of the agricultural sector. Thus, we can observe a development and diversification of entities that activates in agriculture. Positive factors:

- New SMEs and other forms of cooperation that have the main activity the exploitation of agricultural land (property or leased), animal farms, etc. The development of SMEs creates jobs in rural areas and is financially sustained by European funds;
- Loans provided by financial institutions that are guaranteed by the authorities, incentives, and funds for young farmers;
- Contracts between manufacturing factories/retail or wholesale shops and local farmers;
- Direct or online sale of products (in cases of farms/agricultural exploitations situated near cities);
- Local authorities have provided services: cleaning, repairs, infrastructural development;
- Transportation for commuters that work in industrial centers;
- Organization and development of rural tourism within traditional farm.

Nevertheless, the advance average age of landlords, lack of capital and information, as well as the reluctance of entering different forms of collaboration/lease of land, slow the growth and profitability in the agricultural sector.

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Structural Innovation Processes in Medium-Sized Italian Firms: Case Analysis in the Fashion Industry

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Attention to technological innovation is focused on the belief that aesthetic innovation can be either facilitated or inhibited within this open innovation setting where limited protection and dynamic knowledge flows occurring across organizations. The clothing industry in Italy was chosen as a target context, because many innovative pioneering medium sized enterprises (MSEs) were operating in the industry and we decided to adopt a research methodology based on the use of a qualitative analysis of business cases. The data were collected in three regions of Italy: Emilia Romagna, Marche, Umbria visiting investigated companies over six years (2010-2017). From a part of the necessity of deep organizational engagement with integrated stakeholders, the results imply that firms choose a multiple stakeholders integration strategy with particular attention to supply side relationships in the sense that they vary in their openness towards up-stream supply chain.

Keywords: sustainable supply chain, open innovation, manufacturing system

Introduction

The goal is to investigate what new dynamic capabilities are being developed and enriched in innovative fashion companies. Starting from the Resource Based View (RBV), we try to typify the form of openness innovation put in place by companies that are related to companies in the same supply chain preferring contacts, especially from the supply side (with suppliers), or with operators belonging to supply chains that are profoundly different and far from traditional fashion supply chains. What emerges is how innovation within the supply chain impacts on strategic decision-making processes and on the managerial performance of companies in relation to each other. Scholars are then called to interpret open innovation using the conceptual categories of relational based view: firms utilize relationships for competitive advantage by accessing, integrating, and leveraging external resources.

It is also a matter of analyzing which are the inspiring principles of R&D activities, that is if the research efforts (entity and type of resources employed, design of research oriented processes, innovative intership, etc.) are pushed by the economic actors of the supply chain (push technology innovation) or if they are pulled by down-stream actors belonging to the same supply chain or to other supply chains or finally if they are requested by customers (retailers or final clients) (pull technology innovation).

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This paper is structured as follow. The first part presents a structured analysis of the theoretical framework (see Figure 1); subsequently the methodology used is presented; finally, the first results of a research still underway and the concluding observations are exposed.

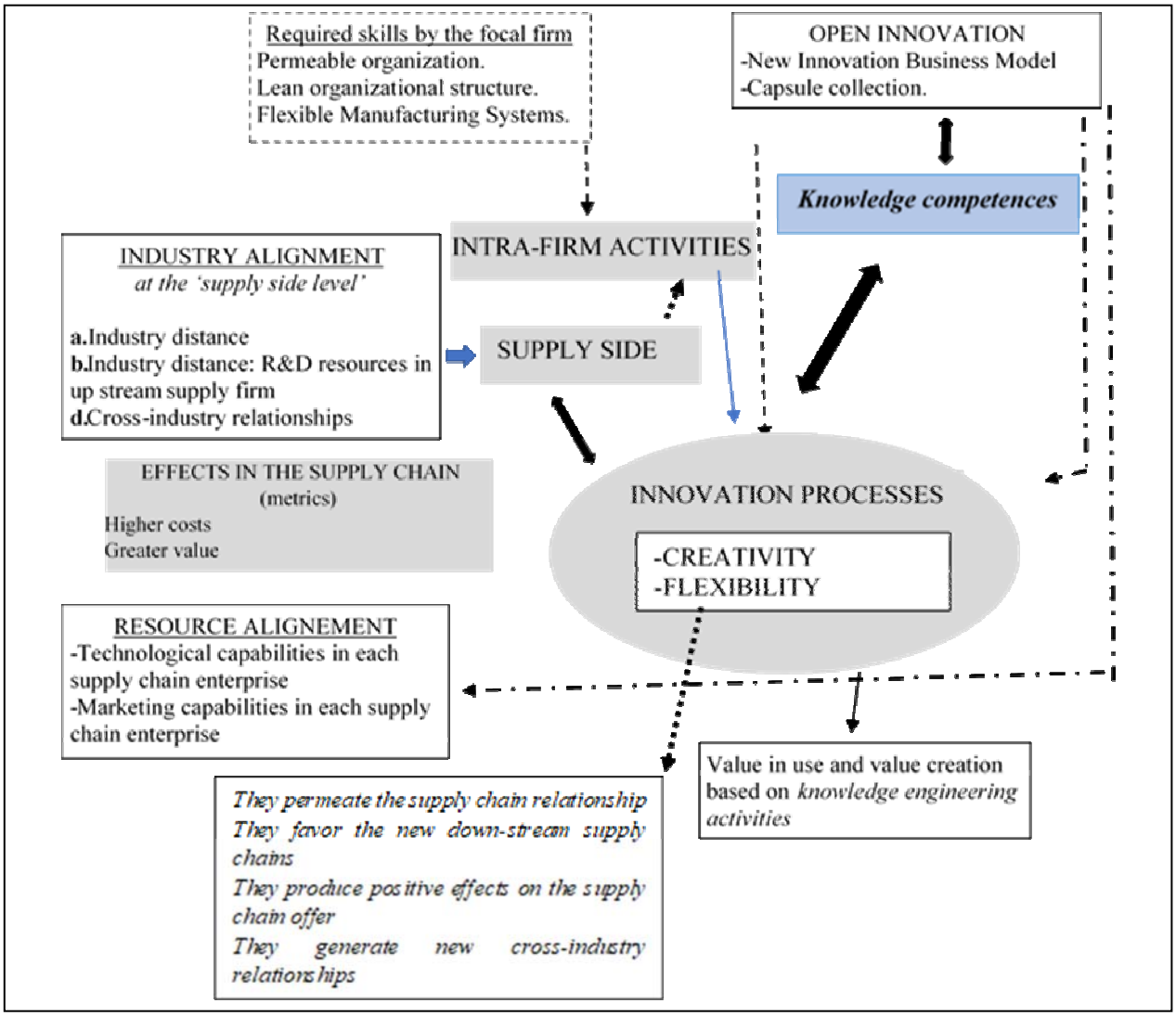

Figure 1. Innovative processes in knitwear supply chain. Source: our elaboration.

Theoretical Framework

Using the theoretical framework of the RBV we try to interpret the almost natural propensity of openness innovativeness of companies that are related to companies in the same supply chain, especially from the supply side, or belonging to deeply different supply chains.

Open innovation is a very complex phenomenon that leads us to review the impact that innovation has on the economic and non-economic actors involved in the various innovative phenomena.

It is increasingly important for entrepreneurs, managers, financiers, and institutional economic bodies to understand the effectiveness of the "widespread innovative phenomena", by analyzing the outcomes of joint inventing and the competitive performance acquired by the companies involved. Instead, an understanding of

value creation and value capture is paramount for advancing our understanding of sustained open-innovation activities. Open innovation requires collaboration among distributed but interdependent actors who rely on each other's capabilities for value creation and capture (Chesbrough, Lettl, & Ritter, 2018).

According to the resource based view, network scholars point out that academics interest in the prerequisites of business, or strategic networks successful exploitation is much more recent. From a resource based perspective firms differ in their capability to shape and exploit networks, to extent that their capability to leverage networks has been identified as distinctive.

If firms seek increased market, innovation, and financial performance, they need to develop network specific capabilities. One such critical capability refers to management skills and competencies in developing valid views of networks and their potential evolution, a condition to perceive the opportunities embedded in networks.

Recent empirical studies re-systematize the conceptualization of network pictures by testing the dimensions of this concept and adopting a dynamic view, focused on the processes through which networks are understood and strategy enacted within them (Czakon & Kawa, 2018). This is particularly useful, in order to avoid the appearance of myopia networks in literature and in managerial practices.

Similar to relational based view the network perspective sees markets as business network, where business units or firms are represented by nodes, and long-term complex interactions between them are represented by links (Håkansson & Ford, 2002).

H1: The propensity of multiple actors to design new supply chains is assumed in which companies are linked by sustainable relationships.

Previous research has examined open innovation and its related interactive mechanism then contributed to the understanding of how generate outcomes in innovative relationships (West & Bogers, 2014; Spender, Corvello, Grimaldi, & Rippa, 2017). The openness innovative phenomena have received a significant amount of attention from scholars and practitioners over the past decade, but its definition derives from a long stream of economics literature on the spillovers that can arise from R&D activities (Chesbrough et al., 2018). Moreover, evidence regarding the role of actors remains fragmented. For instance, the relationship between innovation creator actors (firms, start up, team work) and innovation seekers (founders, business angels, ecc.) is understood. The most analyzed are the contexts of R&D collaborations and technology alliances (Eikhof & Haunschild, 2007; Faems, de Visser, Andries, & van Looy, 2010; Lin, 2018). Thus, research attention to diverse supply chain should be considered.

Over recent years many studies have pointed to creativity as a principal driver of innovation and profitability of firms. According to the most modern literature, innovation process starts from a creative idea that must overcome some of the obstacles such as technology challenges and competitive pressures (Anderson, Jeanrenaud, Bessant, Denyer, & Overy, 2014). Hence, no innovation is possible without the creative processes as the latter is often an initial invention or deep insight in some of several stages of innovation (Yusuf, 2009). From there it follows that creativity is a multi-dimensional concept that encompasses team workers, organizational, supply chain relationships and multi-level perspective.

Firms more and more develop processes to seek out and transfer external knowledge into their own innovation activities. In this sense, R&D activities are inspired by the industrialization of push technology innovation.

X2: The technological innovations of fashion firms are also push type.

The company's deep organizational engagement with stakeholders is crucial for achieving high sustainability performance of innovation. This in the sense that in companies of not large size, where entrepreneurship is strong and where an important decision-making role is attributed to the department heads by virtue of their embedded knowledge, it emerges that the organizational structures are completely involved in the growth processes of sustainable innovative productive systems.

The following is therefore hypothesized.

X3: Multiple and shared strategic commitment for high sustainability performance of innovation is required.

Methodology

Owing the study's exploratory nature, we decided to adopt a research methodology based on the use of a qualitative analysis of business cases (Yin, 2003). Case studies have several advantages; first, they allow one to understand the relationships between a phenomenon and its context and enable scholars to match different data that could enhance a research object's analysis (Dubois & Gadde, 2002). Second, as Stake (1995) notes, case study methods allow one to investigate and to interpret new innovative phenomena both in managerial and in strategic sense, in real time.

The clothing industry in Italy was chosen as a target context, because many innovative pioneering MSEs were operating in the industry.

This study initiated by selecting appropriate business operators (department heads, workers to computerized weaving machines) and area managers who are demanded representative for this research activity. A preliminary round of interviews with designers (or stylists) and entrepreneurs, the founders of the innovative fashion business models, was conducted. Preliminary set of data was collected during the Pitti week in Florence and during the fashion week in Milan. These are industry events, among the most prestigious in the world, which take place at certain times each year and in which well-known companies from the Italian fashion and independent high-end fashion designer business gathering in Florence and Milan showcased their aesthetic (rational or kinesthetic) product innovations for the upcoming season, with businesses ranging from established fashion firms to emerging start-ups. Interviewees' names were kept anonymous due to pre-interview agreements of anonymity.

The second round of data collection was conducted. There were 65 semi-structured interviews involving economic operators at various stages of the supply chain, the consulting organizations, representatives of trade associations, representatives of technical schools and universities.

The data were collected in three regions of Italy: Emilia Romagna, Marche, Umbria visiting investigated companies over six years (2010-2017).

Knitwear Supply Chain. Innovative Relationships in the Opennes Supply Chain

As is known, according to the relational based view, firms utilize relationships for competitive advantage by accessing, integrating, and leveraging external resources. In the theoretical contributions it emerges how the relationships are relevant across a myriad of relationship forms, including alliances, joint ventures, supply agreements, cross-sector partnerships, networks, and consortia. Specifically, in this contribution we consider the effects of power-based behaviors in innovative supply chain relationships involving interdependent supply chains on relational outcomes. Firms' behaviors toward their business partners vary in the direction, extent and approach that the commitment of supply chain partners in innovation projects is exerted.

Networks are structures that decode and convert information in operational sources, innovation inputs, and market opportunities, provide a competitive advantage to some actors over others, and offer opportunities otherwise unavailable.

First, the strength of the relationship between bridging structural holes and firm innovation is likely to vary depending on whether the heterogeneous knowledge comes from firms that are different from or similar to a focal firm.

To enhance their innovation, firms need not only market knowledge, such as the knowledge about market trends, customer needs, and competition, but also technological knowledge, such as the knowledge about methods, processes, applications as well as product parts and the linkages between the parts. Thus, it is expected that the market and technological distances between a focal firm and its network partners are likely to impact how the focal firm might assess the potential value of the type of knowledge provided by bridging structural holes in its ego network.

Because incremental and breakthrough innovation involves different types of resources and activities (e.g., Colombo, von Krogh, Rossi-Lamastra, & Stephan, 2017; Qi Dong, McCarthy, & Schoenmakers, 2017), the heterogonous knowledge that a focal firm might be exposed to from its network partners is likely to influence its innovation differently.

By virtue of the design skills, the knitwear company is the stage of the knitwear supply chain that "controls-governs" the level of flexibility offered to end consumers and governs the type and extent of flexibility that suppliers are called to provide. Knitwear companies offer the level of flexibility that, while exceeding that of their final customers, maximizes the value that the market recognizes to the flexibility of the entire supply chain.

Knitwear firms develop processes that seek out and transfer external knowledge into their own productive innovation activities. They are also available to identify new ones with the same supply chain partners co-creative innovative processes to move unutilized internal knowledge to other organizations in the surrounding environment. You want to put the focus on the wide distribution of useful knowledge, such that no single research institutions or individual firms have a monopoly on useful knowledge. This, together with environmental uncertainty and the complexities of innovation, requires more permeable organizational boundaries that enable combinations of innovative resources (in R&D, manufacturing and marketing areas) beyond and individual actor's resource endowment.

Push technological innovation microsegments the sector and redefines the supply structure at least for the following factors: number and type of supply chain stages, technological heritage of supply chain operators, degree of firm's vertical integration.

Over the years, many scholars have attempted to draw a distinction between creativity and innovation. A common starting point in such efforts is the depiction of innovation as sequential process. In this process creativity enters as initial stage of intra-individual cognitive and inter-individual social efforts that result in a generation of novel and useful ideas (Stojic, Hashi, & Olric, 2018). In reality, in the investigated sector it is noted that creativity is included in all the steps of the innovative processes that permeate the entire supply chain and also that this creativity is inherent in all the innovative processes that follow each other continuously: just think about the multiple designs fashion collections.

The study investigated the positive evaluation of the outputs of innovation, the impact that innovative relationships between producers of knitwear and suppliers have on the flexibility offered by up-stream knitwear

supply chain. Most studies have focused exclusively on the benefits derived from additional flexibility enjoyed by the knitwear producer firms neglecting the contribution that the suppliers can provide for the benefit of the operators belonging to the various stages of the supply chain up to the stage of the final customer (Malhotra & Mackelprang, 2012; Mandal, 2015). To gain a better understanding of the producer-supplier flexibility offering, in this research they are analyzed relationship-specific aspects such as relationship age, shared business volume, and others specific factors at the micro-level analysis such as founders, dynamism and complexity of innovative projects.

In the current study we recognize the cost required to provide additional flexibility (Gligor, 2018). As far as costs are concerned, they are determined by the fact that the innovative processes that presuppose the involvement of suppliers generate innovative outputs that are higher than those required by the supply chain step down streams (industrial-buyers, customers). If we then consider the innovative processes linked to open innovation, which, as is known, generate a great possibility of use in the industrial sense of innovative creative processes, the incomplete usability of innovative principles generates the sunk costs of innovative supply chain processes that in no way can they be recovered.

It emerges how the organizational structures are completely involved in the strategic decision-making process that promotes the growth of sustainable innovative processes. Think of the department heads by virtue of their embedded knowledge: they intervene almost automatically, whenever there is a need, in the application of sustainable innovations, concerning the production systems, the information procedures, the materials to be used, etc. They are able to interact with suppliers of innovative materials as well as with suppliers of machinery.

We therefore find that the best innovative performances of sustainable companies are the result of interships between middle management organizational figures in the operations area and how these interactions profitably increase the relational skills of supply chain actors, especially in the cases investigated in the empirical research with supply side actors.

It is very positive that workers in the operations activity are actively exchanging ideas with other disciplines to enhance learning and create knowledge. More precisely, knowledge co-created and shared with non-usual suppliers belonging to other supply chains help knitwear innovative firms to develop new knowledge, and increase in legitimacy, all of which enable it to take off and grow. Because in some studies it is claimed that the relative importance of knowledge from outside an industry’s boundaries decreases as the industry matures (Agarwal & Hoetker, 2007; Linderman & Chandrasekaran, 2010; Meredith & Pilkington, 2018), the research findings make it possible to exclude fashion knitwear from the mature sectors of Made in Italy.

The innovative phenomena encountered produce not so much value through the collaborative exchange process but also by the participant’s ability to capture the value of other innovative actor’s value creation effort in cross supply chain innovative processes.

Findings

The tension between value creation and value capture is considerably attenuated by the innovative openness phenomena. For example, value creation in open innovation requires firms to be open in order to leverage the knowledge of diverse contributors, while value capture necessitates a tighter, more protective process (paradox of openness) (Laursen & Salter, 2014). This tension is lost in manufactured-based enterprises

that are able to industrialize new knowledge in their production systems. Knowing how to process generates the growth of embedded knowledge: this favors the appropriation of the value of “protective practices”.

We believe this research to bring forth a number of theoretical contributions.

This analysis inductively generated propositions that emphasize the important role played by suppliers towards social sustainability requirements and the reciprocity of the letter’s responses to them.

The findings have important managerial implications considering that the innovative supply chain processes in which a leading role is assumed by companies operating in so-called traditional manufacturing sectors generate an increase in flexibility of the entire supply chain. The findings indicate that from a flexibility perspective, knitwear firms perform best when suppliers and buyers exceed their expectations.

This also explains why Italian yarn producers can direct their resources to the innovation offer both in the processed materials and in the production processes adopted to their industrial-buyers and improve their ability to compete at world level. Our findings reveal that the impact of buyer-supplier fit on supply chain performance increases when firms operate in dynamic environments.

Integrating non-value chain stakeholders, such as unusual lenders, is useful particularly if the firms are open to untypical idea of product’s innovation and are prepared to integrate these so-called secondary stakeholders in early phases of the innovation process. These lenders together with sustainability think-tanks and social enterprises, secondary stakeholders, may not be obvious partners for innovative medium-sized firms.

Without previous experience of collaboration, therefore, it may require significant effort to understand the knowledge gaps, to recognize suitable secondary stakeholders, and to create trusting relationships with stakeholders.

In practice, the success of innovative processes requires motivation to innovate and skills in innovation management as well as availability of relevant financial, human, productive, creative resources that can aid innovation.

The focus of the study on Italian fashion luxury knitwear companies has allowed us to develop innovative and creative processes as analogous sequences: innovation process in this framework, with the decision to innovate and advances through stages of investment in innovations, implementation and commercialization in various supply chains also strongly diversified among themselves.

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A Study on Business Succession in Small and Medium-Sized Chinese Enterprises

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The survival and development of SMEs (small and medium enterprises) is an important issue for the Chinese economy. In particular, business succession in SMEs is a persistent issue. Business succession involves selection of a successor, asset inheritance, transfer of management rights, accumulation of business connections and technology succession, and so forth. This all requires smooth execution of a business succession plan. However, many SMEs do not have a business succession plan, nor are they preparing one. Our task is to explore the reasons these preparations are not being made. Here, the purpose of our research is to get a picture of the status of preparations for business succession in SMEs in China, and the actual circumstances of succession, based on the results of a fact-finding survey of Chinese SMEs, and at the same time bring to the surface the primary factors which influence preparations and plans. The results of the analysis shed light on the status of business succession preparations, successor's awareness of issues, decision making, and so on. This survey highlights the awareness of business succession among business managers.

Keywords: business succession, small and medium-sized Chinese enterprises, changes in presidents

Background

According to "Market In-Depth Survey and Investment Strategy Analysis and Analysis of China's Enterprise Management Project Industry", in a market survey and analysis report on Chinese business projects and investment strategies, there were 40 million small and medium-sized enterprises (SMEs) in China as of 2017, accounting for 99% of the total number of companies, 60% of the Chinese GDP, 50% of tax revenue, and 80% of urban employment. SMEs play an important role in supporting a nation's economy. Further, 90% of SMEs are family businesses, and many of these businesses are now at the point where business managers must consider successors (Chinese Family Business Succession Report, 2017).

Xinhua News Agency reports that the "Chinese Family Business Development Report" (2011), a report published by Beijing city in 2011, gives a comprehensive analysis on the business conditions and growth processes of family businesses in China, indicating that "Chinese family businesses play an important role in the development of the economy and society, and although they increasingly contribute to this development,

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they are also facing issues with succession and generational transitions". The *China Securities Journal* also states that family businesses account for 80% of all privately-operated companies in China, and that "succession" is the greatest worry for such companies (Asano, 2011). A great many companies have been founded in China due to the country's reform policy of opening up to the outside world in the early 1980s. Thirty years later, the founders of these companies now need to consider business succession. A look at company succession for SMEs in the developed nation of Japan reveals that most business managers of such enterprises are 66 years of age, with the average age for the 20-year period from 1995 to 2015 rising from 44 to 66. It is now time for some several 100,000s of business managers to consider business succession (Li, 2014). Chinese SMEs will also likely be facing the issue of aging business managers 20 years from now (Small and Medium Enterprise Agency, 2013).

As previously mentioned, SMEs account for the majority of enterprises in China and account for at least 80% of total employment, serving as the foundation for the Chinese economy and employment. China is still a developing nation, however, and it is increasingly difficult to manage SMEs in an environment of mass production. It will be important for SMEs to continue to develop along with China as a whole.

Business managers of SMEs are extremely busy with running their enterprises, and even those who are considering business succession do not have clear plans. They lack the awareness of how to prepare for the upcoming period of business succession. It goes without saying that enterprises that have not made sufficient preparations for business succession are at great risk, as these companies would need to rush to find a new president at great loss in a sudden emergency, such as death or illness of the business manager. SMEs are weaker than large enterprises with regard to financial, manufacturing, and information-gathering capabilities, so it is important for SMEs to be willing to leverage their strengths (such as the ability to make quicker decisions, the ability to flexibly respond to the needs of consumers, and the benefits of preferential tax treatment) and to make constant improvements in business planning and business succession.

Although SMEs face many issues with business succession, they generally do not take these problems seriously. In order to understand and resolve these issues, we referred to business succession support measures for Japanese SMEs, conducted a fact-finding survey targeting business managers of Chinese SMEs, and then analyzed the results.

The purpose of our research is to get a picture of the status of preparations for business succession in SMEs in China and the actual circumstances of succession, based on the results of a fact-finding survey of Chinese SMEs (mostly in the manufacturing industry) with 400 or less employees, and at the same time bring to the surface the primary factors which influence preparations and plans. The results of our analysis shed light on the status of business succession preparations, decision making on successors, and so on. This survey highlights the awareness of business succession among business managers.

Prior Research

Many family operated enterprises in Japan have been in business for 50 to 60 years, and the majority of these enterprises have been passed down anywhere from three to five times.

In Japan, it has been argued that enterprises and businesses are not necessarily owned by the business manager, and there has been a long history of focusing on business succession research in enterprises (Record China, 2010). Successors also inherit and maintain the reputation of the enterprise and have an important responsibility as "relay runners" who must communicate this to their descendants (Record China, 2010; Adachi,

1974). In other words, Japanese business succession research has characteristically stressed the survivability of a business over the social position of its business manager. Major research can be classified into the following subjects: selection of a successor for the current business manager, inheritance taxes, and the succession process (Record China, 2010; Adachi, 1974).

On the other hand, major research on business succession in China seldom covers business succession in SMEs, as many of these enterprises undergo rapid growth under the founder and then disappear.

As shown in Figure 1, according to "2017 Chinese Government PR Material" (2017), 8% of Chinese business managers were 60 years of age or older in 2017, while 32% were between 51 and 60, and 42% were between 41 and 50. This age distribution of enterprise business managers reveals that 32% will reach an advanced age (between 61 and 70) 10 years from now and that business managers between 51 and 60 years of age will account for 42%. Such enterprises will need to take business succession into consideration if they intend to survive over the long term. However, they will likely face a range of problems in doing so, such as how to train successors.

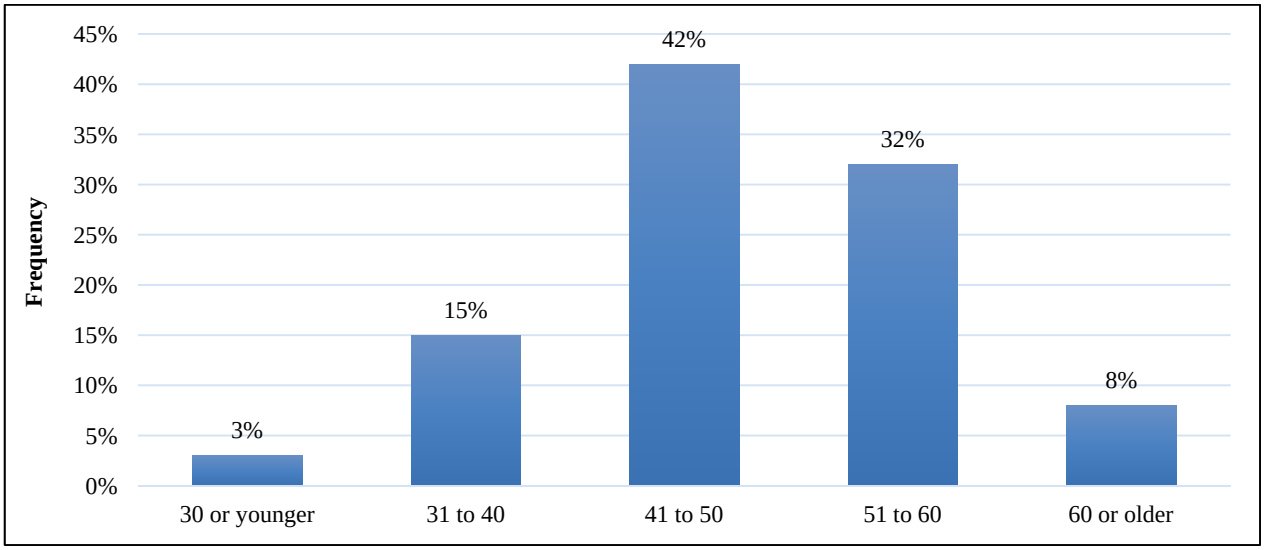

Figure 1. Age distribution of business managers in Chinese SMEs. Source: Chinese government PR material (2017).

Overview of Study on Chinese SMEs

In order to get a picture of the status of preparations for business succession and the status of succession, we conducted a direct survey on trustworthy Chinese SME business managers (103 people). The survey was conducted from December 2017 to January 2018. Approximately 100 surveys were distributed to Chinese SME business managers. 67 valid responses were collected, leading to a valid response rate of 67%.

Most of the enterprises were in the manufacturing industry (43%), 16% were in the construction industry, and less than 10% were in other industries. 40% of the valid responses were received from small and medium-sized manufacturers.

Enterprises were asked about the general situation of their companies, the age of their business managers, whether they were making business succession preparations, their reasons for business succession, their business succession concerns, whether they have decided on successors, and items related to business succession advisors.

Chinese SMEs can be classified into one of three asset categories based on how enterprise assets are owned: state-owned, aggregated, and sole proprietorship/privately-operated (privately-managed) (Ochiai, (2014). This survey targeted sole proprietorships/privately-operated SMEs (family businesses) with 400 or less employees.

Results of Study

Our survey of Chinese SME business managers showed that 20% of enterprises were “preparing for succession” and 20% have “sufficiently prepared for succession”. 33% of enterprises responded that they “feel it is necessary but have not prepared”, 12% of enterprises responded that they “do not feel it is necessary”, and 16% of enterprises responded with “other”. This indicates that approximately 61% of enterprises have not made preparations. A range of problems, including the aging of business managers, will likely face these enterprises over time as business environments change.

31% of enterprises “have decided on a successor”, while 69% of enterprises “have not decided”. This indicates that quite a few enterprises “have not decided on a successor”. Many enterprises “have not made preparations”, and approximately six out of every ten (61%) will face a range of business succession issues in the future.

When asked about “business succession advisors”, the top response was “consult with friends/family” (16 responses), followed by “consult with tax accountant” (13 responses) and “consult with lawyer” (14 responses). These were followed by “consult with external tax accountant” (11 responses) and “consult with SME consultant” (9 responses). In contrast, around 10% of business managers responded they would consult with a financial institution, intermediary, or other organization. The fact that most chose to “consult with friends/family” shows the importance of human relations where there is a friend or experienced senior associate upon which to rely on.

When asked why they would close their companies, most business mangers replied that their “children do not want to inherit [their] business” (37%), while 30% selected “no young employees”. 26% stated that their “company has no future”, suggesting instability in Chinese SMEs. Less than 20% selected “no successor” and “poor company performance”. For many Chinese SMEs that go out of business, there is a sentiment of having no future and facing issues with employment, causing an overall feeling of instability.

Out of 53 respondents asked about business succession issues, the top response was “issues with collateral for loans” (10 responses). There were five responses each for “share purchasing”, “family successor coordination”, “connections with financial institutions”, and “employee coordination”. Other issues (successor decision, inheritance tax, company real estate, connections with clients, shareholder and employee trust, and successor ability) were all selected less than 10 times each.

Comparison of Business Succession Concerns in Chinese and Japanese SMEs

Next, we compared the concerns of Japanese and Chinese SMEs to identify business succession problems in Chinese SMEs. The survey results were compared with those of an identical survey we conducted in 2013 on Japanese SMEs (Wang, 2017). Comparing these surveys, which are depicted in Table 1, revealed that, while 31.1% of Japanese SMEs were concerned about “successor decision”, the percentage of Chinese SMEs that selected this concern was much smaller at only 3.2%. This indicates that business managers of Chinese SMEs are not aware of how serious the aspect of selecting a successor is. 4.4% of Japanese SMEs and 32.3% of

Chinese SMEs responded that they were concerned about “issues with collateral for loans”. This reveals that Chinese SME management is heavily dependent on loans and that they are operating under unstable business conditions. 33.3% of Japanese SMEs and 16.1% of Chinese SMEs stated that they were worried about “share acquisition/purchasing”. The comparative lack of concern over “share acquisition/purchasing” is likely due to there being less regulation of inheritance tax in China. 8.9% of Japanese SMEs and 16.1% of Chinese SMEs responded that they were concerned about “family successor coordination”. This is likely because Japanese SMEs determine successors more quickly and therefore are not concerned about coordinating family successors. A high percentage of Chinese SMEs was worried about “connections with financial institutions”, suggesting a heavy dependence on such institutions and general instability.

Table 1

Comparison of Business Succession Concerns in Japanese and Chinese SMEs (Multiple Responses Allowed)

Business succession concerns	Japanese SME study survey results (%)	Chinese SME study survey results (%)
Successor decision	31.1	3.2
Issues with collateral for loans	4.4	32.3
Share acquisition/purchasing	33.3	16.1
Inheritance tax	28.9	6.5
Family successor coordination	8.9	16.1
Company real estate	2.2	3.2
Connections with clients	11.1	3.2
Connections with financial institutions	6.7	16.1
Shareholder and employee trust	17.8	3.2
Employee coordination	6.7	16.1
Successor ability	44.4	9.7
Other	8.9	22.6

Note that a higher percentage (44.4%) of Japanese SMEs indicated that they were concerned about “successor ability”, while 9.7% of Chinese SMEs selected this answer. Successor training support is often provided in Japanese SMEs, and such enterprises are likely highly aware of a successor’s abilities. This comparison suggests that Chinese SMEs have a much lower awareness of business succession than Japanese SMEs. As inheritance tax and income tax become more regulated, the issue of business succession will likely become more serious for SMEs. Furthermore, if rapid growth of the Chinese economy results in the government providing easier access to support from financial institutions (and more stable economic conditions), concerns over “issues with collateral for loans” and “connections with financial institutions” will become more severe. This will likely also have an effect on business succession.

Discussion

It has been reported that there is little information provision/consulting support available for Chinese SME management. Furthermore, SMEs are faced with a range of business succession issues, such as share distribution within families with regard to succession, asset and successor disputes, tax burdens, and insufficient capital. It goes without saying that advice from an expert is needed to resolve these types of economic problems. Additionally, business succession requires various types of capital, and some argue that a specialized guarantee system is required for business succession (such a system exists in Japan).

In China, experts have little interest in and knowledge about business succession, so a comprehensive awareness of business succession is a must. It is important to have tax accountants/certified public accountants, other business managers, friends/relatives, and officers/employees who are not relatives for consultations regarding business succession.

The difficulty of finding successors for SMEs in China is therefore a serious issue, and even if a business manager has made sufficient preparations for business succession (or is attempting to do so), he or she will soon have to worry about the issue of future successors.

In the advanced nation of Japan, national and local governments provide a range of support measures. SMEs have access to a rich support system that includes such resources as the "Management Succession Facilitation Act" enacted in 2008 and the "Small and Medium-Sized Enterprise Business Succession Handbook: 29 Q&As (Revised for 2011 FY Tax System Revisions)". "Safeguard the Future of Your Company: Smooth Business Succession," a guide published by the Small and Medium Enterprise Agency, and consulting services offered by the Organization for Small & Medium Enterprises and Regional Innovation branches (Small and Medium-sized Enterprise/Startup Comprehensive Support Centers) are other helpful resources for Japanese SMEs.

The Chinese government first became aware of the importance of establishing support systems for SMEs in the early 1990s and began investigating concrete methods. However, while there are non-business organizations that focus on offering technical support and providing information to SMEs, none of these organizations provide support on business succession.

Multiple responses in our survey indicated that enterprises were not making any special preparations for business succession (approximately 60% of enterprises) or that they felt no need to make preparations as the business manager had just recently inherited the business. Many business managers believe that the economy, circumstances, and future of their enterprises are all unclear (and that this situation will continue or become worse in the future), which is why business managers must gain a stronger awareness of the unstable situations in which they operate. There is no guarantee that a business manager will be able to continue to operate his or her enterprise in the future. Enterprises can make succession feasible by gaining an awareness of these risks and by accumulating experience and knowledge within the enterprise. This should help lead each enterprise to its ideal course of action. Unless enterprises pass their experience, technology, and some degree of preparatory expenses down to the next generation, successor generations will once again be faced with succession problems and the expenses required for succession. Although some argue that succession generally only occurs once every 20 to 30 years, this can actually occur as frequently as every 10 or 20 years in the manufacturing industry and construction industry—especially for technology and quality control succession. Providing a clear path ahead can reduce the burden of succession on business managers. Business succession will become a serious problem for Chinese SMEs, many of which undergo rapid growth under the founder and then disappear.

One example of a support measure would be to propose a checklist for understanding the current state of business succession. A checklist similar to that in Table 2 could allow an enterprise to begin preparations based on the current conditions and then to plan succession focusing on areas in which the enterprise has not made sufficient preparations (Maekawa & Suekane, 2011). A checklist could also highlight awareness of business succession similar to a survey.

It would also be important to have such a list checked by not only friends and family, but by experts (such as lawyers, certified public accountants, or tax accountants) as well. While there are many laws and preferential

tax treatment measures in place, these can be complicated and enterprises could mistakenly determine that they apply or do not apply to them.

The best solution would be to continue to create business succession plans and to conduct business succession in an environment in which business managers can avoid meaningless risk and focus on future management. Even if experts are available, China's national government and its local governments will need to provide a range of support measures to increase enterprises' awareness of and knowledge about business succession.

Table 2

Comparison of Business Succession Concerns in Japanese and Chinese SMEs

☐ Do you understand the economic state of your company? (Assets, number/age composition of employees, cash management, debts, competitiveness in industry, etc.) _____ ☐ Do you understand your status as a business manager? (Shares held in your own company, the value of other personal assets, debts, individual bonds, etc.) _____ ☐ Have you written a list of potential successors? Are there any candidates among your relatives or among individuals inside or outside your company that could become successors? Does each potential successor have the required ability and aptitude? (Leadership ability, mutual understanding ability, breadth of vision, fortitude, dynamism, flexibility, management ability, health, etc.) What about attributes for each potential successor? (Age, career history, desire to manage company, human relations with relatives/officers, etc.) _____ ☐ Have you investigated potential problems (and solutions) that could arise during succession? How are your relations with your legal heirs? What is the share ownership situation in your company? Identify inheritances and investigate tax payment methods.

Several respondents were extremely busy with their day-to-day business operations and indicated that they had "no time to think about business succession". It is important to realize that management problems and succession problems are connected. Business plans involve the entire enterprise, and once business succession takes place, changes in management direction and business content will follow. Many business managers consider sales strategies, seek profit (such as reducing expenses), and expand the scale of their businesses as their major management issues. However, the issue of business succession is a crucial factor in any business plan.

There are many enterprises with business plans that have not made preparations for business succession. It is crucial to increase managers' awareness of business succession when creating a business plan.

Conclusion

Chinese SMEs lack awareness with regard to business succession. These enterprises have to increase their efforts in making preparations for business succession. Such enterprises will need to look to advanced nations like Japan to study business succession success cases, business succession support measures, and successor plans. Furthermore, support agencies will also have to provide support measures.

A time span of 10 years is required for an enterprise to spend enough time selecting and training a successor and for the successor to make preparations for business succession. Ultimately, the president of an SME must be aware of the importance of business succession and must make sufficient preparations in order

for the business succession process to go smoothly. If a business manager does not have the will to work towards an efficient business succession or does not work hard enough toward that goal, any available support measures will be meaningless as such measures are ultimately not a replacement for proactive business management.

China is still a developing nation. In order for the country to continue to develop with stability, there should be means for SMEs to smoothly pass down people, assets, and intellectual property and for business succession to be conducted efficiently. The Chinese government will also need to develop policies for SME business succession in accordance with the conditions in China.

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A Model of Interaction Between the Financial Sector and the Energy Sector: The Hypothesis of Energy Currency

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Through an overview of developments in finance and in the energy sector, this work represents an analysis of the relationship of their trends. It is carried out through an interdisciplinary approach. From the original physical currency to electronic payment methods, digital currency is becoming a new concept. It's still a fiat money which is only as good as the organization that issues it. Because Bitcoin is not issued by any central bank, there is no centralized management of the country; there is a great risk of losing control. Finance is not entirely a virtual economy. So, currency development trends must return to intrinsic value. There is the possibility for the energy currency also for its stability. As an energy currency, it is not necessary to print, not to apply the exchange rate, no corresponding pollution, and even better it will help to alleviate the existing environmental problem facing the challenges of global environmental degradation. The international unit of energy can be seen as the unit of energy money because of its intrinsic value. As stated by Scott, there are good reasons to consider energy as a potential currency. If the future integrates energy into the financial system and becomes a means of payment, it will not only eliminate the risk of currency depreciation, but also optimize energy saving and use to achieve environmental protection. The emphasis is given to the integration of the financial sector with the energy one. The aim is to develop a parametric numerical model able to foresee the possibility of combining finance and energy, allowing a sustainable development. This allows us to analyze the pros and cons of the existing energy cryptocurrencies. The last step consists in identifying the main characteristics that this cryptocurrency must have in order to achieve the desired results.

Keywords: cryptocurrency, development, integration, finance, energy, innovation

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Introduction

With the development of the internet economy, digital finance and cryptocurrecies are becoming new concepts. Their development is recording at a rate far beyond our expectations.

We can also feel that the internet technology is a revolution and it can be defined as a distruptive technology, subverting many traditional industries. How many physical stores have been subverted by Amazon and Taobao, and the people is already familiar with digital currency, which can drive economic development to a certain extent.

About digital currency, you have to mention Bitcoin. It's as a concept, was born in 2008 by a mysterious expert named "Zhong Ben Cong", at the same time as the US subprime mortgage crisis and even the global financial crisis.

At that time, Bitcoin was not worth the money, but because there were always players trading, some people began to publicize the hype, which gradually increased from 2009 to 2012, especially in 2012, showing explosive growth. This has made many players who were not Bitcoin come in and use this as a financial investment.

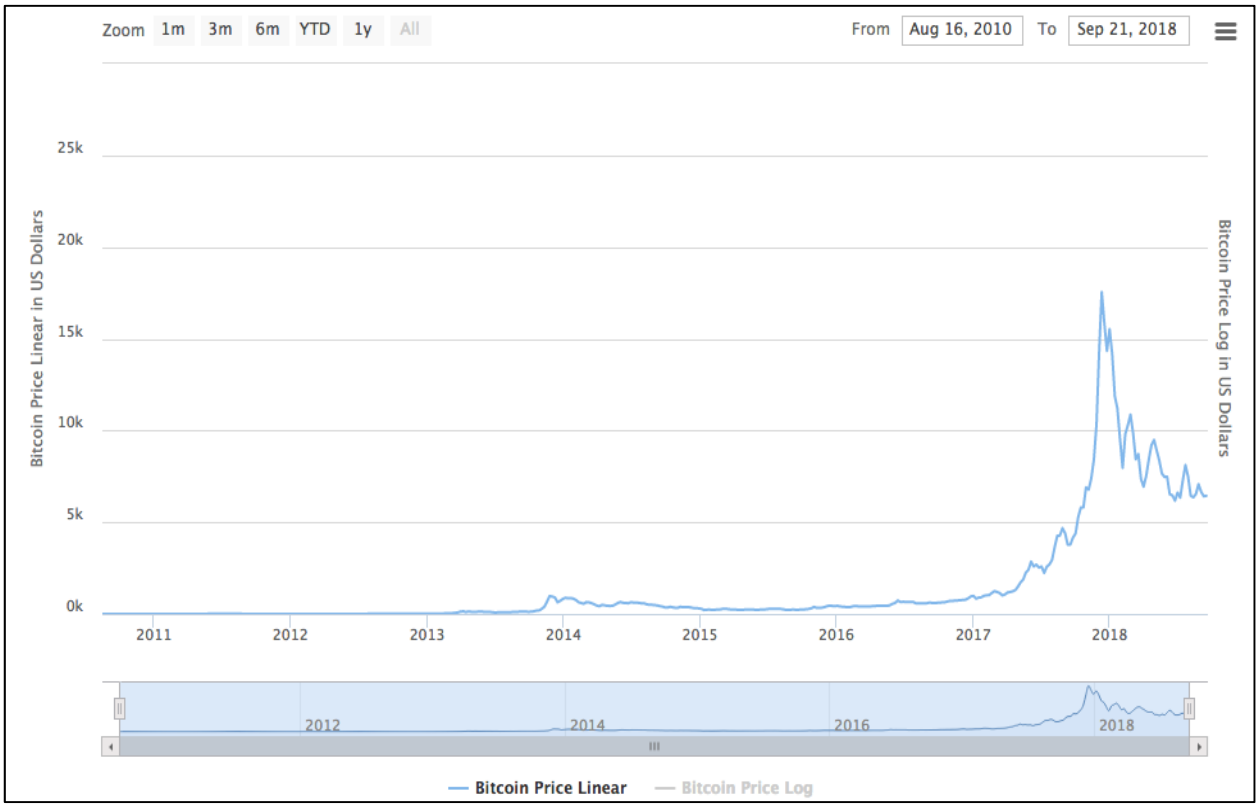

Figure 1. Bitcoin price history chart. Source: CoinMarketCap.

The coin value of Bitcoin soared, allowing some people to see business opportunities, build or expand trading platforms, trying to attract more people to join and earn transaction fees. It is precisely because when more and more players have joined, the value of Bitcoin has begun to rise.

Table 1

Stages of Evolution of Money

N.	Stage and evolution of Money	Origin time	Physical currency form	Character	
				Vantage	Disadvantage
1	Non-Monetary exchange	c.?350 BCE	Furs; skins; salt; rice; wheat; utensils; ceramic; livestock; weapons, etc.	Freedom for exchange; environmental protection	Different sizes, difficult to compare; no equivalent in exchange
2	Commodity Money	Bronze Age		Has intrinsic value; environmental protection; perishable; not easy to store	Heavy; difficult to carry
3	Metallic Money	1000 BCE ? 400 CE	Gold; silver; copper, etc.	Has intrinsic value; easily handled, ascertained	Inconvenient; dangerous to carry; pollution; uneven texture; difficult to segment
4	Paper Money	400? 450	Banknotes	Doesn't has intrinsic value; issued, regulated and controlled by the central bank	Doesn't has intrinsic value; pollution; has time limit and geographical restrictions
5	Credit & Electronic Money	1450-2008	Cheques; credit cards and debit cards	Convenient, smart	Doesn't has intrinsic value; pollution
6	Digital Money	After 2008	Bitcoin; ripple; stellar; litecoin; ETH, etc.	Uses cryptography to seek to ensure trust and fungibility	Doesn't has intrinsic value; pollution; Instability supported by technology platforms
7	Energy Money	Near future	Solarcoin	Has intrinsic value; convenient; environmental protection	Doesn't need to carry

Source: Personal elaboration.

From the process of currency development and its characteristics, as every currency has an important role in each period of economic development, it is important to remember that fiat money is only as good as the organization that issues it because of the inexistence of an intrinsic value. As a matter of fact, if the entity defaults, the currency will become worthless.

The depreciation of the inflationary currency has led many people to start not to believe in the traditional financial system.

As a matter of fact, we think there is a problem with the financial system, and this problem will cause the depreciation of the money in your hands.

Moreover, in international transactions, the high exchange fee makes transactions of the virtual currency, the faster. In the past, it was realized in order to avoid the depreciation of the banknotes in the hands.

Virtual currency, after all, it is still money. For this reason, there is the problem of depreciation when a country has too much debt; or because of the responsibilities of the central bank's monetary valuation; or because of the economic growth and central bank policies; or when speculators quickly lose confidence in a country's economic or monetary policy and generate a currency crisis; or the special case of the dollar as a reserve currency, etc.

Energy refers to various resources that can be directly obtained or obtained through processing and conversion. There are many categories including primary energy and electricity such as coal, crude oil, natural gas, coalbed methane, hydro, nuclear, wind, solar, geothermal, and biomass; secondary energy sources such as heat and refined oil, as well as other new and renewable energy sources. Bioenergy (also known as biomass) uses organic matter (such as plants) as a fuel to generate energy through technologies such as gas collection, gasification (solidification of gases), combustion and digestion (wet waste only). Biomass energy is also a valuable renewable energy source, as long as it is properly implemented, but it depends on how biomass fuel is produced.

Hydrogen, wind, solar, ocean energy, biomass energy and nuclear fusion energy, the way of new energy, are just a part of the multi-step advancement of energy utilization. Neglected, the engine with great potential or the principle of work and the innovation of ideas are the first direction of energy development in the future.

The conversion of energy includes kinetic energy, potential energy, thermal energy, and light energy, etc.

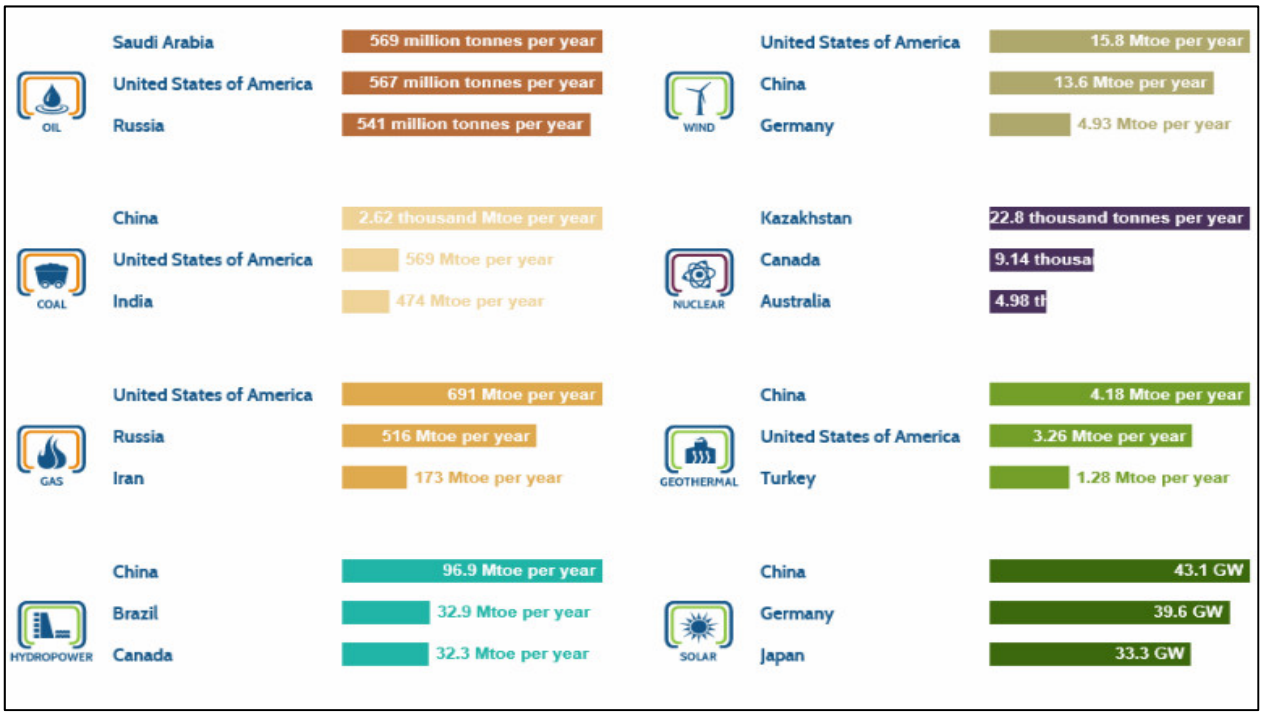

Figure 2. Top 3 producing countries by resource worldwide. Source: https://www.worldenergy.org/data/resources/.

Table 2

Some Forms of Energy (That an Object or System Can Have as a Measurable Property)

N.	Type of energy (from)	Transformation (to)	Description
1	Mechanical	14	The sum of macroscopic translational and rotational kinetic and potential energies
2	Electric	3	Potential energy due to or stored in electric fields
3	Magnetic	2	Potential energy due to or stored in magnetic fields
4	Gravitational	2, 14, 15	Potential energy due to or stored in gravitational fields
5	Chemical	2	Potential energy due to chemical bonds
6	Ionization	2	Potential energy that binds an electron to its atom or molecule
7	Nuclear	3, 15	Potential energy that binds nucleons to form the atomic nucleus (and nuclear reactions)
8	Chormodynamic	14	Potential energy that binds quarks to form hadrons
9	Elastic	14	Potential energy due to the deformation of a material (or its container) exhibiting a restorative force
10	Mechanical wave	14	Kinetic and potential energy in an elastic material due to a propagated deformational wave
11	Sound wave	14	Kinetic and potential energy in a fluid due to a sound propagated wave (a particular form of mechanical wave)
12	Radiant	2, 14	Potential energy stored in the fields of propagated by electromagnetic radiation, including light
13	Rest	15	Potential energy due to an object's rest mass
14	Kinetic	5	The energy that it possesses due to its motion
15	Thermal	2	Kinetic energy of the microscopic motion of particles, a form of disordered equivalent of mechanical energy

Source: Personal elaboration.

Why we say there is the possibility for the energy currency to become the development target of the future currency. It is not only because of its uniform measurement but also because of its good stability

characteristics.

As we all know the money is Bitcoin as one of the most important electronic currencies, it doesn't be issued by the central bank, but issued by the information service provider; the issuer exists outside the monetary system, which is not conducive to centralized management of the country, and there is a risk of losing control. Finance is not entirely a virtual economy.

This trend has also been asserted by one of relevant scholars, Brett Scott .

There are good reasons to consider energy as a potential currency, according to Brett Scott, who calls himself Alternate Finance Explorer and is the author of the book *The Heretic's Guide to Global Finance: Hacking the Future of Money*. Ideally a currency should be anchored to something people always need, so energy-based currencies are interesting because certificates are a necessary asset everywhere (Scott, 2013).

However this hypothesis may appear as a radical a hypothesis, but energy-based currencies are not completely new and unprecedented (Scott, 2013).

SolarCoin (SS), launched in 2014, is one of the first examples, and is now adopted in around 21 countries. It provides a social protocol that supports the exchange of value, where SS1 represents 1 MWh of solar energy production. SolarCoin currently claims to be the world's largest locally-based solar-based remuneration program, valued at over $12 billion.

As a matter of fact, we are entering an era in which energy is power, literally; a world in which energy is the new currency (Scott, 2013).

From the current stage, the energy industry is a capital-intensive industry, and financial support plays a vital role in its development. In the process of interactive development of energy finance, the development of the energy industry has promoted innovation and cooperation in the financial industry, as well as the demand for diversified financial services.

The special needs of energy development strategies for financial services have made energy finance face many issues such as support for energy industry development, financial service methods, financial products, and even the entire financial market for energy industry innovation.

Both the financial system and the energy industry need innovation, and the combination of the two achieves this goal. If the future integrates energy into the financial system and becomes a means of payment, it will not only eliminate the risk of currency depreciation via global unified measurement unit, unimpeded flow and easily exchange as a general equivalent, but also optimize energy saving and utilization to achieve environmental protection, ultimately to realize the original nature of human return to nature.

Literature Review

Before the introduction of the Bitcoin system (BTC), there had already been several attempts to create a secure digital currency and, at the same time, to allow the protection of anonymity of users and to be able to operate without a central authority.

Already in 1998, Wei Dai had conceived "b-money", a virtual currency that had already foreseen a payment system linked to a virtual ledger comparable to the blockchain of the BTC system, but less complex and, therefore, less secure in confirming the transactions.

In 2005, Nick Szabo presented "bit-gold", from a technical point of view very similar to Bitcoins, but with serious fundamental economic defects: There had not been a precise amount of virtual money to distribute and, above all, the speed at which to distribute it; anyone who had procured a powerful enough computer could have

produced an almost unlimited quantity, thus eliminating its value.

Undoubtedly, Bitcoin is partly based on the fundamental characteristics of these predecessors, but has been able to stand out for greater efficiency in combining the structural elements of the whole system through the link between blockchain and mining, as will be illustrated below.

Even the hundreds of cryptocurrencies born after the success of Bitcoin in recent years have never detached too much from the fundamental aspects of the BTC system.

As a matter of fact, although the concept of electronic currency dates back to the late 1980s, Bitcoin, launched in 2009 by pseudonymous (and still unidentified) developer Satoshi Nakamoto, is the first successful decentralized cryptocurrency.

To sum up, a cryptocurrency is a virtual coinage system that functions much like a standard currency, enabling users to provide virtual payment for goods and services without a central trusted authority.

In order for an asset to be used as a currency in commercial transactions, it must possess the following fundamental requirements attached to money:

(1) Be a valid unit of account;

(2) Guarantee a reserve of value;

(3) Be an efficient means of exchange.

Undoubtedly, Bitcoin represented a real revolution with respect to the forms of money adopted in the course of history.

As a unit of account, Bitcoins have characteristics superior to the money currently used. Generally, currencies having legal tender are divided into cents, according to a decimal system, while the cryptocurrency can be divided into Satoshi, each of which corresponds to 0.00000001 Bitcoins, ensuring unparalleled accuracy, regardless of the type of currency in which or from which it is converted: a considerable advantage offered by the dematerialization of money.

In this way, even if the value of Bitcoins were to increase enormously in the future, microtransactions and micropayments in any currency will still be technically possible in the coming years.

Cryptocurrencies are based on the transmission of digital information, using cryptographic methods to guarantee unique and legitimate transactions.

Bitcoin has taken the digital money market a step further by decentralizing the currency and freeing it from hierarchical structures of power. Instead, individuals and businesses electronically process coins on a peer-to-peer network.

It caught wide attention in early 2011 and several altcoins appeared—a generic name for all other post-Bitcoin cryptocurrencies.

Litecoin was released in the autumn of 2011, obtaining a modest success and enjoying the highest cryptocurrency market cap after Bitcoin until it was exceeded by Ripple on October 4, 2014. Litecoin changed the Bitcoin protocol, increasing the speed of transactions with the idea that it would be more suitable for daily transactions.

Ripple, launched in 2013, introduced a completely unique model compared to that used by Bitcoin and currently maintains the second highest market capitalization of about $255 million.

Another noteworthy coin in the evolutionary chain of cryptocurrency, Peercoin, employs revolutionary technological development to secure and sustain its currency.

Peercoin combines the PoW technology used by Bitcoin and Litecoin along with its proof-of-stake (PoS)

mechanism to use a hybrid network security mechanism.

More recently, NuShares/NuBits emerged, introduced in August 2014, which are based on a double currency model almost entirely separated from the single currency model used by previous crypto-currencies.

At the time this paper was written, the cryptocurrency industry consisted of over 2,080 coins with different user bases and trade volumes.

Due to the high volatility, the market capitalization of the cryptocurrency sector changes drastically, but at the time of writing this paper has just finished $181,142 billion, with Bitcoin accounting for about 53% of market capitalization.

The cryptocurrency market has evolved in an irregular way and at an unprecedented speed during its short duration. Since the release of the pioneering anarchist cryptocurrency, Bitcoin, to the public in January 2009, over 2,080 cryptocurrencies have been developed, most with only a minimum of success.

Research on industry is still scarce. Most of it is individually focused on Bitcoin rather than on a more diversified spread of cryptocurrencies and is constantly outperformed by developments in the fluid industry, including new currencies, technological progress, and increased government regulation of markets.

Although the fluidity of the industry, of course, is a challenge to research, a thorough evaluation of the cryptocurrency industry is required.

Following the success of Bitcoin, hundreds of alternative cryptocurrencies have been created, many of which have tried to solve the technical problems of Bitcoins (above all the very high generation costs) proposing structural changes, while many others are in fact simple copies of Bitcoin and the original blockchain system.

The proliferation of these new currencies is due in most cases to the hope of easy profits, if the price of the new currency should increase dramatically as it has occurred with the Bitcoins, especially considering that this kind of activity does not require nor relevant initial investments or even special protocols and regulations to follow.

Furthermore, the original Bitcoin system is completely open source. On 15 November 2018, according to the Coin-MarketCap, Bitcoin holds about 53% of the cryptocurrency market and is by far the most famous and important.

Among the cryptocurrencies that have spread the most in recent years, there are Litecoin, GeistGeld, SolidCoin, and BBQcoin; these currencies are also called altcoins, as we have already said before.

Going more in detail, Litecoin, created in 2011 by Charles Lee, was conceived as an updated and perfected version of the Bitcoin system: The new algorithm introduced allows any user to extract the currency, with far more efficient energy consumption. In this way, moreover, the whole system prevents that only users who have a very high computational power can profit from the Litecoin system; the algorithm also allows shortening the transactions. Furthermore, the final and total money supply will be equal to 84 million units (and therefore the quadruple with respect to the Bitcoins); however the offer, even if higher, is however limited and this will not allow Litecoin to avoid the deflationary problems linked also to the Bitcoin system. Also the Feathercoin, introduced in 2013 by Peter Bushnell, guarantees an offer of currency that, even if equal to four times that of Litecoin, is still limited.

Cryptocurrencies like Peercoin and Novacoin, on the other hand, propose a completely different approach with the proof-to-stake system as an alternative to proof-to-work: When a cryptocurrency unit is successfully created, those who have solved the cryptographic puzzle are not rewarded. But a sort of “dividend” is

distributed to all the units already in circulation, rewarding those who hold the most. In fact, even in the extraction of these cryptocurrencies 15 are the users with more powerful hardware to get the best results. An interesting case is that of Ethereum Project (founded in 2014), which proposes to use blockchain technology even in areas other than online payments and completely disconnected from the economic sphere, for example to ensure the security of votes made via internet. Such potential applications, although the entire project is not yet complete, have attracted the attention of IT giants such as Microsoft and Intel, but also of companies such as Airbus and Toyota. The price of Ethereum's currency, Ether, has grown by 2,700% from January to May 2017, even exceeding the very high Bitcoin growth rates in the same period (Kharpal, 2017).

These are added the so-called "digital currencies", including Liberty Reserve, WebMoney, Perfect Money, and CashU, but they are not based on cryptography and must be purchased using an intermediary (even if most of them try to guarantee to the user the complete anonymity), renouncing to the attractiveness of the principle of decentralization.

With the sole exception of Litecoin and Ethereum, however, all these currencies are still scarcely used in real transactions and the Bitcoins undoubtedly still enjoy the advantages of the first-mover, which in a context like this could prove more relevant than technological superiority. Certainly the vast majority of cryptocurrencies will not be used in the future and the growth of the last few years of the entire sector is mainly due to massive speculation.

Many users, in fact, buy dozens of different cryptocurrencies without any intention of using them as a medium of exchange, waiting to be able to resell them at higher prices in the future.

It is not for a very long time that money is the cash as we understand it today. In Japan, for example, rice was the unit of account of the great fiefs until the second half of the 19th century. In Iceland, at the end of the same century, the price of each commodity was established on the basis of the equivalent of dried fish. And going even further back in the centuries, the commodity currency was represented by cattle, shells, obsidian, salt, tea, and pieces of fabric.

Today, however, we have cash. But that of money is a world that is anything but static: The very popular checks are becoming an historical find, while electronic payments are now part of everyday life, through credit cards or even smartphones.

At the base of all these digital transactions, however, are always the national currencies: the euro, the dollar, the pound, the yen...And if instead we began to use energy as a global currency? This is the proposal/provocation by Brett Scott, author of *The Heretic's Guide to Global Finance: Hacking the Future of Money*.

There are good reasons to consider energy as a potential currency, explaining Brett Scott who calls himself an Alternative Finance Explorer.

Ideally, a currency should be anchored to something people always need, so currencies based on energy are interesting because the certificates represent a necessary good everywhere.

Alternatively we could think of these currencies as a financing instrument—the possibility of collecting funding for a renewable energy project through the issue of representative certificates of energy that will be produced in the future (in this sense, the currencies based on energy to a certain extent resemble equity certificates).

However radically a hypothesis may appear, energy-based currencies are not completely new and

unprecedented.

There are already embryonic examples of energy as a currency. There is, for example, the SolarCoin cryptocurrency (whose symbol is §), launched in 2014 to stimulate the production of solar electricity globally.

SolarCoin (§) is one of the first examples, and today it is adopted in around 21 countries.

It provides what is described as a social protocol that supports the exchange of value, where §1 represents 1 MWh of solar energy production. SolarCoin currently claims to be the world's largest locally-based solar-based remuneration program, valued at over $12 billion.

SolarCoin, a project supported by an open community, was created in 2014 by its own founders and some volunteers who set up the SolarCoin Foundation. SolarCoin Foundation rewards solar energy producers with blockchain-based digital tokens at a rate of 1 SolarCoin (SLR) for 1 MWh of solar energy produced.

Based on blockchain technology—the same as Bitcoin—it provides a social protocol that supports a value exchange, in which 1 § is equivalent to 1 MWh of solar energy produced.

The SolarCoin project uses the advantages of the blockchain to support the development of solar energy on the planet. SolarCoin is a digital asset and a currency intended to support the transition from an economy focused on fossil fuels to an economy supported by solar energy.

The Solarcoin Foundation rewards solar energy producers through digital tokens based on blockchain technology at the price of 1 SolarCoin (SLR) per MWh of solar energy produced. SolarCoin is an additional premium recognized free of charge and independent of any other incentives that solar plant owners might be entitled to receive (such as government incentives, incentive tariffs, green certificates, tax credits, CO_2 reduction credits, etc.). Anyone producing solar energy, helping to avoid CO_2 emissions, can receive a reward in SolarCoin.

The SolarCoin project is global, decentralized, and independent of any government. SolarCoin is similar to other cryptomete like Bitcoin, but unlike these, SolarCoin "binds"the distribution of money to a real economic activity of public utility: the production of verifiable solar energy.

Different but with a very similar objective is the initiative of the British start-up ZAPP, which aims to create and place on the world market an app that renumber consumers for the storage and use of renewable energy. Its operation is based on the Zapp Points, or points that customers can earn by charging their electrical appliances synchronizing to the production of renewable energy. The Zapp Points earned by the customer can then be exchanged for goods and services or converted into cash.

There is then another initiative that brings the concept of energy closer to that of currency to be used concretely for the physical development of the real world. It has its base of operations in New York, more precisely in Brooklyn, on President Street: here the startup Transactive Grid has launched a pioneering project that uses a microrete powered by solar energy, boasting a technology based on the cloud and the Internet of Things. The New York experiment aims to allow peer-to-peer energy exchanges: If a President Street building generates excess solar energy, it is automatically made available to other houses. And all this happens without the use of cash, through the secure platform for Ethereum transactions, also based on blockchain.

As you can understand from these initiatives, in short, the hypothesis of the energy used as a currency is not so radical: Something is already moving, in a global perspective for which energy is increasingly synonymous with power (and then, in some ways, even cash).

Another type of cryptocurrency based on energy is represented by Energy Efficiency Coin (EECoin).

Energy Efficiency Coin is a blockchain asset class designed to have a positive ecological impact and to track

a weighted aggregate of real world renewable energy markets, giving token holders the opportunity to vote on which renewable resource markets will be included in the weighted average price. Energy Efficiency Coin is a pegged asset in which the price is linked to a weighted super index of the constituent green equity and bond indices, where keeping the price index peg becomes the incentive trading strategy and the revenue stream for the company of token shareholding, ensuring future financing for capital management and the development of technical platforms.

Additional type of coin based on renewable energy is represented by Electronic Energy Coin (E2C) that is a trading block platform for green technology.

E2C is built according to the ERC-20 token standard, which is used by the famous Ethereum system. This makes E2C compatible with most of the cryptocurrency standards and protocols on the market.

In E2C, we look at an ecological and sustainable future. Our project will be based on an energy revolution, a fairer distribution, and better control over the use of energy.

Conventionally, the energy market is dominated by a few people. This entails high costs for ordinary people, such as owners of private companies.

All these types of crypto currencies are a testimony to how there is a link between the world of crypto currencies with the energy sector and therefore with the financial world.

However, it should be noted that most of the cryptocurrencies based on energy sector assets are limited only to certain energy sources, such as, in particular, renewable energy sources.

Our intention is to present a new interpretation for this topic, giving the possibility to identify a standard method that can be used for the whole energy sector.

Method

The Kinetic energy is the energy that an object has due to its motion and its expression is as follows, with the meaning of half mass times velocity squared:

$$E_k = \frac{1}{2}mv^2 \tag{1}$$

Where, if direction and speed direction are the same:

E_k, is the energy of a mass, m, in motion, v^2

E_k = Kinetic energy

m = mass (kg)

v = velocity (m/sec)

Kinetic energy is a scalar, also a state quantity. The expression is as follows:

$$\text{Unit: Joule (J) } 1\text{kg}\cdot\text{m}^2/\text{s}^2 = 1\text{J} \tag{2}$$

After combined the above two formulas, we have:

$$E_k = 1 \text{ kg m}^2/\text{sec}^2 = 1 \text{ Joules} \tag{3}$$

Discussion and Conclusion

The international unit of energy is joule (or abbreviated as J). We can consider it as the unit of energy money which is the energy that has intrinsic value. This new kind of energy cryptocurrency differs from existing solutions as it is based globally on the energy macro-category and not on a sub-sector. This element is

what makes this solution new and represents a strong point compared to existing solutions.

While intrinsic value means that the commodity has value even if it is not used as money, as energy there are production, exchange, reserves, distribution, and consumption.

As there is neither energy nor mass can be destroyed; rather, both remain constant during any process, there is no energy depreciation, on the contrary only energy appreciation. And using energy as a currency, there is no need for printing or casting and applying the exchange rate, so there is no corresponding pollution,

Even better it'll contribute to relieve the environmental problem in the current stage and in a practical and effective way to meet the challenges of global environmental degradation.

Energy issuer and reserve agency such as International Energy Bank (IEB) will be given support and capacity for combination in order to achieve the desired results through IMF (International Monetary Fund) and IEA (International Energy Agency) to realize the unique currency form—Energy and its unified currency symbol "Joule (J)".

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