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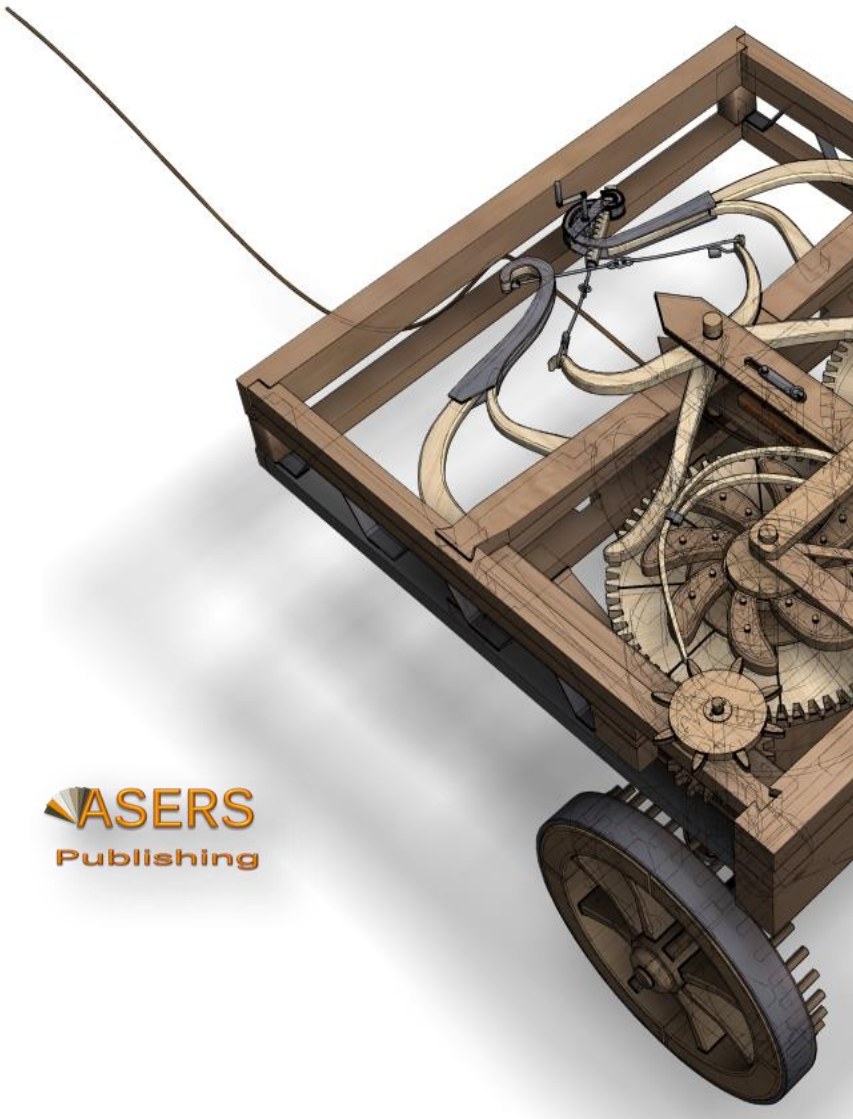

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CAPITAL FLOWS, MONEY SUPPLY AND PROPERTY PRICES IN CHINA

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Abstract:

This article examines the interaction among capital flows, money supply and property prices with a focus of Chinese economy by using a vector auto-regression (VAR) estimation as an analytical framework. The key research questions were, first, whether money supply has been determined independently from capital flows, and then which factor, capital flows or money supply, has given a dominant effect on property prices. The contributions of this study are to investigate the impacts on property prices jointly from capital flows as an external factor and from money supply as a domestic factor, and to count on the differences in the trends in property prices of seventy regional cities in China. The main findings through the VAR estimations were as follows. First, domestic money supply has been determined exclusively from external capital flows through the authority's perfect sterilization of foreign-exchange-market intervention. Second, the main contributor to property prices' movement has been domestic money supply rather than external capital flows. Third, some deviations of property prices from the trend in money supply were found in big cities and/or coastal advanced cities.

Keywords: Capital flows; Money supply; Property prices; China; Seventy regional cities; Vector auto-regression estimation

JEL Classification: E51; F32; O53

1. Introduction

Asset prices have become a serious target of macroeconomic policies in emerging market economies as well as advanced economies.[1] In particular, it has been a critical concern for policy makers and academic circles to prevent and address the boom-bust cycle of asset bubbles. The 2008 global financial crisis was a typical example of the product of asset bubbles in the United States. China is not an exception to care about asset prices since Chinese economy has also experienced some large fluctuations in its property prices and stock prices since the 2000s.

[1] For instance, Blanchard *et al.* (2010) argued in their conclusion that policymakers have to watch many targets, including the composition of output, the behaviour of asset prices, and the leverage of different agents.

When it comes to the issue on the determinants of asset prices, it is often pointed out that massive capital flows in the global financial markets have accelerated the fluctuation of asset prices, particularly, in emerging market economies. Large capital inflows, for instance, may lead to excessive foreign borrowing, possibly fueling domestic credit booms and asset bubbles. Once capital flows reverse suddenly, however, a boom stage of credit expansion and asset price hikes may be turned into a bust stage, and the economies may finally suffer from serious financial and economic crisis.

The monetary authorities in emerging market economies, facing capital flows, usually intervenes in the foreign exchange market regardless of their currency regimes to avoid their currency fluctuations. Whether the authority sterilizes the intervention for shutting off the impacts of capital flows on domestic monetary market leads to different stories on the influenced asset prices. In case that the intervention is not fully sterilized, it accommodates an increase in money supply, which affects asset prices as an indirect impact of capital flows. When the authority sterilizes the intervention perfectly, the money supply managed by the authority could be a factor independent from capital flows to influence asset prices.

It would be significant, therefore, to investigate the channel in which asset prices are affected by capital flows and/or money supply. In this context, China could be a good analytical example, since her economy has experienced the fluctuations of asset prices and capital flows, which have required sophisticated management of money supply by the authority.

This article examines the interaction among capital flows, money supply and property prices with a focus of Chinese economy by using a vector auto-regression (VAR) estimation as an analytical framework. Our research questions are: whether the sterilization of the intervention has been conducted for shutting off the impacts of capital flows on domestic money supply, and which factor, capital flows or money supply, has given a dominant effect on property prices. The contributions of this study are that the determinants of asset prices are investigated jointly from capital flows as an external factor and from money supply as a domestic factor, whereas the determinant was usually examined separately in most of the literature. Another contribution is that the study focuses on property prices as a representative of asset prices and takes into account the differences in the trends in property prices of seventy regional cities in China.

The rest of the paper is structured as follows. Section 2 clarifies a theoretical framework on the interaction among capital flows, money supply and asset prices. Section 3 describes the literature review focusing mainly on the determinants of asset prices in the case of Chinese economy. Section 4 conducts a VAR estimation on the interaction among capital flows, money supply and property prices targeting seventy regional cities in China. The section proceeds with the descriptions of data, methodologies and estimation outcomes with its interpretation. The last section summarizes and concludes.

2. Theoretical Framework

This section clarifies a theoretical framework on the interaction among capital flows, money supply and asset prices. We suppose that asset prices are affected by capital flows as an external factor and by money supply as a domestic factor.

Regarding the impacts of capital flows on asset prices, Caballero and Krishnamurthy (2006) provided theoretical insights on the nexus between capital inflows and asset bubbles in emerging market economies. They argued that emerging market economies present a fertile macroeconomic environment for the emergence of asset bubbles dynamics, since a shortage of stores of value, *i.e.* dynamic inefficiency, caused by the "financial repression" in their financial systems tends to create a space for bubbles on unproductive assets to arise.

As Kim and Yang (2009) and Taguchi *et al*. (2005) described, there are two kinds of channels in which asset prices are affected by capital flows. One channel is that capital flows can directly affect the demand for assets, which can thus influence asset prices. For example, capital inflows to the stock market increase the demand for stocks, thereby causing the stock price hike. Another channel is an indirect one through a change in money supply. Whether this channel works or not, however, depends on the degree of monetary autonomy of the authority facing capital flows. The authority with full autonomy can manage money supply independently from any capital flows.

In general, an economy cannot avoid the constraint of "impossible trinity": an economy should pursue two of three options – fixed exchange rates, independent monetary policy and free capital flows (see Diagram 1). Thus, an economy has to give up fixed exchange rate or capital mobility to secure monetary autonomy. When we focus on currency regime, an economy with perfect "floating" regime does not intervene in its foreign exchange market. Even if the economy faces capital flows, therefore, nothing happens in its domestic money supply. On the contrary, a monetary authority with "pegged" regime under free capital flows cannot help intervening in its

foreign exchange market, resulting in a change in foreign reserves and money supply. Thus, capital flows would affect asset prices through a change in money supply as an indirect channel.

The monetary authority in emerging market and developing economies usually intervenes in their foreign exchange market to a greater or less extent to avoid their currency-value fluctuations, since they are basically facing the problem of "fear of floating" suggested by Calvo and Reinhart (2002). Then the key question in their economies is whether the authority "sterilizes" the intervention in foreign exchange market to regain its monetary autonomy. If the economies allow some changes in their currency value (*e.g.* under "managed floating" regime) and/or adopt "capital control", monetary autonomy would be guaranteed by the sterilization in a greater or less degree. In this case, capital flows do not always affect money supply, and an indirect channel from capital flows to asset prices does not necessarily work.

Source: Author's description based on Mankiw (2007)

Diagram 1. Impossible Trinity

When we focus on the case of China, its economy may have some monetary autonomy for the following reasons. First, foreign capital flows have been still regulated to a greater extent in China. According to the Chinn-Ito index (KAOPEN) [2], an index measuring a country's degree of capital account openness, China ranked 158th out of 174 countries in 2014. Thus, the strict capital control might have guaranteed independent monetary policy in China. Second, China has reformed its currency regime into a managed floating one since July in 2005, and under this regime, the value of renminbi has appreciated by around thirty percent from 2005 to 2015. This increasing flexibility of exchange rate might also have allowed monetary autonomy in China.

In this context, the research questions on the interaction among capital flows, money supply and asset (property) prices in China are, first, whether the money supply has been determined independently from capital flows, in other words, whether the sterilization of foreign-exchange-market intervention has worked fully enough to cut off the impacts of capital flows on money supply. In case that money supply and capital flows have an exclusive relationship, there comes the second question: which factor, capital flows through a direct channel or money supply that is domestically determined, has had a major impact on asset (property) prices.

3. Literature Review and Contribution

This section reviews the literature focusing mainly on the determinants of asset prices in the case of Asian emerging market and Chinese economy.

Regarding the studies targeting Asian emerging market economies, Kim and Yang (2011) investigated the effects of capital inflows on stock and land prices by employing a panel VAR model with the samples of South Korea, Malaysia, Indonesia, the Philippines, and Thailand. Their empirical results suggested that capital inflows indeed contributed to the asset price appreciation in this region, although capital inflow shocks explained a relatively small part of asset price fluctuations. Tillmann (2012) also estimated the impacts of capital inflows on house prices and equity prices by a panel VAR model with the samples of Korea, Hong Kong, Malaysia, Thailand and Taiwan. The study found that capital inflow shocks pushed up house and stock prices in general, and at the same time identified cross-country differences in asset price responses to capital flow shocks. The key finding in this study was that the differences in the asset price responses were mainly due to the differences in the monetary policy responses to the capital flow shocks.

There have also been limited but several studies on the interaction among capital flows, money supply and asset prices in the case of Chinese economy. In the combination between capital flows and asset prices, Deng (2010) verified that the "hot money" flowed into real estate rather than equity market and thus had an effect to push up housing prices. Wang *et al.* (2007) argued, on the contrary, that foreign money inflow was not the

[2] See the website: http://web.pdx.edu/~ito/Chinn-Ito_website.htm. As for the data source, refer to Chinn and Ito (2006).

cause of real estate price rising and its price rising caused capital inflows on the contrary based on Granger causality tests, although they identified a long-term equilibrium between both variables through co-integration tests. As for the relationship between monetary policy and asset prices, Koivu (2012) found that a loosening of China's monetary policy led to higher asset prices through structural vector autoregressive estimation. On the other hand, Yao *et al.* (2013) pointed out that monetary policies had little immediate effect based on vector autoregressive estimation and attributed the outcome to irrational and speculative behaviors of Chinese investors. In this way, the empirical evidence has been inconclusive in each of bilateral combination analysis. Xu and Chen (2012) examined jointly the impacts of capital flows and monetary policies on asset prices. They demonstrated that Chinese monetary policy actions were the key driving forces behind the change in real estate price growth in China. They also showed that hot money flow did not have a significant impact on the change in home price growth after controlling for the money supply growth.

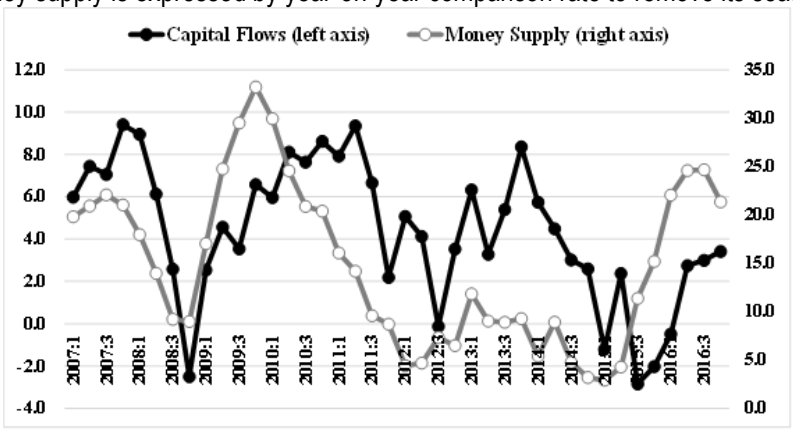
This study contributes to enriching empirical evidence on the determinants of asset prices by examining them jointly from capital flows as an external factor and from money supply as a domestic factor, whereas the determinant was usually investigated separately in most of the literature. Another contribution is that the study focuses on property prices as a representative of asset prices and takes into account the heterogeneity in the trends in property prices of seventy regional cities in China, while most of the literature cared only about the nationwide trend in property prices.

4. Empirics

This section conducts the empirics on the interaction among capital flows, money supply and property prices in China through Granger causality test under VAR estimation. We first examine the combination between capital flows and money supply in Subsection 4.1, *i.e.*, whether the money supply has been determined independently from capital flows. Then we next investigate which factor, capital flows or money supply, has had a major impact on property prices in Subsection 4.2. The causalities are examined on property prices for each of individual regional cities and for total panel of all cities. Through the subsections, the study samples the period from the first quarter of 2007 to the fourth quarter of 2016 due to the data availability of property prices. All the data are retrieved from National Bureau of Statistics of China (NBSC) and the People's Bank of China (PBC).[3]

4.1 Relationship between Capital Flows and Money Supply

This subsection focuses the relationship between capital flows and money supply in China. We first specify each variable as follows. The capital flows (*cif*) are shown by "Liabilities" of "Financial account" in China's balance of payments. This item contains all the liabilities in terms of direct investment, portfolio investment, financial derivatives and other investment (*e.g.* bank loans). For the estimation, the capital flows are expressed by a percentage of GDP. Money supply (*mon*) is represented by M1, which reflects monetary policy stances of the authority. The money supply is expressed by year-on-year comparison rate to remove its seasonable variation.



Source: NBSC and PBC

Figure 1. Capital Flows and Money Supply

[3] The data of money supply are taken from PBC, and the other data are from NBSC. The websites are as follows.
PBC: http://www.pbc.gov.cn/diaochatongjisi/116219/index.html
NBSC: http://data.stats.gov.cn/english

We add the variable of GDP (*gdp*) as a control variable to extract purely bilateral effects between capital flows and money supply. The GDP is also expressed by year-on-year rate to remove its seasonable variation.

Figure 1 displays the overviews of the relationship between capital flows and money supply. It appears by rough observation that there is no clear correlation between both variables. Since both variables might also be affected by the trend in GDP, the relationship should be statistically tested by a more sophisticated manner, *i.e.*, a VAR estimation, by controlling the third variable of GDP.

Before specifying a VAR estimation, we investigate the stationary property of the data for each variable, by employing the Ng-Perron unit root test on the null hypothesis that each variable has a unit root in the test equation including "intercept" and one quarter lag.[4] This test constructs four test statistics: modified forms of Phillips and Perron (1988) statistics (MZa, MZt), the Bhargava (1986) statistic (MSB), and the Point Optimal statistic (MPT). Table 1.1 reports the test results for the data for all three variables, *i.e.*, capital flows (*cif*), money supply (*mon*) and GDP (*gdp*). The test rejected a unit root in all the data at the conventional level of significance by more than 90 percent, thereby their data showing stationary property. Thus, their data were justified to be used for a VAR estimation.

We now specify an equation for VAR estimation in the following way.

$$y_t = \mu + V y_{t-1} + \varepsilon_t \quad (1)$$

where y_t is a column vector of the endogenous variables with year *t*, *i.e.*, $y_t = (cif_t\ mon_t)'$; μ is a constant vector; V is a coefficient matrix; y_{t-1} is a vector of the lagged endogenous variables; and ε_t is a vector of the random error terms in the system. The lag length (-1) is selected by the Schwarz information criterion with maximum lag being equal to (-2) under the limited number of observations. We also insert GDP (*gdp*) in the equation to control the bilateral correlation between *cif* and *mon*.

Based on the specification above, we conduct the VAR estimation (see Table 1.2) and then examine the Granger causality between capital flows (*cif*) and money supply (*mon*) (see Table 1.3). When we focus on the causality from capital flows to money supply, the causality was identified at the 99-percent significant level, but its sign was negative in the VAR estimation as shown in Table 1.2. This implied that when China has faced capital inflows, the authority has not allowed any monetary expansion, but even reduced money supply. In other words, the impacts of capital flows have been shut off from domestic money supply by more than 100 percent through the authority's sterilization of foreign-exchange-market intervention.

Table 1. Analysis of Correlation between Capital Flows and Money Supply

Table 1.1. Unit Root Test

		MZa	MZt	MSB	MPT
Capital Inflows	*cif*	-10.37 **	-2.26 **	0.21 **	2.40 **
Money Supply	*mon*	-11.60 **	-2.39 **	0.20 **	2.15 **
GDP	*gdp*	-10.32 *	-2.21 **	0.21 **	2.57 **

*Note: **, * denote the rejection of null hypothesis at the 95% and 90% level of significance.*
Source: NBSC and PBC

[4] Ng and Perron (2001) introduced a new unit root test, which used detrended data and a lag selection procedure that improved on previous methods.

Table 1.2. VAR Estimation

	cif	*mon*
cif$_{-1}$	0.392 **	-0.577 **
	[2.382]	[-2.581]
mon$_{-1}$	0.091 *	1.011 ***
	[1.761]	[14.312]
C	-0.798	3.737 ***
	[-0.832]	[2.869]
gdp	0.159	-0.102
	[1.512]	[-0.714]
adj. R^2	0.530	0.862

*Note: ***, **, * denote the rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively. The figure in parenthesis [ ] indicates t value.*

Source: NBSC and PBC

Table 1.3. Granger Causality Test

Null Hypothesis	Lags	Chi-sq
cif does not Granger Cause *mon*	1	6.66 *** (negative)
mon does not Granger Cause *cif*	1	3.10 * (positive)

*Note: **, * denote the rejection of null hypothesis at the 95% and 90% level of significance.*

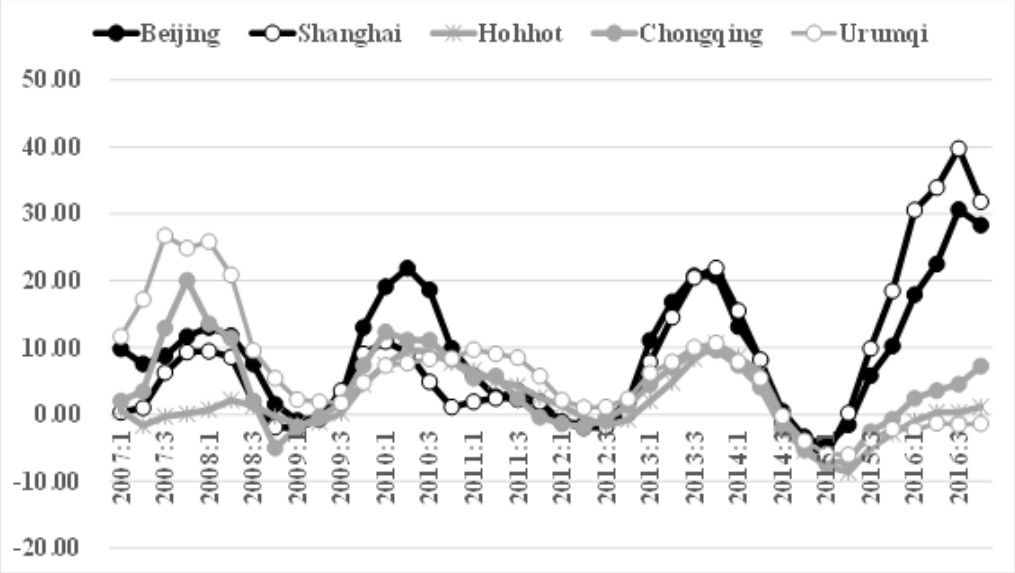
Source: NBSC and PBC

4.2 Impacts of Capital Flows and/or Money Supply on Property Prices

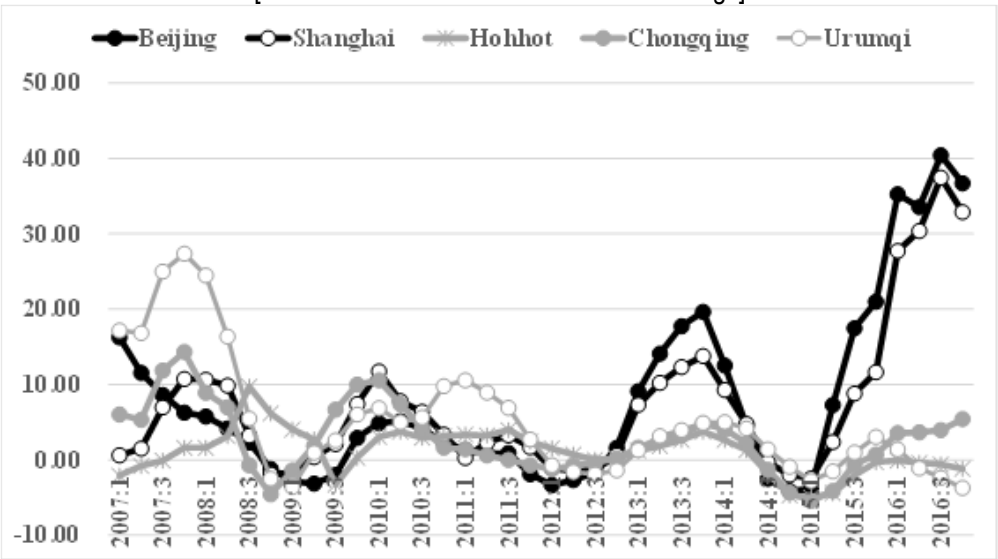
The previous section suggested that domestic money supply has been determined exclusively from external capital flows in China. However, capital flows may still have an effect on property prices through a direct channel as the theoretical framework in Section 2 presented. Then, which factor, capital flows or money supply, has had a dominant impact on property prices is the next question.

We add a variable of property prices retrieved from NBSC. The property prices sample the data of two kinds: prices of newly constructed commercialized buildings (*nccp*) and prices of second-hand residential buildings (*shrp*); and the data of seventy selected cities in thirty provinces, in terms of year-on-year change rate. It is because the prices of two kinds in seventy cities show highly different movements during sample period form the first quarter of 2007 to the fourth quarter of 2016 in Figure 2. We also replace GDP (*gdp*) with gross regional products, GRP(*grp*), which seventy cities belong to, as a control variable.

[Prices of Newly Constructed Commercialized Buildings]



[Prices of Second-Hand Residential Buildings]



Source: NBSC

Figure 2. Trends in Property Prices in Selected 5 Cities

We investigate the data property for property prices and GRP by the same methodology as the previous section's one. The test results in Table 2 showed that the data were not stationary for some cities' property prices and some provinces' GRP: the prices of newly constructed commercialized buildings in *Juning*, the prices of second-hand residential buildings in *Bengbu*, *Nanchang*, *Jiujiang*, *Zhanjiang*, *Zunyi* and *Xining*, and the GRP in *Anhui*, *Shandong* and *Guangxi*. Thus, we exclude these data from the following VAR estimation.

We again specify an equation for VAR estimation in the same way as before.

$$y'_t = \mu' + V' y'_{t-1} + \varepsilon'_t \quad (2)$$

where y'_t is a column vector of the endogenous variables with year *t*, *i.e.*, $y_t = (cif_t\ mon_t\ nccp_t)'$ and $(cif_t\ mon_t\ shrp_t)'$; μ' is a constant vector; V' is a coefficient matrix; y'_{t-1} is a vector of the lagged endogenous variables; and ε'_t is a vector of the random error terms in the system. The lag length (-1) is selected by the same methodology as in previous section. We also insert GRP (*grp*) in the equation to control the correlations among capital flows, money supply and property prices.

Table 2. Unit Root Test of Property Prices and GRP

[Prices of Newly Constructed Commercialized Buildings]

nccp		MZa	MZt	MSB	MPT
Beijing	*pbei*	-108.78 ***	-7.30 ***	0.06 ***	0.34 ***
Tianjin	*ptia*	-48.53 ***	-4.76 ***	0.09 ***	0.91 ***
Shijiazhuang	*pshi*	-23.34 ***	-3.34 ***	0.14 ***	1.29 ***
Tangshan	*ptan*	-9.02 **	-2.12 **	0.23 *	2.72 **
Qinhuangdao	*pqin*	-48.46 ***	-4.92 ***	0.10 ***	0.51 ***
Taiyuan	*ptai*	-56.36 ***	-5.30 ***	0.09 ***	0.43 ***
Hohhot	*phoh*	-35.56 ***	-4.21 ***	0.11 ***	0.68 ***
Baotou	*pbao*	-14.94 ***	-2.70 ***	0.18 **	1.74 ***
Shenyang	*pshe*	-45.51 ***	-4.76 ***	0.10 ***	0.54 ***
Dalian	*pdal*	-11.35 **	-2.35 **	0.20 **	2.26 **
Dandong	*pdan*	-20.88 ***	-3.22 ***	0.15 ***	1.19 ***
Jinzhou	*pjin*	-15.42 ***	-2.72 ***	0.17 **	1.79 **
Changchun	*pcha*	-11.24 **	-2.37 **	0.21 **	2.18 **
Jilin	*pjil*	-20.43 ***	-3.19 ***	0.15 ***	1.19 ***
Harbin	*phar*	-28.43 ***	-3.76 ***	0.13 ***	0.88 ***
Mudanjiang	*pmud*	-8.78 **	-2.00 **	0.22 **	3.12 **
Shanghai	*psha*	-1,007.55 ***	-22.41 ***	0.02 ***	0.04 ***
Nanjing	*pnan*	-858.13 ***	-20.65 ***	0.02 ***	0.06 ***
Wuxi	*pwux*	-240.84 ***	-10 75 ***	0.04 ***	0.36 ***
Xuzhou	*pxuz*	-35.26 ***	-4.18 ***	0.11 ***	0.74 ***
Yangzhou	*pyan*	-66.64 ***	-5.72 ***	0.08 ***	0.46 ***
Hangzhou	*phan*	-42.80 ***	-4.49 ***	0.10 ***	0.93 ***
Ningbo	*pnin*	-22.87 ***	-3.36 ***	0.14 ***	1.14 ***
Wenzhou	*pwen*	-10.34 **	-2.27 **	0.21 **	2.37 **
Jinhua	*pjih*	-25.50 ***	-3.55 ***	0.13 ***	1.00 ***
Hefei	*phef*	-305.29 ***	-12.17 ***	0.03 ***	0.27 ***
Bengbu	*pben*	-45.18 ***	-4.74 ***	0.10 ***	0.57 ***
Anqing	*pang*	-17.15 ***	-2.92 ***	0.17 ***	1.44 ***
Fuzhou	*pfuz*	-16.12 ***	-2.73 ***	0.16 ***	1.90 **
Xiamen	*pxia*	-55.95 ***	-5.14 ***	0.09 ***	0.79 ***
Quanzhou	*pqua*	-24.40 ***	-3.48 ***	0.14 ***	1.02 ***
Nanchang	*pnac*	-19.63 ***	-3.10 ***	0.15 ***	1.34 ***
Jiujiang	*pjiu*	-19.32 ***	-3.04 ***	0.15 ***	1.49 ***
Ganzhou	*pgan*	-8.65 **	-2.06 **	0.23 *	2.87 **
Ji'Nan	*pjia*	-168.14 ***	-9.02 ***	0.05 ***	0.35 ***

nccp		MZa	MZt	MSB	MPT
Qingdao	*pqig*	-50.23 ***	-4.93 ***	0.09 ***	0.67 ***
Yantai	*pyat*	-8.55 **	-2.05 **	0.23 *	2.92 **
Jining	*pjii*	-4.43	-1.41	0.31	5.64
Zhengzhou	*pzhe*	-57.94 ***	-5.08 ***	0.08 ***	1.10 ***
Luoyang	*pluo*	-29.65 ***	-3.84 ***	0.12 ***	0.83 ***
Pingdingshan	*ppin*	-37.76 ***	-4.34 ***	0.11 ***	0.65 ***
Wuhan	*pwuh*	-142.68 ***	-8.32 ***	0.05 ***	0.36 ***
Yichang	*pyic*	-25.78 ***	-3.59 ***	0.13 ***	0.95 ***
Xiangfan	*pxig*	-10.32 **	-2.26 **	0.21 **	2.39 **
Changsha	*pchn*	-58.92 ***	-5.37 ***	0.09 ***	0.53 ***
Yueyang	*pyue*	-8.74 **	-2.07 **	0.23 *	2.85 **
Changde	*pchg*	-25.02 ***	-3.53 ***	0.14 ***	0.98 ***
Guangzhou	*pgua*	-55.51 ***	-5.21 ***	0.09 ***	0.56 ***
Shaoguan	*psho*	-20.80 ***	-3.20 ***	0.15 ***	1.26 ***
Shenzhen	*pshn*	-30.20 ***	-3.86 ***	0.12 ***	0.87 ***
Zhanjiang	*pzha*	-20.26 ***	-3.18 ***	0.15 ***	1.21 ***
Huizhou	*phui*	-12.37 **	-2.45 **	0.19 **	2.10 **
Nanning	*pnai*	-21.14 ***	-3.24 ***	0.15 ***	1.17 ***
Guilin	*pgui*	-44.27 ***	-4.70 **	0.10 ***	0.55 ***
Beihai	*pbeh*	-7.90 *	-1.95 *	0.24 *	3.22 *
Haikou	*phai*	-17.82 ***	-2.98 ***	0.16 ***	1.37 ***
Sanya	*psan*	-17.63 ***	-2.96 ***	0.16 ***	1.39 ***
Chongqing	*pcho*	-31.34 ***	-3.94 ***	0.12 ***	0.81 ***
Chengdu	*pche*	-32.19 ***	-4.01 ***	0.12 ***	0.76 ***
Luzhou	*pluz*	-10.35 **	-2.27 **	0.21 **	2.38 **
Nanchong	*pnah*	-11.23 **	-2.34 **	0.20 **	2.27 **
Guiyang	*pguy*	-12.19 **	-2.46 **	0.20 **	2.01 **
Zunyi	*pzun*	-22.37 ***	-3.34 ***	0.14 ***	1.09 ***
Kunming	*pkun*	-15.22 ***	-2.75 ***	0.18 **	1.60 **
Dali	*pdai*	-13.72 **	-2.61 ***	0.19 **	1.78 **
Xi"An	*pxin*	-50.99 ***	-5.04 ***	0.09 ***	0.48 ***
Lanzhou	*plan*	-8.67 **	-2.06 **	0.23 *	2.89 **
Xining	*pxii*	-12.63 **	-2.48 **	0.19 **	2.04 **
Yinchuan	*pyin*	-21.90 ***	-3.30 ***	0.15 ***	1.12 ***
Urumqi	*puru*	-11.51 **	-2.33 **	0.20 **	2.36 **

*Note: **, * denote the rejection of null hypothesis at the 95% and 90% level of significance.*
Source: NBSC

[Prices of Second-Hand Residential Buildings]

shrp		MZa	MZt	MSB	MPT
Beijing	*pbei*	-8.85 **	-1.91 *	0.21 **	3.46 *
Tianjin	*ptia*	-23.20 ***	-3.08 ***	0.13 ***	2.09 **
Shijiazhuang	*pshi*	-14.11 ***	-2.50 **	0.17 **	2.31 **
Tangshan	*ptan*	-9.82 **	-2.18 **	0.22 **	2.60 **
Qinhuangdao	*pqin*	-12.84 **	-2.53 **	0.19 **	1.90 **
Taiyuan	*ptai*	-65.49 ***	-5.72 ***	0.08 ***	0.37 ***
Hohhot	*phoh*	-11.91 **	-2.43 **	0.20 **	2.07 **
Baotou	*pbao*	-20.87 ***	-3.22 ***	0.15 ***	1.17 ***
Shenyang	*pshe*	-17.95 ***	-2.97 ***	0.16 ***	1.44 ***
Dalian	*pdal*	-13.27 **	-2.57 **	0.19 **	1.85 **
Dandong	*pdan*	-13.52 **	-2.56 **	0.18 **	1.94 **
Jinzhou	*pjin*	-7.60 *	-1.88 *	0.24 *	3.44 *
Changchun	*pcha*	-15.48 ***	-2.77 ***	0.17 **	1.60 ***
Jilin	*pjil*	-53.53 ***	-5.17 ***	0.09 ***	0.46 ***
Harbin	*phar*	-5.92 *	-1.65 *	0.27	4.33 *
Mudanjiang	*pmud*	-8.64 **	-2.05 **	0.23 *	2.91 **
Shanghai	*psha*	-23.68 ***	-3.15 ***	0.13 ***	1.96 **
Nanjing	*pnan*	-750.59 ***	-19.26 ***	0.02 ***	0.11 ***
Wuxi	*pwux*	-10.67 **	-2.16 **	0.20 **	2.84 **
Xuzhou	*pxuz*	-11.25 **	-2.34 **	0.20 **	2.28 **
Yangzhou	*pyan*	-71.13 ***	-5.94 ***	0.08 ***	0.39 ***
Hangzhou	*phan*	-24.49 ***	-3.33 ***	0.13 ***	1.52 ***
Ningbo	*pnin*	-17.24 ***	-2.90 ***	0.16 ***	1.53 ***
Wenzhou	*pwen*	-11.35 **	-2.38 **	0.20 **	2.15 **
Jinhua	*pjih*	-22.24 ***	-3.32 ***	0.14 ***	1.13 ***
Hefei	*phef*	-170.10 ***	-9.04 ***	0.05 ***	0.39 ***
Bengbu	*pben*	-3.21	-1.24	0.38	7.58
Anqing	*panq*	-16.47 ***	-2.85 ***	0.17 ***	1.52 ***
Fuzhou	*pfuz*	-9.48 **	-2.13 **	0.22 **	2.75 **
Xiamen	*pxia*	-28.24 ***	-3.64 ***	0.12 ***	1.22 ***
Quanzhou	*pqua*	-11.47 **	-2.39 **	0.20 **	2.13 **
Nanchang	*pnac*	-4.91	-1.56	0.31	4.98
Jiujiang	*pjiu*	-3.40	-1.29	0.37	7.18
Ganzhou	*pgan*	-22.91 ***	-3.28 ***	0.14 ***	1.41 ***
Ji'Nan	*pjia*	-63.18 ***	-5.44 ***	0.08 ***	0.79 ***
Qingdao	*pqig*	-24.50 ***	-3.44 ***	0.14 ***	1.16 ***
Yantai	*pyat*	-13.19 **	-2.55 **	0.19 **	1.89 **
Jining	*pjii*	-6.59 *	-1.75 *	0.26 *	3.91 *
Zhengzhou	*pzhe*	-10.89 **	-1.92 *	0.17 **	3.72 *
Luoyang	*pluo*	-10.03 **	-2.21 **	0.22 **	2.52 **
Pingdingshan	*ppin*	-18.43 ***	-3.02 ***	0.16 ***	1.37 ***
Wuhan	*pwuh*	-70.61 ***	-5.77 ***	0.08 ***	0.69 ***
Yichang	*pyic*	-8.86 **	-2.09 **	0.23 *	2.80 **
Xiangfan	*pxig*	-12.18 **	-2.43 **	0.20 **	2.12 **
Changsha	*pchn*	-6.76 *	-1.83 *	0.27 *	3.62 *
Yueyang	*pyue*	-5.81 *	-1.65 *	0.28	4.37 *
Changde	*pchg*	-19.65 ***	-3.12 ***	0.15 ***	1.29 ***
Guangzhou	*pgua*	-13.78 **	-2.29 **	0.16 ***	2.96 **
Shaoguan	*psho*	-24.80 ***	-3.52 ***	0.14 ***	0.99 ***
Shenzhen	*pshn*	-22.62 ***	-3.35 ***	0.14 ***	1.12 ***
Zhanjiang	*pzha*	-4.72	-1.47	0.31	5.32
Huizhou	*phui*	-15.40 ***	-2.63 ***	0.17 ***	2.12 **
Nanning	*pnai*	-7.22 *	-1.89 *	0.26 *	3.42 *
Guilin	*pgui*	-15.47 ***	-2.76 ***	0.17 **	1.63 ***
Beihai	*pbeh*	-11.01 **	-2.33 **	0.21 **	2.25 **
Haikou	*phai*	-11.96 **	-2.44 **	0.20 **	2.05 **
Sanya	*psan*	-9.70 **	-2.19 **	0.22 **	2.54 **
Chongqing	*pcho*	-24.91 ***	-3.52 ***	0.14 ***	0.99 ***
Chengdu	*pche*	-8.42 **	-2.05 **	0.24 *	2.91 **
Luzhou	*pluz*	-11.46 **	-2.38 **	0.20 **	2.17 **
Nanchong	*pnah*	-9.28 **	-2.14 **	0.23 **	2.66 **
Guiyang	*pguy*	-13.68 **	-2.61 ***	0.19 **	1.79 **
Zunyi	*pzun*	-3.77	-1.29	0.34	6.52
Kunming	*pkun*	-8.31 **	-2.00 **	0.24 *	3.06 **
Dali	*pdai*	-17.31 ***	-2.94 ***	0.16 ***	1.41 ***
Xi'An	*pxin*	-9.34 **	-2.12 **	0.22 **	2.76 **
Lanzhou	*plan*	-6.21 *	-1.71 *	0.27	4.08 *
Xining	*pxii*	-4.05	-1.22	0.30	6.24
Yinchuan	*pyin*	-40.44 ***	-4.49 ***	0.11 ***	0.61 ***
Urumqi	*puru*	-16.59 ***	-2.79 ***	0.16 ***	1.80 **

*Note: **, * denote the rejection of null hypothesis at the 95% and 90% level of significance.*
Source: NBSC

[Gross Regional Products: GRP]

grp		MZa	MZt	MSB	MPT
Beijing	*gbei*	-16.33 ***	-2.84 ***	0.17 ***	1.56 ***
Tianjin	*gtia*	-13.85 ***	-2.60 ***	0.18 **	1.86 **
Hebei	*gheb*	-10.33 **	-2.26 **	0.21 **	2.41 **
Shanxi	*gsha*	-14.27 ***	-2.64 ***	0.18 **	1.80 **
Inner Mongolia	*gmon*	-6.08 *	-1.62 *	0.26 *	4.40 *
Liaoning	*glia*	-3.60	-0.50	0.13 ***	6.82
Jilin	*gjil*	-8.52 **	-1.95 *	0.22 **	3.27 *
Heilongjiang	*ghei*	-18.37 ***	-2.97 ***	0.16 ***	1.54 ***
Shanghai	*gshn*	-17.96 ***	-2.99 ***	0.16 ***	1.36 ***
Jiangsu	*gjia*	-6.72 *	-1.78 *	0.26 *	3.79 *
Zhejiang	*gzhe*	-7.29 *	-1.86 *	0.25 *	3.52 *
Anhui	*ganh*	-5.50	-1.60	0.29	4.59
Fujian	*gfuj*	-9.07 **	-2.05 **	0.22 **	2.97 **
Jiangxi	*gjin*	-15.55 ***	-2.78 ***	0.17 **	1.58 ***
Shandong	*gshd*	-4.82	-1.41	0.29	5.37
Henan	*ghen*	-5.58	-1.65 *	0.29	4.42 *
Hubei	*ghub*	-8.51 **	-2.04 **	0.24 *	2.93 **
Hunan	*ghun*	-6.62 *	-1.75 *	0.26 *	3.93 *
Guangdong	*ggua*	-11.60 **	-2.39 **	0.20 **	2.17 **
Guangxi	*ggun*	-5.46	-1.58	0.28	4.68
Hainan	*ghai*	-15.50 ***	-2.76 ***	0.17 **	1.64 ***
Chongqing	*gcho*	-15.95 ***	-2.82 ***	0.17 **	1.54 ***
Sichuan	*gsic*	-6.79 *	-1.82 *	0.26 *	3.68 *
Guizhou	*ggui*	-20.16 ***	-3.12 ***	0.15 ***	1.38 ***
Yunnan	*gyun*	-13.84 ***	-2.62 ***	0.18 **	1.81 **
Shaanxi	*gshx*	-8.65 **	-2.04 **	0.23 *	2.95 **
Gansu	*ggan*	-8.65 **	-2.06 **	0.23 *	2.87 **
Qinghai	*gqin*	-13.54 **	-2.55 **	0.18 **	1.97 **
Ningxia	*gnin*	-14.06 ***	-2.64 ***	0.18 **	1.76 ***
Xinjiang	*gxin*	-16.92 ***	-2.87 ***	0.16 ***	1.58 ***

*Note: **, * denote the rejection of null hypothesis at the 95% and 90% level of significance.*
Source: NBSC

We then conduct the VAR estimation and examine the Granger causalities from capital flows and money supply to property prices.[5] Table 3 reports the results of causality tests as follows. The tests were conducted on 60 cities for the prices of newly constructed commercialized buildings (*nccp*) and on 55 cities for the prices of second-hand residential buildings (*shrp*), by excluding the cities in which the data with nonstationary property was included out of total 70 cities. Regarding *nccp*, positive causalities from money supply to the property prices were identified at significant levels on 57 cities out of 60 cities, whereas those from capital flows to the property prices were verified only on one city. As for *shrp*, positive causalities from money supply to the property prices were identified at significant levels on 37 cities out of 55 cities, while those from capital flows to the property prices were verified only on 4 cities. These test results, therefore, suggested that the main contributor to property prices' determinant was domestic money supply rather than external capital inflows. This outcome is also consistent with the previous study of Xu and Chen (2012).

It should also be noted that some of cities where their property prices are not affected by money supply as well as capital flows belong to big cities and/or coastal advanced cities, *e.g. Shanghai* and *Shenzhen* in *nccp*; and *Beijing*, *Changchun*, *Shanghai*, *Ningbo*, *Fuzhou*, *Guangzhou*, *Shaoguan* and *Shenzhen* in *shrp*. In these cities, property prices might be subject to investors' speculations. Yao *et al.* (2013), again, argued that monetary policies had little effect on property prices since Chinese investors might be "irrational" and "speculative" in such a way that investors rushed to buy houses or shares whenever tightening monetary policies were taken. Although the authority is keeping its monetary autonomy, it may have a room to enhance the accountability and transparency of its monetary policies to minimize irrational behaviors of Chinese investors.

Finally, we herein check the robustness of the individual city's estimation above by conducting a panel VAR estimation. We construct a panel data with total seventy cities for the full sample period from the first quarter of 2007 to the fourth quarter of 2016 in the prices of newly constructed commercialized buildings (*nccp*) and those of second-hand residential buildings (*shrp*). The data property was examined by the Levin, Lin and Chu unit root test developed by Levin *et al.* (2002), which assumes that the parameters of the series lagged are common across cross sections. The test result in Table 4.1 showed that all the data were stationary at the 99 percent significant level. We then replace the data in the equation (2) and conduct the panel VAR estimation with Granger causality test (see Table 4.2 and Table 4.3). The causality test reported that both of property prices, *nccp* and *shrp*, were

[5] The results of VAR estimation in individual cities are not reported here to conserve space.

caused negatively by capital flows and positively by money supply. From this panel VAR analysis, we could also confirm that the major determinant of property prices was domestic money supply in China.

Table 3. Granger Causality Test on Property Prices

[Prices of Newly Constructed Commercialized Buildings]

nccp		*grp*	*cif*	*mon*
Beijing	*pbei*	*gbei*	8.64 *** (negative)	6.05 **
Tianjin	*ptia*	*gtia*	7.38 *** (negative)	10.45 ***
Shijiazhuang	*pshi*	*gheb*	0.21	17.56 ***
Tangshan	*ptan*	*gheb*	0.69	8.89 ***
Qinhuangdao	*pqin*	*gheb*	0.35	21.09 ***
Taiyuan	*ptai*	*gsha*	0.66	0.09
Hohhot	*phoh*	*gmon*	0.78	7.64 ***
Baotou	*pbao*	*gmon*	2.09	3.77 *
Shenyang	*pshe*	*glia*	1.88	3.82 *
Dalian	*pdal*	*glia*	0.18	9.04 ***
Dandong	*pdan*	*glia*	1.35	11.00 ***
Jinzhou	*pjin*	*glia*	0.40	3.64 *
Changchun	*pcha*	*gjil*	0.18	9.58 ***
Jilin	*pjil*	*gjil*	4.72 **	7.77 ***
Harbin	*phar*	*ghei*	0.43	6.13 **
Mudanjiang	*pmud*	*ghei*	1.12	14.93 ***
Shanghai	*psha*	*gshn*	7.89 *** (negative)	1.71
Nanjing	*pnan*	*gjia*	7.11 *** (negative)	8.54 ***
Wuxi	*pwux*	*gjia*	2.91 * (negative)	8.13 ***
Xuzhou	*pxuz*	*gjia*	0.66	8.32 ***
Yangzhou	*pyan*	*gjia*	1.61	22.27 ***
Hangzhou	*phan*	*gzhe*	1.50	8.42 ***
Ningbo	*pnin*	*gzhe*	2.09	7.42 ***
Wenzhou	*pwen*	*gzhe*	2.14	14.02 ***
Jinhua	*pjih*	*gzhe*	0.00	15.25 ***
Hefei	*phef*	*ganh*	-	-
Bengbu	*pben*	*ganh*	-	-
Anqing	*panq*	*ganh*	-	-
Fuzhou	*pfuz*	*gfuj*	6.74 *** (negative)	7.81 ***
Xiamen	*pxia*	*gfuj*	6.31 ** (negative)	7.10 ***
Quanzhou	*pqua*	*gfuj*	0.79	7.39 ***
Nanchang	*pnac*	*gjin*	1.17	14.54 ***
Jiujiang	*pjiu*	*gjin*	0.07	21.61 ***
Ganzhou	*pgan*	*gjin*	0.14	17.43 ***
Ji'Nan	*pjia*	*gshd*	-	-

nccp		*grp*	*cif*	*mon*
Qingdao	*pqig*	*gshd*	-	-
Yantai	*pyat*	*gshd*	-	-
Jining	*pjii*	*gshd*	-	-
Zhengzhou	*pzhe*	*ghen*	2.71 * (negative)	10.08 ***
Luoyang	*pluo*	*ghen*	0.33	6.37 **
Pingdingshan	*ppin*	*ghen*	0.54	2.84 *
Wuhan	*pwuh*	*ghub*	3.77 * (negative)	13.40 ***
Yichang	*pyic*	*ghub*	0.45	17.77 ***
Xiangfan	*pxig*	*ghub*	0.02	7.07 ***
Changsha	*pchn*	*ghun*	0.08	16.35 ***
Yueyang	*pyue*	*ghun*	0.21	13.22 ***
Changde	*pchg*	*ghun*	2.21	17.55 ***
Guangzhou	*pgua*	*ggua*	4.05 ** (negative)	4,23 **
Shaoguan	*psho*	*ggua*	0.08	8.99 ***
Shenzhen	*pshn*	*ggua*	6.41 ** (negative)	0.06
Zhanjiang	*pzha*	*ggua*	0.03	18.76 ***
Huizhou	*phui*	*ggua*	4.15 ** (negative)	6.61 **
Nanning	*pnai*	*ggun*	-	-
Guilin	*pgui*	*ggun*	-	-
Beihai	*pbeh*	*ggun*	-	-
Haikou	*phai*	*ghai*	0.86	6.93 ***
Sanya	*psan*	*ghai*	0.53	4.34 **
Chongqing	*pcho*	*gcho*	0.00	9.41 ***
Chengdu	*pche*	*gsic*	0.17	6.96 ***
Luzhou	*pluz*	*gsic*	0.01	3.12 *
Nanchong	*pnah*	*gsic*	1.70	3.28 *
Guiyang	*pguy*	*ggui*	0.25	7.15 ***
Zunyi	*pzun*	*ggui*	0.05	9.22 ***
Kunming	*pkun*	*gyun*	2.68	14.42 ***
Dali	*pdal*	*gyun*	0.45	8.37 ***
Xi'An	*pxib*	*gshx*	0.41	13.08 ***
Lanzhou	*plan*	*ggan*	0.00	5.47 **
Xining	*pxii*	*ggin*	0.04	11.85 ***
Yinchuan	*pyin*	*gnin*	0.00	4.87 **
Urumqi	*puru*	*gxin*	0.59	4,24 **
Contributions in Total			1 / 60	57 / 60

*Note: **, * denote the rejection of null hypothesis at the 95% and 90% level of significance.*
Source: NBSC

[Prices of Second-Hand Residential Buildings]

shrp		*grp*	*cif*	*mon*
Beijing	*pbei*	*gbei*	11.48 *** (negative)	0.07
Tianjin	*ptia*	*gtia*	6.41 ** (negative)	4.34 **
Shijiazhuang	*pshi*	*gheb*	0.54	12.78 ***
Tangshan	*ptan*	*gheb*	1.25	5.78 **
Qinhuangdao	*pqin*	*gheb*	0.00	15.93 ***
Taiyuan	*ptai*	*gsha*	0.14	1.71
Hohhot	*phoh*	*gmon*	0.05	0.04
Baotou	*pbao*	*gmon*	1.34	1.87
Shenyang	*pshe*	*glia*	0.66	5.81 **
Dalian	*pdal*	*glia*	0.19	17.52 ***
Dandong	*pdan*	*glia*	0.08	12.89 ***
Jinzhou	*pjin*	*glia*	0.76	4.76 **
Changchun	*pcha*	*gjil*	0.00	1.01
Jilin	*pjil*	*gjil*	1.70	18.73 ***
Harbin	*phar*	*ghei*	2.33	0.87
Mudanjiang	*pmud*	*ghei*	1.03	6.87 ***
Shanghai	*psha*	*gshn*	8.67 *** (negative)	1.97
Nanjing	*pnan*	*gjia*	2.12	4.18 **
Wuxi	*pwux*	*gjia*	0.03	10.87 ***
Xuzhou	*pxuz*	*gjia*	5.25 ** (negative)	4.71 **
Yangzhou	*pyan*	*gjia*	3.07 *	32.80 ***
Hangzhou	*phan*	*gzhe*	5.48 ** (negative)	11.85 ***
Ningbo	*pnin*	*gzhe*	2.36	1.14
Wenzhou	*pwen*	*gzhe*	5.94 ** (negative)	4.96 **
Jinhua	*pjih*	*gzhe*	0.63	9.54 ***
Hefei	*phef*	*ganh*	-	-
Bengbu	*pben*	*ganh*	-	-
Anqing	*panq*	*ganh*	-	-
Fuzhou	*pfuz*	*gfuj*	5.80 ** (negative)	1.89
Xiamen	*pxia*	*gfuj*	8.98 *** (negative)	7.22 ***
Quanzhou	*pqua*	*gfuj*	0.39	2.86 *
Nanchang	*pnac*	*gjin*	-	-
Jiujiang	*pjiu*	*gjin*	-	-
Ganzhou	*pgan*	*gjin*	1.04	10.17 ***
Ji''Nan	*pjia*	*gshd*	-	-
Qingdao	*pqig*	*gshd*	-	-
Yantai	*pyat*	*gshd*	-	-
Jining	*pjil*	*gshd*	-	-
Zhengzhou	*pzhe*	*ghen*	1.81	3.53 *
Luoyang	*pluo*	*ghen*	0.91	9.61 ***
Pingdingshan	*ppin*	*ghen*	1.31	0.64
Wuhan	*pwuh*	*ghub*	3.32 * (negative)	14.78 ***
Yichang	*pyic*	*ghub*	1.05	1.46
Xiangfan	*pxig*	*ghub*	1.40	2.18
Changsha	*pchn*	*ghun*	0.98	6.79 ***
Yueyang	*pyue*	*ghun*	0.37	6.73 ***
Changde	*pchg*	*ghun*	0.97	15.52 ***
Guangzhou	*pgua*	*ggua*	7.56 *** (negative)	1.15
Shaoguan	*psho*	*ggua*	0.97	0.79
Shenzhen	*pshn*	*ggua*	4.17 ** (negative)	0.00
Zhanjiang	*pzha*	*ggua*	-	-
Huizhou	*phui*	*ggua*	0.97	6.81 ***
Nanning	*pnai*	*ggun*	-	-
Guilin	*pgui*	*ggun*	-	-
Beihai	*pbeh*	*ggun*	-	-
Haikou	*phai*	*ghai*	0.73	6.81 ***
Sanya	*psan*	*ghai*	1.02	2.60
Chongqing	*pcho*	*gcho*	0.68	5.95 **
Chengdu	*pche*	*gsic*	0.49	5.55 **
Luzhou	*pluz*	*gsic*	0.27	2.85 *
Nanchong	*pnah*	*gsic*	0.00	4.15 **
Guiyang	*pguy*	*ggui*	3.23 *	4.31 **
Zunyi	*pzun*	*ggui*	-	-
Kunming	*pkun*	*gyun*	0.02	1.57
Dali	*pdai*	*gyun*	3.61 *	8.17 ***
Xi''An	*pxin*	*gshx*	0.93	12.22***
Lanzhou	*plan*	*ggan*	0.00	7.09 ***
Xining	*pxii*	*gqin*	-	-
Yinchuan	*pyin*	*gnin*	2.76 *	4.97 **
Urumqi	*puru*	*gxin*	0.56	2.30
Contributions in Total			4 / 55	37 / 55

*Note: **, * denote the rejection of null hypothesis at the 95% and 90% level of significance.*
Source: NBSC

Table 4. VAR Estimation by Panel Data

Table 4.1 Unit Root Test

		Levin, Lin & Chu
Capital Inflows	*cif*	-5.16 ***
Money Supply	*mon*	-10.20 ***
Prices of Newly Constructed Commercialized Buildings	*nccp*	-7.20 ***
Prices of Second-Hand Residential Buildings	*shrp*	-3.15 ***
Gross Reginal Product	*grp*	-4.84 ***

*Note: *** denote the rejection of null hypothesis at the 99% level of significance.*
Source: NBSC and PBC

Table 4.2 VAR Estimation

	cif	*mon*	*nccp*
cif -1	0.506 *** [31.753]	-0.587 *** [-27.929]	-0.228 *** [-9.067]
mon -1	0.109 *** [18.840]	1.015 *** [132.206]	0.179 *** [19.450]
nccp -1	0.051 *** [7.477]	-0.062 *** [-6.985]	0.864 *** [79.659]
C	0.074 [0.760]	3.232 *** [24.971]	-1.046 *** [-6.741]
grp	0.016 *** [3.014]	-0.042 *** [-5.968]	0.004 [0.559]
adj. R^2	0.549	0.875	0.782

	cif	*mon*	*shrp*
cif -1	0.532 *** [34.245]	-0.617 *** [-30.160]	-0.193 *** [-8.750]
mon -1	0.114 *** [19.257]	1.011 *** [129.611]	0.127 *** [15.213]
shrp -1	0.029 *** [3.899]	-0.041 *** [-4.199]	0.848 *** [79.590]
C	0.016 [0.162]	3.289 *** [25.043]	-0.738 *** [-5.215]
grp	0.016 *** [2.918]	-0.042 *** [-5.844]	0.012 [1.546]
adj. R^2	0.542	0.874	0.772

*Note: *** denote the rejection of null hypothesis at the 99% level of significance. The figure in parenthesis [ ] indicates t value.*
Source: NBSC and PBC

Table 4.3. Granger Causality Test

		Lags	*cif*	*mon*
Prices of Newly Constructed Commercialized Buildings	*nccp*	1	82.22 *** (negative)	378.32 ***
Prices of Second-Hand Residential Buildings	*shrp*	1	76 56 *** (negative)	231.46 ***

*Note: *** denote the rejection of null hypothesis at the 99% level of significance.*
Source: NBSC and PBC

Conclusion

This article examined the interaction among capital flows, money supply and property prices with a focus of Chinese economy by using a vector auto-regression (VAR) estimation as an analytical framework. Our research questions were, first, whether money supply has been determined independently from capital flows, and then which factor, capital flows or money supply, has given a dominant effect on property prices. The contributions of this study were that the determinants of asset prices were investigated jointly from capital flows as an external factor and from money supply as a domestic factor. Another contribution was that the study focused on property prices as a representative of asset prices and took into account the differences in the trends in property prices of seventy regional cities in China.

The main findings through the Granger causality tests by the VAR estimations were as follows. First, domestic money supply has been determined exclusively from external capital flows through the authority's perfect sterilization of foreign-exchange-market intervention. Second, the main contributor to property prices' movement has been domestic money supply rather than external capital flows. Third, some deviations of property prices from the trend in money supply were found in big cities and/or coastal advanced cities. The strategic implication of our findings is that although the monetary authority is keeping its autonomy, it may has a room to enhance the accountability and transparency of its monetary policies to minimize irrational behaviors of Chinese investors.

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ON THE "SCIENTIFICITY" OF MICROECONOMICS: INDIVIDUAL DEMAND, AND EXCHANGE-VALUE DETERMINATION

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Abstract:

This note examines how the concept of utility has led neo-classical economists astray. It first briefly reviews the thoughts of the early pioneers who have engaged these economists on the utility trail. It next scrutinizes the requirements imposed on the preference set of the consumer in view of extracting a utility function having anticipative properties. Then it shows how set theory can solve the dynamic exchange process and value determination without any need for a utility function.

Keywords: Utility; Preference; Well-Ordered Sets; Ordinal Space; Binary Relation; Order-isomorphism.

JEL Classification: D10; D11

1. Introduction

The early pioneers of the discipline of economics, *i.e.*, the physiocrats, the forerunners of the marginalists, and the marginalists themselves have laid the foundation of the demand side of microeconomics on an unobservable utility concept. Yet economists have also realized long ago that cardinal utility analysis will eventually pose problems for the scientificity of demand functions, and that ordinal analysis was a proper beginning. But in the end analysis ordinal preference is simply cardinalized into a utility function, which remains nevertheless unobservable. Even though today the so-called "Subjective Theory of Value" asserts that the value of a commodity or a service is nothing but the subjective value assigned to it by its consumer. Modern economists nevertheless persist in carrying out mathematical operations on utility functions. Worse still, the notion of utility is still surreptitiously associated with some sort of pleasure that the consumer is supposed to derive from consumption. The appeal to the concept of utility has produced only pathologies relative to the determination of value. In the meantime, individual demand remains miss-specified, while the association of consumption with pleasure carries many negative consequences such as insatiability of needs, waste, and environmental degradation.

The purpose of this note is to show how naïve set theory would have been a better tool to analyze the process of exchange and value determination. But beforehand, we will briefly review the historical development of the concept of utility as well as some other utility-related requirements of the modern version of microeconomics; hoping that will underline the need to turn a page

2. The beginning

A conventional definition of "microeconomics" asserts that it is the "study of the behavior of individuals and firms in decision regarding the allocation of scare resources". One could find other equally or more appropriate definitions such as "the study of the process of exchange" or "a search for a 'metric' of value", etc. For, these definitions encapsulate '*totus in toto'* the reasoning behind the choice of the paths that the early scholars of physio-

mathematics followed to associate microeconomics to concepts such as "utility", "value", and "needs". Today, the result of that effort appears scanty, while the utility trail is perceived as not only superfluous but somewhat damaging, for it has led neo-classical economists directly to a no- men's land, where they remain trapped.

The concept of utility may have originated mainly in the works of the physiocrats and their followers such as Condillac (1714-1780), Turgot (1727-1781), Condorcet (1743-1794), among others. For example, Condillac introduced the psychological basis of value and anticipated marginal utility, but his ideas were not followed by his contemporaries. Turgot for his part was more interested in the measurement of economic phenomena as a basis for rational administrations. And Condorcet emphasized social mathematics in view of constructing a science of society that would have objective value. While it is true to say that the physiocrats, in general, ignored the notion of 'exchange-value' in favor of 'use-value', as determined by the cost of production, but it is no exaggeration to point out that they are initially responsible for engaging neo-classical economists on the utility trail.

Their immediate successors, known as the forerunners of the marginalists, followed them in the same trail in using the concept of utility, but cast in the analysis of the margin, to analyze specific questions. For example, Jeremy Bentham (1748-1832) gave the analysis of the margin a definite expression and associated it with "pleasure". Jules Dupuit (1804-1866) used it to justify *price discrimination*. Augustin Cournot (1801-1877) and Heinrich von Thünen (1780-1850) developed the concept of *marginal productivity*. Bernoulli (1706-1782) made use of the concept of *marginal increment of incom*e, etc. Yet, these early developments were not fully appreciated before the mid-19th century because both physiocrats and forerunners, deep down, continued to associate the concept of utility to the inherent characteristic of commodities. And I believe that it is the reason why they were unable to distinguish 'value-in-use' and 'value-in-exchange', also known as the diamond-water paradox enunciated by Adam Smith.

Concepts of total and marginal utility received a more complete characterization from William Gossen (1810-1854). He brought back Condillac's and Bentham's idea, but added that the utility function must be concave; because as an economic agent acquires additional units of a particular good, each additional unit yields continuously diminishing "pleasure" up to a point of satiation. From then onward the act of consumption came to be associated with pleasure (sic). But even after Gossen's addition, the concept of the margin was still not fully appreciated as a general tool of analysis until the early 1850s and beyond. That is, until the analyses of Jevons (1957), Léon Walras (1874a, 1874b), and Carl Menger (1870). These marginalists independently formulated a theory of exchange value based on the principle of diminishing marginal utility as opposed to the cost of production. Thus, all three accepted Bentham's definition of a good as an object which brings pleasure. All three emphasized circumstances of things arising out of their relationship to an agent's need rather than intrinsic characteristics of goods. For Walras, limitation begets rarity, and rarity begets value, even though he knew fully well that utility was not measurable. Nevertheless, he had reasoned that rarity is the cause of value in exchange, and until his death in 1912 he remained convinced that one day science would find a way to measure rarity as an absolute magnitude.

Walras' method was nevertheless severely criticized by scientists and mathematicians on the grounds that desire and needs were not susceptible to exact measurements. To counteract such criticisms, Pareto (1848-1923) explored the possibility that consumers' behavior might be better examined without resorting to the notion that utility was a cardinally "measurable magnitude". He then proposed the notion of indifference curves as an alternative for determining the allocation of income. John Hicks (1946) followed up on that development and is today credited with the so-called indifference map together with the curious notion of the marginal rate of substitution between pairs of goods. In essence, the contribution of Hicks is that individual demand curve could be derived from the indifference map and the constraint of the consumer's budget. This means that the demand curve is not the same as declining marginal utility, which now appears as non- essential.

All these early developments, in one form or another, constitute what is known today as the "Subjective Theory of Value" which asserts that a commodity's or a service's value is none other than the subjective value assigned to it by his consumer. That theory therefore rejects all notions of labor content and inherent properties that the commodity might have, and solves the diamond-water paradox. Yet today the notion of utility is still surreptitiously associated with pleasure, while the realization that marginal utility constantly falls until it is equal to the price of an item at least supports the belief that individual demand curves are downward sloping. But, as will be argued later, Hicks' demand curve is arrived at through a questionable roundabout procedure.

On a deeper level, these beliefs are pregnant with pathologies relative to the determination of exchange value as discussed in Sonnenschein (1973, 1974) and Mantel (1974). It suffices to consider the indifference map of Hicks and the so-called *price-consumption curve* (the *loci* of tangencies of indifference curves and price lines) out of which the demand curve is derived. To observe a point on that curve one must know prices. But prices are

known only in equilibrium. Hence, a consumer is unable to derive another point, for there is no more price change in equilibrium. This means that only a single point of the demand can be observed during a given market period (Dominique 2017). The same situation arises in the so-called Lagrange constrained utility maximization concept, which skips individual demand all together to differentiate a utility function so as to move directly to a constrained solution even though the so-called utility function remains unobservable. In other words, satisfying the budget constraint automatically maximizes a utility function or the consumer's satisfaction.

Today, modern economists live with a contradiction. On the one hand, they accept that value is determined by the market in equilibrium; that is, declining marginal utility is not the same as individual demand. On the other, subjective utility is maximized and inserted into the method of mechanics so as to determine value. Thus, after travelling for almost two hundred years on the subjective utility trail, they are still unable to provide an unambiguous metric for value, and still they remain steadfastly attached to the maximization of an elusive utility function. In the end, the subjective utility trail produces nothing of value except lots of irony from mathematicians and scientists.

Erroneous conclusions such as *linear demand curves*, *differentiation* and *maximization of utility*, *consumption equals pleasure*, etc., could have been avoided had the early pioneers chosen instead a trail that led to scientific achievements. In that context, it is fair to say that the forerunners and marginalists may be forgiven for having lived before the advent of more appropriate tools of analysis. But the same cannot be said about their modern followers; *i.e*., Hicks, Samuelson, Debreu, among others, who could have oriented the profession toward set theory. For in the mid-19th century there was a renaissance in logic. George Cantor (1845-1918) had taken the idea of set to a higher level, and scholars such as Frege (1848-1925), Russel (1872-1970) and Whitehead (1841-1947) had completed the foundation of mathematical logic, which now stands as a corner stone of mathematics. Gotlob Frege in particular had by then demonstrated that one could use his formal system to resolve theoretical mathematical statements in terms of simpler logical notions. As already stressed above, many pathologies could have been avoided. Instead, the individual demand curve (sic) remains miss-specified and unobservable, while the association of consumption and pleasure carries negative con-sequences, such as *insatiability of needs, addiction, rising consumer's debt level, waste and environ-mental degradation*.

3. Some bizarre requirements

Modern economists argue that there exists a universal consumption set C, and $X \subseteq C$ represents a basket of goods selected by a given consumer. Then $X = \{x_1, x_2, \ldots, x_n\}$ (with the x's as elements) represents consumers' preference. Since preference does not have a 'metric', economists agree since the 1930s that X is an ordinal space, equipped with an order R. They next posit that R must be *complete*, *reflexive*, *continuous*, *transitive*, *monotone* and *convex*. But this set of requirements imposed on R appears both stringent and somewhat redundant. Recalling that X is an ordinal space equipped with a relation of order and equivalence. To say that X must be complete means that $\forall x_1, x_2, x_3 \varepsilon X$, either $x_1 \precsim x_2 \vee x_2 \precsim x_1$, $\forall x_i \varepsilon X$. Thus, if any two elements $x \varepsilon X$ are comparable, then X must be a well-ordered set. If the ordering is strict, then R is automatically endowed with the properties of *irreflexivity*, *antisymmetry* and *transitivity*. If, on the other hand, the order is non-strict, then R is *reflexive*, *antisymmetric* and *transitive*.

As we will make more explicit in a moment, to be well-ordered a set must have a smallest element. Since there is no zero utility nor zero preference, both the set X and U (utility) are not well-ordered just like the real set (0, 1] is not. We will then assume that consumers with asymmetric and incomplete information sets and facing new and differentiated products cannot possibly well-order their preference sets. It is therefore reasonable to assume that X is a partially ordered set or a *poset.* In that case, the pair $(X, \precsim)$ satisfies reflexivity, antisymmetry, and transitivity; while the pair $(X, \backsim)$ satisfies reflexivity, symmetry, and transitivity. Thus, if X is a poset, as it is reasonable to suppose, it is rather redundant for the modern version to require reflexivity and transitivity.

Regarding the requirement of convexity, it is understood that if $x_1 \succ x_2$, then $x_2 \leq [\lambda\, x_1 + (1- \lambda)\, x_2]$, where $\lambda \varepsilon (0, 1)$. I understand that this demand is to ensure that the consumer will prefer more to less, but as we will make clear below, no multiplication is defined in ordinal space. There is no doubt that the average consumer prefers more to less, but this cannot be a necessary condition since it might not apply to some. Characteristics such as selfishness, monotonicity, etc. are subsumable in the consumer's behavior. Indeed, the role of the scientist is to observe instead of imposing. In this sense, it is rather incongruous for any would-be scientist to begin by imposing properties on a configuration to be investigated.

Beside stringent demands and redundancies, there are other incongruities to be discussed below after we give formal definitions of the terms used in this study.

3.1 Definition of Terms

Terms and symbols used in the language of set theory vary with authors. For tractability, therefore, we begin by defining the terms used in this study:

The Smallest Element: Let the pair $(X, \precsim)$ be a poset. Then an element $x_1 \varepsilon X$ is the smallest element in X if $x_1 \precsim x_2, \forall x_2, x_3, \ldots, x_n \varepsilon X$.

A Binary relation R: A Binary relation R on a set X is: $R \subseteq X \times X$.

A Well-Ordered Set: The poset X is well-ordered if every non-empty subset of X contains a smallest element.

A Partially Ordered Set (poset): A relation $(\precsim)$ on a set X is a poset if it is reflexive, antisymmetric and transitive.

The Inverse of a Binary relation: If R is a partial order on a set X, then the inverse R^{-1} is a partial order on X.

An Ordinal Space: is a set $X = \{x_1, x_2, \ldots, x_n\}$ of distinct elements equipped with a relation of order and equivalence[6].

Isomorphism: Let $(X, \precsim_x)$ and $(Y, \precsim_y)$ be two posets that are isomorphically related. Then, there exists a one-to-one function f from X to Y such that $\precsim_x$ y iff $f(x) \precsim_y f(y), \forall x \varepsilon X$.

Order Isomorphism: Let X and Y be two sets. An order isomorphism between X and Y preserves the largest, smallest, maximal, minimal elements, if they exist. Further, if X does not have a smallest element then the sets are not completely order-isomorphic[7].

4. The process of exchange

With these definitions in mind, we can now examine other aspects of the modern version of neo-classical economics.

The modern version at times emphasizes two models. Namely:

$$f : X \rightarrow \mathbb{R}_+ \tag{1}$$

$$f : X \rightarrow U, \text{ and } g : U \rightarrow \mathbb{R}_+, \tag{2}$$

where, as before, X is an ordinal space, U is the utility index, another ordinal space, and $\mathbb{R}$ is some real set. It should be noted first that if U is an ordinal space, then model (1) is in fact $f: X \rightarrow X = I_x$, the identity function, which implies that the ordinal space X is simply 'cardinalized'. Hence model (2) can be rewritten as:

$$h = (g \circ I_x) : X \rightarrow \mathbb{R}_+, \tag{3}$$

where h is the composition of g and f.

Students of economics are taught that if preference satisfies certain conditions (see above), then there exists a utility function f such that $x_1 \prec x_2$ implies $f(x_1) \prec f(x_2)$ without stating how that f is related to X. In (3), we find no such utility function, for as it can be seen in (3), h is no more a utility function nor a preference function. In fact, h is a monotone bijection with the ordinal space X as its domain and $\mathbb{R}_+$ as its co-domain, or a mapping from a poset X to another $\mathbb{R}$. If both are ordered antisymmetrically, then they are isomorphically related[8]. However, the idea behind the mapping is to move X to a real set on which mathematical operations are defined. It would not make any sense to map X into a real set that is not pertinent to the problem of exchange.

As shown in Dominique (2017), the only set of reals that will do the trick is the set of budget shares $\alpha = \{\alpha_1, \alpha_2, \ldots, \alpha_n\}$. Equation (3) can then be written as:

$$h = (g \circ f): X \rightarrow \alpha \tag{4}$$

That real set α offers various clues as to how to solve the exchange problem. Its elements appear in every pertinent equation of the system. To see how, we first consider how α enters the equilibrium equations of

[6] Mathematical operations such as multiplication, addition, subtraction, differentiation, etc. are not defined on ordinal spaces. For a source, see Barsilai (2013).

[7] If the sets X and Y are isomorphically related, then $f: X \rightarrow Y$ is an injection; $f^{-1}: Y \rightarrow X$ is a surjection. And both f and f^{-1} are strictly increasing.

[8] There are many proofs in the literature. For more, see: Warner (1965), Karolyi (2016), Simovici, *et al*. (2014), Roitman, (2013). See also: Wikibooks.org/Wiki/abstract-Algebra/Group-Theory/Homomorphism; retrieved on July 9, 2017.

exchange with m consumers indexed by i and n goods indexed by j, and using superscript and subscript below to avoid double summations. Within a small e > 0 radius, the equilibrium equation perceived by i is:

$$\alpha^i_j = (p_j \,.\, x^i_j\,(p)) \,/\, B^i\,(p_j), \tag{5}$$

where x^i_j (p) stands for good j purchased by consumer i, p is the market price, and B^i (p) stands for the budget of i. It is clear from (5) that price is a target variable, for if it is known then both quantity and budget will be known as well.

Equation (4) is written in terms of X and α, both are open sets, *i.e.*, without smallest elements. Hence, the graph of h is not defined in the neighborhood of the origin. We will examine the consequence of that below. For now, it suffices to say that, as $\alpha \in \mathbb{R}$, it is proper for economists to perform mathematical operations on it. Indeed, many such operations can be performed. For example,

Operation 1: Operation 1 yields the nature of an individual demand curve as,

$$x^i_j = \alpha^i_j\, B^i \,/\, p_j. \tag{6}$$

Thus, near the equilibrium point, the individual demand curve is a *rectangular hyperbola*; its *instantaneous price elasticity* lies between -1 and 0; and both are derived from real values. If supply is fixed, we have:

Operation 2: The excess demand of good j is:

$$p_j \,.x^i_j - \alpha^i_j\, B^i \lesseqgtr \xi_j, \tag{7}$$

where ξ is the excess demand of good j perceived by i. The summation over all i's and j's yields another mapping M such that:

Operation 3: The mapping M solves the exchange problem as:

$$M\colon \xi\,(p) \rightarrow p. \tag{8}$$

M is in fact the monotone bijection performed by all consumers. That mapping is derived in detail in Dominique (2017), where it is shown that every one of its elements is a function of α. The following conclusions can then be drawn:

i) due to monotonicity, M contains a free variable, hence its rank is (n – 1);

ii)M^{-1} exists, M therefore is a monotone bijection;

iii) if |.| stands for the cardinality of a set, then over the proper range |X|= |α|; order is preserved as:

$$\sum_i^m \alpha^i_j > \sum_i^m \alpha^i_{j+1} >,\ldots, > \sum_i^m \alpha^i_{j+(n-1)} \rightarrow p_j > p_{j+1} >,\ldots, > p_{j+(n-1)},$$

hence, M is an order-isomorphism:

iv) price is the metric of value, and:

v) individual demand is relatively inelastic, then there is a tendency for prices to increase in the absence of a concomitant increase in supply.

The *free variable* in M is what Walras identified as the numéraire. It remains to be seen after further studies, but *it would appear that a mapping from an open ordinal space to another set leaves a variable free due the monotonicity of the mapping h*[9].

It should also be noted that only one point on the individual demand curve is in fact observed. Therefore, the problem of aggregating individual demand curves analyzed by Sonnenschein (1973, 1974) and Mantel (1974) simply does not arise since the operation addition is mathematically defined. Of course, one could use the concept of price elasticity to reconstruct an *ex-post* demand curve, but what would be the use of that?

In the end, this approach reveals that the dynamic process of exchange or the determination of value in economics reduces to consumers' search for the mapping h, which incidentally is not observable except in equilibrium. Further, this approach subsumes the concept of revealed preference proposed by Samuelson (1938) and it also shows that the criticisms addressed to revealed preference theory, namely whether consumers' preference scale remains constant over time or not (see Wong 1978) are not pertinent.

Conclusion

The present approach based on naïve set theory is conform to a scientific "démarche" because it is based on observables. The neo-classical approach, on the other hand, is based on 'cardinalizing' an ordinal space while imposing unrealistic demand on individual preference in an attempt to generate a utility function with a convex

[9] A similar process occurs in Political Science where the citizens map their preference of candidates (an ordinal space) into ballots (a real set) on which all kinds of mathematical operations can be performed.

hypograph. It fails dramatically to reach its objectives. Whereas the present approach based on naïve set theory uses real values to derive a proper individual and community demand curves. It also solves the market equilibrium as a stable sink, while establishing an unambiguous monotone metric for value.

In sum, the utility trail requiring that mathematical operations be performed on ordinal spaces where they are not defined is not only a violation of mathematical rules, but it produces negative consequences. It fails to emphasize the reflexivity of markets. More importantly, it associates consumption with pleasure; as a result, we now have millions of individuals addicted to shopping. Moreover, the concept of maximization of an unobservable utility function (associated with pleasure) might be a bonanza for advertisers, but it is scientifically unjustified and it produces indebtedness, waste, and environmental degradation.

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EXPECTATIONS AND RATIONAL DECISIONS ACCORDING TO JOHN MAYNARD KEYNES'S THOUGHT

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Abstract:

The aim of this paper is to question the existence of economic laws that can uniquely determine capitalist "equilibrium". The presence of uncertainty is one of the conditions that cannot be eliminated, which can make the equilibrium unstable. We will try to find possible improvements in the techniques of modern capitalism through collective action, beyond the rationale of "laissez-faire". All this in a Keynesian methodological view and in the presence of a social pact which, by committing the parties to the attainment of collective goals, minimizes the conflict.

If a separation between spending decisions and savings decisions is assumed, the role of an external subject that can affect the current and expected profitability is particularly important. Thus, this issue will be addressed, that is, the expectation of profit in a system of uncertainties, where well-governed capitalism can represent the closest frame to the most efficient system to achieve economic goals.

Keywords: Capitalist system; Expectations; Profit; Uncertainty

JEL Classification: B11; B21; E12

1. Introduction

According to Keynes (1930), in a monetary economy characterized by a high degree of uncertainty, given the range of actions interacting among the various economic actors, income holders will make choices aimed at minimizing the risk and maximizing the benefits.

Therefore, choices in conditions of uncertainty concern both the use of existing wealth and options about the will to create new wealth. It is here that Keynes embodies Marshall's scheme (1925) (which included uncertainty), by inserting uncertainty among the properties of a capitalist monetary economy. This means that every activity of wealth utilization is based on a set of variables ranging from the expected net yield to the risk factor and the cost of maintaining, or still the price for liquidity; a set which defines the rate of interest of the chosen activity. As we find ourselves in the presence of random and subjective assessments, agents do not have a single reference rate for each individual activity (Keynes 1937*a*).

Obviously, in order to be able to hypothesize market equilibriums in contexts with uncertainties, there is a need for adjustment mechanisms capable of operating by changing all the variables that define their own rates (Knight 1921).

If long-term expectations are given, and short-term ones are met, we are in a static equilibrium (Kregel 1977); then any adjustment process will occur on the effects of a shift of funds (loanable funds, unused cash, etc.) along the value parameters of the elements that contribute to define interest rates.

Demand movements have effects on markets, which can affect both prices and production levels, and the coefficient of liquidity, depending on the supply elasticity coefficient to evolving demand. In a re-equilibrium process, with given expectations, by differentiating the activities with elastic supply from those with inelastic supply for different flexibility of interest rates, the equilibrium stands around the rate values that depend on their realignment rates, resulting in ranges of returns in different markets. However, the hypothesis of realignment between rates and activities, based on the elasticity of supply, does not exactly reflect Keynes's position, which is rather focused on the elasticity of production associated with price changes.

Keynes does not exclude that demand variations have an immediate effect on prices. However, even for the effects on profit and expectations, changes in price lead to variations in supply levels and levels of employment, due to the drop-in returns.

Is it possible to imagine, outside of the neoclassical perspective, a model with features such that real income and price levels depend on demand for money and wages, which increases the amount of money at any level of money wage, guarantee full employment?

We can only answer in the affirmative in two conditions: 1) in the presence of a political-institutional hegemony of the capital category and the capitalist class; 2) in the presence of a social pact that, by committing the parties to the achievement of collective goals, minimizes the conflict (Morselli 2015). The Keynesian idea moves along the second point, in the belief that, given the wage, there are no political-social conditions to lower the real wage by manipulating the amount of money. Therefore, employment cannot be increased in this way.

In fact, in the absence of a social pact, systemic uncertainties persuade entrepreneurs to wait for better times for their investment plans.

This means that in the presence of a separation between spending decisions and savings decisions, it is particularly important to involve an external subject that is able to cope with the external funding of accumulation; And capable of affecting current and expected profitability of investments, for given long-term expectations. Therefore, this work aims to address these issue, that is, the expectation of profit in a system of uncertainties, also because opinions on the subject are still very divergent.

2. Profit in a system characterized by uncertainties

Keynes (1936) in chapter XVII claims that "... a rise in the monetary interest rate slows down the production of all the goods whose production is elastic, and cannot stimulate the production of currency, whose production is, by hypothesis, perfectly inelastic ...". In addition, in Chapter XVI he claims: "... we have seen that capital must be kept fairly scarce in long periods so that it has marginal efficiency at least equal to the rate of interest for a period equal to the life of the capital itself, as determined by the psychological and institutional conditions ...". And he asks himself: "... what are the consequences for a company that was so well equipped with capital that the marginal efficiency of this was zero or even negative for any additional investment; And yet possessed such a monetary system that the currency could be kept with a negligible cost of conservation and therefore interest could not become negative; And also, that in conditions of full employment, was willing to save?"

In this context, Keynes replies that the equilibrium position, under *laissez-faire*, will be a low employment position and such a miserable living standard to zero the savings. It appears, therefore, that Keynes only considers Say's law (1803), with demand equal to supply, in pure survival conditions with levels of employment and income to assure savings equal to zero. It is clear, then, that Keynes's refusal to direct attention, as a system engine, to savings.

Conversely, Keynes, always in chapter XVI, claims that even "digging a hole in the ground" through savings funds will increase not only employment, but also real national income, since if the rate of interest cannot go down as quickly as the marginal efficiency of capital, the diversification of the desire to possess wealth towards activities that in fact will not exploit any economic income will increase economic well-being.

But is this charity work, done by bearers of a class conflict such as capitalists, possible? The answer is certainly negative. Either there is a strong and constant covenant between the contractors, guaranteed by the state, or all the economic actors internalize in their behavior, the needs of capital. Or one proceeds to a partial integration of the two hypotheses.

In the absence of such structural and institutional framework, Keynes (1936, Chapter 12) is convinced that the system operates in conditions of uncertainty such as to expect cyclical trends based all around levels of activity below full employment.

The individual entrepreneur, in uncertainty, can only try to expand his market, theoretically to reduce uncertainties, at increasing costs and decreasing profits, due to price reductions. The single capitalist certainly cannot rely on any form of class solidarity, since he interacts not with workers, but with other capitalists; therefore, he can only base his own decisions on his own intuition (expectations) in solitude.

3. Keynes, the underemployment equilibrium and the economic cycle

It is important to revisit Keynes's methodological passage (1936, chapters 21-22), which deals with the underemployment equilibrium and the economic cycle, in order to appreciate our intuitions. These two themes of the "General Theory" appear to be connected and difficult to separate. The underemployment equilibrium is not only the result of unrealized expectations, on the contrary, the economy may stop in a situation of underemployment even if its expectations are met. The problem is to know why this phenomenon takes place and to hypothesize overcoming mechanisms.

The scheme applied by Keynes (1930) in "A Treatise on Money", is based on the distinction between production prices and market prices; i.e. prices that ensure the sale of the entire production. The non-coincidence between these prices is caused by the difference between the decisions regarding production at the time $t-1$ and the demand that occurs in the market at the time t. This difference determines the presence of profits or losses. It is the profits or the loss of time t that determine the business decisions of the entrepreneurs, generating the causal link between market outcomes and production decisions (investments) that bind time t to time $t+1$, the latter to time $t+2$, and so on.

Indeed, the equations of market prices included in the "Treatise" suggest that the disequilibrium can be determined by the difference between *ex ante* savings and investments. Since savings do not vary greatly from $t+1$ to $t+2$, the cause of the disequilibrium can easily be attributed to decisions of investment in fixed capital. Subsequently, in the shift from "Treatise" to the "General Theory", Keynes seems to be driven by the academic debate to some analytical changes about the causal links that are the basis of cumulative processes. Among these changes, it is possible to find that of a causal link between stock variations and production decisions, with prices that only vary because of variations caused by monetary costs.

This sequence does not appear in the "General Theory", but a different explanation of the doubts arising from the scheme adopted by Keynes can be related to a theory based on increasing short-term supply curves. The assumption of increasing cost curves can be traced back to Hawtrey (1928), who links the general price level with some business theory, thus trying to join monetary theories and value theories.

Keynes simply assumes a different impact of demand variations, depending on whether or not they are foreseen. If they are not foreseen, the first effect is assumed on prices and stocks and only later on production. If such variations are foreseen, prices only vary in relation to the decreasing returns curve, while multiplier effects have an immediate effect on real variables.

Ultimately, however, Keynes does not seem to have a joint theory of price formation based on the structural features of the markets. Therefore, is the innovative character of the "General Theory" missing? Indeed, the analysis of cycle in the "General Theory" assumes an innovative approach to the inclusion of expectations in the process of entrepreneurs' decision-making. In the "General Theory", Keynes does not seem to be particularly interested in defining the set of causal links that can contribute to determining the direction of expectations. Rather, it appears that its real goal is to connect entrepreneurial decisions to actual aggregate demand.

This results in a definition, though not conclusive, of effective demand that would seem to bring it back to the level of activity that businesses decide on the basis of a demand expectation, given the production conditions. Since the theoretical context that Keynes gives us is characterized by the overall characteristics of a capitalist monetary economy, the previous definition can refer to a concept of effective demand that, given the (increasing) cost curves and the short-term maximization conditions, corresponds to that "value" of expected value that maximizes short-term profits. It is on the basis of such expectation that the entrepreneur decides on the current level of production, employment and the supply price.

4. Formalizing an interpretive scheme

If we specify A as the expected revenues from the companies, we can derive the aggregate supply function as follows:

$$A = P \cdot Y \qquad \text{where} \quad P = \text{Prices};\ Y = \text{Production} \qquad (1)$$

$$P = W / \Pi \cdot (1+q) \qquad \text{where} \quad W = \text{Wages};\ \Pi = \text{Profits} \qquad (2)$$

$Y = \pi N$ where π = Technical conditions; N = Number of workers (3)

Thus, the supply function can be rewritten as follows:

$$A = W / \pi(1+q) \cdot \pi N = W(1+q)N \quad (4)$$

As entrepreneurs know both current wage and the applied level of profit per produced unit, for each level of employment it is possible to determine the revenue that the entrepreneur considers indispensable to realize over time his own plans.

The revenues derive from the sales that the companies manage to achieve towards the household sector, the business sector and the public sector.

Therefore, the expected revenues can be summarized in:

B = Consumption + investment + public spending

However, entrepreneurs can only rely on household consumption, given the consistency of the consumption of the same households in the short term. Indeed, investments are decided by other companies, as the considered company, as a result of estimates about the expected returns. Micro level and macro levels interact, canceling any company-wide strategic certainty. In addition, public spending is decided by the government on the basis of very complex variables, compared to the simple employment data.

If it is determined that consumptions are a function of income net of taxes, under equilibrium conditions, the result will be:

$$Y = \Pi / W(q+t) \cdot (G+I) \quad \text{where} \quad t = \text{Taxes}; \ G = \text{Public spending}; \ I = \text{Investments} \quad (5)$$

Hence

$$N = 1/W(q+t) \cdot (G+I) \quad (6)$$

The final result is that the level of employment is determined in the following way:

$$N = 1/W(q+t) \cdot (\text{autonomous demand}) \quad (7)$$

This means building an aggregate demand function by correlating the expected revenues of businesses at different levels of employment. Revenues that depend on the sales levels, given the prices. And this, since:

$$A = PY; \rightarrow A = W / \pi(1+q) \cdot \pi N = W(1+q)N \quad (8)$$

Function that relates the expected revenues to different levels of employment.

Therefore, it seems obvious that if business decisions, about future production levels, depend on whether or not the expectation conditions are met, changes in the decisions themselves can only result from changes expressed by the market.

The formulas used make it possible to link the variation in expectations to variations in the overall spending decisions expressed by the market.

This expresses the Keynesian approach according to which what determines the investment is not the interest rate, which can be synthesized in a complex of circumstances that affect the medium to long-term. As argued by Napoleoni (1985), in order to be able to reflect, this set of circumstances in Keynes's model, it would be necessary to assume a highly rigid function of investments with respect to the interest rate. This assumption, however, contrasts with the Keynesian one that money can be required as a demand for wealth in general. This implies that demand for money should be perfectly elastic with respect to the interest rate.

On this basis, and with these functional definitions, effective demand and supply become the two faces of an identical phenomenon of price and production decisions attributable to the same decision-making unit (single enterprise or business group). This is because the actual demand corresponds to the current level of production decided on the basis of the expected demand.

Therefore, the values to be related to understand the evolution of the system concern: 1) the actual demand; 2) the expected demand; 3) the current demand; 4) the demand that will be realized on the market.

Different moments of market evolution and consequent behavior of actors that influence each other in their temporal interconnections. However, Keynes is convinced that such connections and relationships cannot be defined a priori in their own mark. His goal is to reach the definition of effective demand for the whole system not

by summing up the actual demand values of individual businesses, rather by aggregating individual demand curves and expected demand in order to be able to calculate the global volume of current production (Morselli 2012).

However, it is evident that this is still an aggregation process that is not intended to automatically ensure the consistency of decisions. It seems to be a method that Keynes chooses for two reasons: 1) exemplification of behavioral hypotheses; 2) the possibility to explain the functioning of the system by comparing demand curves and supply curves.

5. The absence of automatic mechanisms and the neoclassical synthesis

The central theme of the Keynesian analysis is the affirmation of the existence of automatic equilibrium mechanisms that can ensure the full use of resources to the capitalist system. This theme can be considered as a logical and scientific pathway that leads to the revolutionary result of the underemployment equilibrium. This result, in turn, will lead to the interpretation of the Keynesian scheme under the name of "Neoclassical Synthesis". This synthesis draws its origin from two articles, one by Harrod (1937) and the other one by Hicks (1937).

Both accomplish a very gratifying operation at the academic level, consisting in formalizing what Keynes did not know or want to formalize. However, they add some changes to the Keynesian model, in order to build a simultaneous equilibrium model. The model is known as the IS-LM scheme, so named after the curves that appear.

Compared with the Keynesian orthodox model, the interest rate is included, as a further reference variable for the consumption function, as well as the investment function income. Thus, the same model includes the money demand for speculative purposes with broader expectations. The result is to come up with a formulation of the demand-supply function of money, which includes both the Keynesian assumption (liquidity trap) and the classic assumption (constant income).

However, in the construction of LM, the money supply appears to be binding, given and perfectly exogenous. Is this a plausible and Keynesian assumption? It is reasonable to think that monetary authorities will be inattentive to varying levels of income? The answer is no. It is more plausible (unless one admits that the only possible level of income is that of full employment) that monetary authorities seek, at least, to keep the relationship between money supply and real income constant. If this were not the case, the assumption of neoclassical synthesis would lead to unexpected changes in the price level.

It is possible to overcome such problems by considering, for example, the assumption of the functioning of labor market that introduces mechanisms that recall Walras's general equilibrium scheme (Modigliani 1944, 1963). In fact, a minimum wage is assumed (Wo) that, if it is not the subsistence wage, in terms of pure reproduction of the workforce, it is defined as the wage below which unions are unwilling to go down. Therefore, however, one introduces a not so realistic representation on the historical level, in the absence of a social pact. The real wage is (Wo/P), it is assumed that to the current wage given (dependent on P) the labor supply is infinitely elastic. The labour demand function (which defines the relationship between Y and N) is connected to the real wage through a direct relationship with marginal labour productivity. The relationship between labour demand and supply defines the equilibrium employment level which, of course, increases with the increase in prices (and falling real wages); As the employment increases, the income generated increases. The latter, given the nominal wage, is a variable that increases with the increase in the price level. The pair of equilibrium values of real income and prices, which determines the meeting between global supply and global demand curves (IS-LM), becomes function of the amount of suspended money (to use a Marxian term) and of the minimum wage accepted.

Therefore, in this scheme, what can unemployment, or any level of employment less than full employment, result in? Obviously, a bad relationship (in terms of value) between the amount of money and the level of monetary wage, caused by restrictive monetary policies or resistance by trade unions.

As highlighted by Napoleoni (1985), the synthesis is, therefore, a free interpretation of a working scheme of the capitalist economy with social agents, both public and private, that operate on the basis of their own motives. Therefore, this scheme cannot be called Keynesian or Anti-Keynesian.

6. Interpretations of the capitalist system

If, for a moment, we abandon Keynesian ideas, we can introduce some alternatives to the possible functioning scheme of the capitalist mechanism. We can, for example, think of an underemployment equilibrium resulting from the downward rigidity of interest rate; or determined by the inadequacy of long-term expectations, even at a zero-interest rate. Furthermore, as Patinkin claims (1965), it is not impossible to assume the effects of a price variation on demand for goods due to variations induced on the real wealth of the various economic agents.

In this context, we can refer to Friedman (1962) and the monetarist school, assuming a long-term model with flexible wages and prices. After all, economic variables have often been more flexible than socio-political variables, and it is therefore possible to imagine the full effect of wealth in a framework of full trend towards balances.

All of the aforementioned theoretical trends are based on the refusal of corrective public intervention, given the long-term trends. The Keynesian ideas start from the assumption that what determines the flow of investment is not the interest rate and that money can be demanded as a pure, generic and indistinct symbol representing wealth in general.

These latter statements are taken seriously by Patinkin (1976). He says that if the money is demanded for itself, it appears as an indicator of uncertainties. In addition, says Patinkin, if we interpret the "General Theory" as a dynamic theory of underemployment disequilibrium, as a result of a fall in the marginal capital efficiency curve quicker than the fall in the interest rate and monetary wage, we can imagine varying the possible variables to reverse the sign of uncertainty.

Patinkin's theory, in this context, is important. Although in a non-Keynesian theoretical framework, the introduction of the marginal capital efficiency curve raises the following problem: when we assume underemployment equilibrium or disequilibrium, do we only focus our attention on unemployed workers or on underused facilities too?

If, in fact, we pay attention to the role of entrepreneurs too, and to their equilibriums, unemployment can be the consequence of so many other disequilibrium, but never of an equilibrium. Keynes's problem, on the contrary, is the explanation of the causes of the underemployment equilibrium, defined as a chronic unemployment state and independent of any divergences between aggregate demand and production capacity of the system. A production capacity that can be used without guaranteeing full employment (Patinkin 1948).

Keynes regards affliction and anguish as two stable elements of capitalist development. Affliction and anguish that in a world without rules and without guarantees, more or less negotiated, can only induce capitalists to plans which can be reduced and easily manipulated as events unfold the result, in Keynes's opinion, that looks at the long-term period as a chained, but always nebulous, combination of short-term periods, is an economic system that seeks to settle around a position of capitalist equilibriums marked by unemployment (Keynes 1937*b*). This results in a conception of a living wage regarding the entire working class and which can be defined as "total wages" derived from the 'level of employment, a drop under which it would endanger life' (Leijonhufvud 1968, Morselli 2012).

Therefore, a condition marked more than by waste, by the total underutilization of resources which, because of the uncertainties, seems to be, in Keynes's opinion, the true characteristic of mature capitalism. Uncertainties and underutilizations that, by affecting each other, cause chronic demand and employment deficiencies. Then the few certainties that Keynes seems to welcome concern the monetary wages linked to political-institutional (and therefore conventional) elements of the system. But more important are the features of the legal money, which allow its interest rate to limit the compatible drop in other rates. But the underemployment equilibrium is also characterized, according to Keynes, by the lack of automatic readjustment mechanisms towards full employment. His conception of capitalist relations, in a world marked by potential imbalances in industrial relations, convinces him that capitalists consider the monetary wages irrelevant with respect to the change in the rate that determines the volume of investments; whether the interest rate on money or any other rate. And above all, because the monetary wage is the result of the same industrial relations that can be influenced by the meeting between supply and demand. Moreover, there is no guarantee that the flexibility of monetary wage can lead to increases in employment. Changes in the monetary wage, if they do not affect the expectations of workers and entrepreneurs, cannot lead to effects on production (Keynes 1937*b*).

Perhaps a deeper reading of such relationships could lead to Sraffa's thinking (1925), but taking the road to a historicizing of capitalist relations and consequent industrial relations would not be helpful, given that the expectations referred to by Keynes are a complex set of subjective facts and objective elements enumerable, but not always convertible into theories.

7. Keynesians, New Keynesians and Post Keynesians

As we have seen, at the basis of Keynesian thinking we always find the following problem: how to make individual and collective decisions with limited knowledge of the future. This theme, in the nineties, gave rise to two different theoretical pathways under the Keynesian methodology.

New Keynesians move in the context of a general equilibrium in which the future is presumed to be known. Their theoretical contribution is to incorporate different forms of market imperfections in the analysis of the causes of unemployment (Andersen 2000).

Whereas *Post Keynesians* follow the original context of Keynesian methodology, where the future is unknown, implying that the structure of the economy is open and constantly changing (Jespersen 2009).

The *New Keynesian* reference model is very far from the Keynesian positions of the "General Theory", while it seems to be close to the new traditional neo-classical theory. The element that distinguishes them from the neo-classical theory is the assumption that market imperfections may in the short term block the general equilibrium. If the economy is not in equilibrium, as it did with the 2008 financial crisis (Morselli 2010), the New Keynesian model requires a few years until prices and wages adapt to a new long-term equilibrium of full employment. The more imperfections are introduced into the model, the greater the deviation from the state of equilibrium. In this transient phase, even the New Keynesians acknowledge that a temporary increase in effective demand may accelerate the process of rebalancing and thus reduce involuntary unemployment. Then economic policy is able to reduce adaptation time, so that the new equilibrium can be reached more quickly without triggering an inflationary process. (Morselli 2016).

New Keynesians are interested in studying imperfections in labor supply. It is the structure of incentives that modifies the behaviour of the unemployed and creates structural unemployment. In the case where one seeks to reduce unemployment, labour-market, social and fiscal policies are addressed, as the cancellation of demand in this perspective is only of a temporary nature (Layard *et al.* 1992).

To sum up, for New Keynesians, the fight against unemployment goes through an increase in wage flexibility and labour mobility to intercept realistic variations in demand. In addition, even the reduction in social welfare benefits and funding can stimulate job search and productivity growth. In all this, it is possible to see a more realistic development than Lucas's market equilibrium model (1987). The difference is seen in the adaptation mechanisms in which New Keynesians recognize the rigidity of prices and wages that cause slowness and disequilibriums in the path leading to the new general equilibrium.

The other Keynesian current of thought, represented by Post Keynesians, starts from Chapter 19 of the "General Theory", where full occupation was an exception rather than the rule. In addition, the other key point is the importance of expectations for economic decisions. Keynes (1921) in the "A Treatise on Probability" had already analyzed the question: what is meant, with reference to reality, by *rational expectations* when the future is uncertain? This means that Keynes (and Post Keynesians with him) uses the concept of *rational expectations* in a different meaning from New Keynesians, inspired by Lucas. For Keynes, it is not reasonable to expect that the economic system can spontaneously, in a few years, converge towards a general equilibrium. The hypothesis that the future is known with certainty would have been defined by Keynes as irrational (Jespersen 2009).

The formation of post-keynesian expectations excludes that macroeconomic outcomes can be reached on the basis of a generalized microeconomic theory. If this were to happen, aggregation errors would be made. A large number of microeconomic behaviours of different individuals cannot simply be aggregated into a macroeconomic behaviour equation that describes the behaviour of all consumers in a single mathematical equation. This would mean that total consumption can be determined as *n* times the average consumer microeconomic behaviour. This macro-economic behaviour relationship at the micro level must have a series of aggregation errors, which include: that the formation of the expectations of individual households will be different; that families influence each other's future expectations, for example through the effect of neighborhood, publicity and social hierarchies, in which group behavior becomes relevant (Jespersen 2015).

Such aggregation errors occur when, for example, the macroeconomic investment function is based on the investment strategy of an optimal single average enterprise. The scenario is out of control in areas where microeconomic behavior is marked by speculation, which by nature requires that the individual believes he knows the future better than the majority. If all speculators were the same, there would be nothing to trade on, as an exchange between two speculators assumes that the future is valued differently (Jespersen 2009).

The economy is a human activity and, therefore, decisions are made in uncertainty. The future is uncertain and for this reason different decisions of subjective nature are made. This was Keynes's main methodological contribution, i.e. to incorporate uncertainty in macroeconomic analysis (Morselli 2017). It is precisely the element of uncertainty that leads Keynes and New Keynesians' Keynesianism to be in conflict with each other. This is due to the fact that the interpretation of the new New Keynesians has taken as a basis the neo-classical general equilibrium model, which assumes that the future is known with certainty.

Conclusions

Ultimately, in the light of the foregoing, it seems plausible to think that full employment is incompatible with any level of real wage. In fact, is it conceivable that, given the cost structure, real wage growth does not lead to a decline in employment? And is it conceivable that Keynes had something similar in mind when he theorized the stimulating role of "additional demand"?

At this point, we have to agree with Napoleoni (1985), who assumes that the Keynesian representation includes, alongside the "additional demand", a more or less marked inflationary effect. If this were not the case, we would have, theoretically, stable or growing wages and growing employment with a different conception of the above-mentioned concept of living wages incorporating the wider concept of total wages. Rejecting this concept there is the risk of reviewing the entire consolidated structure of distributive theories. Coupling increases in public demand with private demand, preventing inflationary impacts, is possible in a political-social-institutional framework other than capitalism, producing positive effects also on employment levels. In a capitalist context, the same goal is equally possible, for certain periods of time, with rigorous income policies, that is through an agreement on distributive quotas.

We can think of putting next to the private entrepreneur, the public entrepreneur (as replacement), or admitting direct public financing of private consumption demand; but in this context, we would be faced with a mix of Malthusian theories (Malthus 1836), Welfare State and Socialism. A kind of political-economic experiment, the result of extraordinary political-ideological syntheses with a blend of solidarity and ideological conveniences whose outcomes are doubtful over the medium to long run. According to Napoleoni (1985), the responsibility for such ideological mixing is partly attributable to the incomplete formulations of Keynes's "General Theory". He also states: "... so it was that Welfare State and the especially Keynesian policy of propulsion and stabilization entered a state of crisis at the same time, with a contemporaneity that is the image of what their solidarity should have been."

Keynes does not think that there are economic laws that can uniquely determine capitalist 'equilibrium.' Uncertainty is one of the conditions that cannot be eliminated, which can make the equilibrium unstable and precarious. Thus, his goal is to find possible improvements in the techniques of modern capitalism through collective action, beyond the rationale of "*laissez-faire*". By collective action, Keynes means the socialization of investments; that rationalizing intervention of the 'politician' that Weber (1978) sees as natural.

For Keynes in a monetary economy of production combined with uncertainty, the theoretical purity of the innovative entrepreneur does not lead to equilibrium, but to an underemployment equilibrium with an arbitrary distribution of income and wealth. Otherwise, a governed capitalism can represent the closest frame to the most efficient system to achieve economic goals.

In a world characterized by limited knowledge of the future, the danger of committing an atomistic error can be greater at individual level. Uncertainty will be more pronounced at individual, rather than institutional level. It would therefore be rational if collective decisions were taken in areas where a number of individual decisions have consequences that are not immediately recognizable individually. Social institutions in the form of welfare state, collective agreements in combination with a stability-oriented economic policy can limit the effect of the lack of coordination between the micro level and the macro level of the economy. This reduces the risk that an atomistic error will occur in macroeconomic analysis (Jespersen 2009).

Keynesian macroeconomic methodology is based on realism. The main theme has always been trying to figure out how to make rational decisions with limited knowledge of the future; and the consequences of such decisions made in uncertainty. Thus, macroeconomic theory can become abstract; In fact, this is the case with the "General Theory". In the final part of this work Keynes emphasizes what constitutes its main methodological contribution: the object of our analysis is not to provide a machine, or a method of blind manipulation, that gives us an infallible answer, but to provide us with an organic method to devise particular problems; and, after reaching a provisional conclusion by isolating one by one the complication factors, we must return to ourselves and consider, as best we can, probable reciprocal reactions of the factors considered (Keynes 1936, 265).

In order to reach as close as possible to relevant conclusions in the macroeconomic field, it is important that the theory rests on realistic bases. This is the methodological basis for Post Keynesian theories.

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POLITICAL ECONOMY OF TRADE PROTECTION AND LIBERALISATION: IN SEARCH OF AGENCY-BASED AND HOLISTIC FRAMEWORK OF POLICY CHANGE

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Abstract

The paper provides comprehensive review of alternative explanations of the trade policy formation, associated rise of trade protectionism, and difficulties of trade liberalization. Normative economic, systemic, public interest, political, institutional and constitutional economic theories of trade policy, together with political science models of trade cooperation are considered. The paper shows that current research in the area tends to accentuate the factors that entrench trade protectionism, while paying insufficient attention to the role of agency, policy dynamics and informal institutions that may bring in trade liberalization. Requirements for holistic and dynamic analysis of trade policy are outlined.

Keywords: trade policy; protectionism; liberalization; policy dynamics

JEL Classification: F13; F50; P11; Z18

1. Introduction

The topic of trade protectionism and trade liberalization as its dual has been subject to extensive research in economics, political science and international relations over the past few decades. A great majority of research contributions reviewed in this paper tended to adopt one of the two views of trade liberalization – mechanistic (in the sense that removal of endogenous or exogenous factors that bring protectionism will more or less automatically result in free and liberal trade), or reductionist (protectionism can be remedied by dealing with one of the relevant components, e.g. changing organizational structures, rules and institutions, providing expert advice, insulating trade policy from, or exposing it to, systemic economy-wide influences, moderating protectionist lobbying etc).

We posit in contrast that trade liberalization is:

1). A complex undertaking that requires attending to all these factors and integrating them in analytical framework;

2). Driven and brought in through agency, leadership and facilitation of various types; and

3). Involves multiple layers, varying paths and speeds of policy and institutional change.

The respective purpose of this paper is two-fold:

Firstly, to review in a sufficiently comprehensive fashion the existing approaches to trade policy with a particular emphasis on the above-mentioned issues. Not all of the theoretical explanations presented below capture the process of trade policy reform and liberal trade policy formation, and hence it is necessary to identify their deficiencies and outline how the latter can be remedied in the dynamic model of policy regime.

Secondly, to discuss methodological foundations that allow holistic analysis of trade liberalization. We argue that appropriate methodology will have to incorporate policy entrepreneurship and be grounded in dialectical scientific method.

The scope of discussion in this paper is limited to trade policy in the developed economy setting. The analysis of trade protectionism and liberalization in developing countries, while showing some similarities, will require separate investigation.

2. Review of existing theoretical approaches

The theoretical explanations of trade policies originate from several social sciences – economics and political economy, politics and international relations as well as public policy and law. We look at the following theoretical approaches:

1) Normative economic theory arguments stressing the importance of conformity of policies to economic theoretical principles;

2) Systemic views of policy, accentuating the influence of exogenous economic factors on policy outcomes;

3) Public interest views of policy, emphasising the centralisation of the policymaking process and the aggregation of political interests;

4) Political economy approach, seeing policy as an outcome of endogenous formulation process, determined by policy demand and supply forces;

5) Contractarian-constitutionalist perspective, highlighting the role of legal constraints and rules as well as contractual arrangements in shaping policy outcomes;

6) Political institutions arguments, viewing outcomes as a function of formal policy and decision-making procedures; and

7) International cooperation arguments, pointing to political power and negotiation complexities as intermediate variables conditioning policymaking.

2.1. Normative international trade theory

Normative international trade theory (NITT) argues that there exist economic arguments supporting free trade and that free trade is superior to restricted trade or autarky (Kemp 1962, Bhagwati 1987). NITT elaborates on the method of trade liberalisation (multilateral, bilateral, unilateral), the latter being economically superior, but not politically palatable, while the former two bringing concerted reduction in trade barriers, yet instilling reciprocity-based thinking and thereby slowing down liberalisation process (Glassman 1998). NITT also compares various trade protection instruments, and argues in favour of production subsidies as less trade-distorting and against quotes and export subsidies as most distorting (Jones and Kenen 1984).

The main problem with NITT is that the reality of policymaking in most of the sectors is at complete variance with theoretical recommendations, as attested by rare occurrence of unilateral liberalisation, by insulation of many trade domains from liberalisation (*e.g.* agricultural trade) or slow liberalisation progress therein, and ongoing sophistication of non-trade and technical barriers to trade.

Political science scholars (Cohen 1990, Bromley 2006) argue that weakness of NITT lies in its sterility as far as political and institutional determinants of trade policy are concerned. Once these two factors are taken into account, it becomes possible to see that what we consider as policy abnormality or aberration (protectionism) is, in fact, a perfectly logical phenomenon from a political and institutional perspective. The elimination of protectionism would therefore require prior alteration of institutional and political conditions, rather than unsuccessfully trying to force some prescriptions on policy actors.

In this connection, the trade policy logics are numerous and not solely restricted to economic one. Other ideational foundations of trade policy are no less important, including (but not restricted to) traditional Mercantilist (Libby 1992), fairness (Benjamin and Yager 1993), food sufficiency and national security arguments (Winters 1990), managed trade considerations (Lemieux 1989), balance of payments stability argument (Bergsten 1996) and others.

In this regard, protectionism and liberalisation in GATT/WTO may be successfully explained with reference to managed trade logic. Managed trade idea does not imply free trade, but rather mutually agreed protection limits, *i.e.* in sectors where conventional trade barriers are agreed upon and protection limits are established, the new more sophisticated instruments are introduced – both to protect the domestic market (*e.g.* non-tariff barriers) and open foreign markets (*e.g.* US Section 301 sanctions). The GATT/WTO history is thus a continuing attempt by contracting parties to gain market access concessions by agreeing (in early Rounds) on tariff limits, and later by putting in order new instruments that prevent market access. GATT/WTO is therefore not a “free trade charter”, but

a mechanism to prevent closure of markets, to stop countries' continuing marches towards protectionism, while allowing exemptions and loopholes in certain sensitive areas, *e.g.* agriculture (Downs and Rocke 1995). Other trade policy logics likewise are extensions of this managed trade, quid pro quo philosophy.

The presence of multiple logics of trade policy points to following analytical requirements. Firstly, the analysis of trade policy needs to consider contestation of ideas/logics process, with normative economic prescriptions playing important, but not necessarily formative role. The application of sociological institutionalist literature (Hall 1993, Peters 1999), studying the interplay between ideas, beliefs and norms on one hand and institutions and policies on the other, may prove fruitful. Secondly, in contrast to Keynesian view of ideas of economists having their own life and sufficient power to dictate and transform policy (policymaker following prescriptions of some "defunct economist"), the wide spread of logics alternative to free trade suggests that the process of incorporation of economic advice in trade policy should be given proper consideration. In contrast to analysis of economic advice in policymaking in general or economic advice in selected policy areas (Niskanen 1986, Slembeck 1997), the analysis of the roles and functions of policy economists and the effectiveness of economic advice in the trade area has been scant (Evenett 2007 stands as exception).

2.2. Systemic explanations of liberalisation

Systemic explanations of agricultural protectionism postulate that the level of protection, the directions and objectives of trade policies are functions of broader economic and societal factors, such as balance of payments position of the country, the state of the budget, as well as prices (exchange rates, commodity and input prices). Specifically, as a result of changes in these factors, policymakers will have to consider whether current trade policy arrangements are sustainable and do not require any modifications, or the trade policy has to be reformed (in a radical or incremental way).

The majority of systemic explanations of trade policy assume that adverse economic conditions delay movement to a liberal economic regime and increase the supply and demand for protection (Gallarotti 1985, Gourevitch 1986, Wallerstein 1987). The demand for protection may come from affected sectors or industries (e.g. with no protection, profits of a particular sector are eroded by foreign competition), but also due to broader cyclical downturn (fall in aggregate demand and profits).

Stern (1987) however made certain clarifications to the general proposition – he argued that protectionism may be on the rise, even if a country's overall economic position is sound. This was the case of US trade policy in the early 1980s - the economy was growing, but the fortunes of certain US industries (steel production and car manufacturing) were eroded, leading to the call to protect these industries.

The alternative hypothesis (Rodrik 1992, 89) is that adverse systemic factors may be instrumental in protectionism removal by "enabling radical reforms that would have been unthinkable in earlier times."This is the case when the political and economic costs of sticking to protectionist and interventionist policies become higher than costs of adjustment. The deeper the crisis, the quicker comes the radical reform.

Gourevitch (1986) argues that reaction of trade policy to crisis is largely country specific: new policies can be profoundly different for similar-type economies. It is left unanswered nonetheless why this happens and whether there are any regularities in the responses. To understand the specificities of policy outcomes, one has to acknowledge that there exists no "general" transmission mechanism and that policy action is contingent and is driven by a unique and quite "anarchic" combination of building blocks – ideas, behavioural patterns and moves of particular people.

Also, while a dire economic situation indeed instils positive attitudes in policymakers towards change, it may be insignificant or even incidental to the speed of reform (Rodrik 1996). The latter is the function of problem recognition and agenda setting activities, the design of solutions to policy problems and resolution of policy conflicts.

The possibility of differential responses to crisis was evident in agricultural protection case. Agricultural recession in the 1920s and the Great Depression led to the rise of agricultural protectionism and agricultural welfare state in the USA, Western Europe and Japan (Winters 1987, Sheingate 2001). However, the period of low commodity prices in early 1980s led to different outcomes, in line with two alternative systemic explanations. Australia and the group of agricultural exporters began the campaign for a more liberal agricultural trade regime (Botterill 2004). Likewise, USA experienced the transformation of agricultural policy system with increasing number of policymakers lobbying for agricultural trade liberalisation (Browne 1995). Europe continued to resist agricultural trade liberalisation (at least in the early 1980s). However, the first agricultural trade liberalisation agreement in GATT history, signed in 1994, was only partially affected by these responses; decisive factors for liberalisation success were agenda setting and management, facilitation activities by many parties and judicious negotiations, conducted over almost a decade.

2.3. Public interest explanations

The early stream of literature attempting to explain public policy (including economic policy) adopted distinctly mechanistic and functional view of policy. It conceptualised the state as a single decision-making unit that acts for the interests of society as a whole.

Policy problem was in this regard a purely engineering one, with benevolent bureaucrat being a central figure in policymaking process (Tinbergen 1952). The analysis refrained from the consideration of competing political interests, ideas and the like in the dynamic setting, and instead conceptualised policy as social welfare maximization, using social welfare and political preference functions (SWF and PPF) as analytical tool.

In trade policy analysis, functionalist views were presented in 1). The analysis of common commercial and common agricultural policies in the EU in the early formative years and of the debate on role of elite technocrats in forming EU policies (Haas 1958, Rhodes and Mazey 1995), and 2). The analysis of agricultural protectionism and liberalisation (Paarlberg and Abbott 1986, Tyers 1990, Johnson *et al*. 1993).

Regarding PPF method, Bullock (1994) pointed to following methodological features of the approach: specification of power/weights of relevant interest groups; endogenous determination of equilibrium policies; arbitration by policymaker of conflicting objectives of interest groups; maximization of producer, consumer and taxpayer utilities within PPF; possibility of the analysis of welfare effects of alternative policies.

Numerous aspects of public interest theory and PPF method in particular came under scrutiny (Borcherding 2002): unlikelihood of real-life policymaking in a "top-down" directive fashion; inability by policymakers to get information about social preferences and order them; inherently subjective nature of preferences and the impossibility of inter-personal comparisons of subjective utilities; the absence in the functionalist view of multiple policy actors (interest groups, broader community or individuals within government) except for economic experts; restriction of economic and policy advice to supplying advice on how to reach the predefined "ends" with best available "means" without questioning the nature of those "ends"; the absence of normative views and ideas in the functionalist view; reduction of policy entrepreneurship and agency to political technology, defined vaguely as "improved means to negotiate the allocation of society's welfare".

2.4. Political economy explanations

Political economy (PE) models and theories attempt to explain such anomalies and inefficiencies observed in policymaking, as disproportionate involvement of particular groups; excessive and concentrated appropriation of political benefits; spreading the costs among all taxpayers; rent seeking activities are usual practice in policymaking (Krueger 1974, 1995). In contrast to older political science literature and Marxist views documenting policy capture by organised business interests (Schattschneider 1935, Chase-Dunn 1995), neo-classical political economy (Chicago and Virginia schools) view policy formation in terms of political market equilibrium (Johnson 1992). PE explanations of trade policies and trade protectionism thus fall in three streams – explanation of protectionist demand formation, explanations of supply of protectionism and role of the state in the process, and equilibration in a political market for protection.

Regarding demand side, the endogenous trade policy literature examined the rationales of demands for protection (Goldberg and Maggi 1999), specifically the link between the characteristics of economic environment (in which firms and businesses are placed) and the level of protection. It was established that more competitive industries typically demand freer trade, while industries that are sensitive to import competition usually oppose trade liberalization (Matsuyama 1990, Gilligan 1997, Chase 2003); protectionist demands are positively correlated with unemployment levels, declining profit rates, negative GDP dynamics and capacity utilisation (Bauer *et al*. 2007, Magee and Brock 1989); higher industrial concentration levels are also leading to higher demands for protection (Caves 1976); while labour intensive industries are more prone to demand protection (Helleiner 1977). A special case of firms (likely to benefit from export expansion or cheaper intermediate inputs) demanding free trade and liberalisation was mentioned by Odell (1993).

Recent contributions (Hiscox 2002) emphasized formulation of protectionist demands based on factor ownership (rather than on industry or sector lines). Factor endowment and factor returns were considered to be equally important (hence factor ownership as a determinant of policy preferences and demands). Synthesis of old and new literature suggests that depending on whether Stolper-Samuelson or Ricardo-Viner theorems hold, two types of protectionist coalitions are possible – one among production factors of the same industry (industry line coalition), when business and labour have same preferences (Rogowski 1989), and the other among factor owners of different industries (factor based coalition, Gourevitch 1986).

More recent literature examined variations of lobbying depending on institutional setting, *e.g.* lobbying executive versus legislative branch (Bennedsen and Feldmann 2002); lobbying in different electoral systems

(Besley and Coate 2001); and also expanded the concept of lobbying – informational lobbying, role of lobbies in agenda-setting (Anderson and Zanardi 2004).

PE explanation of policy supply side (*i.e.* provision of protection) considered the basis upon which policymakers form their preferences, and the degree and mechanics of autonomous operation of the government in formulating policies.

The early view of government as a "clearing house", conceptualised government as a passive translator of electoral votes or protectionist demands into policy: for instance, Caves (1976) posited that industries with the largest number of votes become crucial in elections, and hence policymakers tend to grant protection to the industries. In contrast, Krueger (1990) argued that as policymakers do not know the preferences of all voters or groups, they tend to align with those industries (voters) who have already established their preferences (identity) in order to retain their contribution (votes). Fieleke (1976) noted that protectionist motives of governments are based on public concerns about inequality and the overall increase in living standards. Hence protection is granted to those who are less able to adjust in the face of increased import penetration.

State and policymakers' own views of trade protection or liberalisation were also examined: specifically such issues as trade policy preferences of US government and resulting pro-free trade redirection of US trade policy in the 1980s (Bauer *et al*. 2007); or changing preferences of Western European governments in late 19th century and resulting move towards free trade (Kindleberger 1975).

Regarding autonomous operation of government in trade policymaking, several aspects of the issue were looked at. Katzenstein (1978) distinguished between "weak" states that are unable to resist private interest pressures and exercise leadership (USA) and "strong" states that are able to do so (France, Japan). The levels of protection were argued to be higher in the former. Davis (2005) noted that in such areas as agricultural trade, the level of protection is as high (or higher) in "strong" states as in "weak" ones. Vernon (1991) mentioned that that state autonomy and separation of executive bureaucracy from organised interests and parliamentary politics may indeed be artificial and exaggerated, as attested by the well-known practice of "revolving doors", symbiosis of business, legislatures and executive branch, formation of policy "iron triangles", present in both "weak" and "strong" states. PE literature also deliberated on the responsiveness of government to lobbying, its interest in the issue being lobbied (Grossman and Helpman, 2001); as well as varying interest of government in protecting certain sectors/industries (Rogowski 1989).

PE literature on policy supply side also outlined factors that prevent policy reform (trade liberalisation). Lindblom (1959) and Allison (1971) discuss such organisational practices within state as searches for "good enough" rather than "best" solutions (satisficing); limitation of the repertoire of policy choices by following the existing organisational routines; organisational parochialism; "muddling through" and incrementalism as a dominant mode of policy making – all making succession of policy regimes and reform difficult or hardly possible. The applications of these concepts in trade policy realm (specifically agricultural trade policy) included Petit (1985) and Josling and Tangermann (1996). In some trade policy areas (*e.g.* agricultural protectionism) the problem was seen as particularly pressing.

Likewise, PE research analysed bureaucratic behaviour and pointed to increased autonomy of economic (including trade policy) bureaucracy from top leadership and legislative branch; unwillingness to change and adapt; incongruity between bureaucratic preferences and preferences of other stakeholders; and related problems (Finger *et al*. 1982, Messerlin 1983).

The analysis of political market operation and equilibrium concerned two problems – the relative influence in the political markets, and optimality/stability of attained equilibria. Regarding former problem, the debate has been ongoing about the role of voters in policymaking, specifically rational ignorance of voters and their relative unwillingness to participate in policymaking (Downs 1957, Brennan and Buchanan 1984), giving rise to voting models literature. Applications to trade policy included (Dutt and Mitra 2002). Another aspect tackled related to collective action problems in political market (Olson 1965). Literature demonstrated that equilibrium policies are typically heavily skewed towards business interests, principally due to their substantial power and organisational ability, compared to diffuse and weak consumer groups and other stakeholders (Gawande 1998). Regarding optimality/stability of equilibria, Chicago-school economists (Becker, Stigler) adopted an efficiency view of political market, with policy capture by powerful interest being only transient and triggering political reordering competition from counter interest groups. In contrast, Virginia-school (Tullock) emphasized persistence of sub-optimal equilibria, principally due to rent-seeking activities.

The assessment of PE literature suggests that PE explanations are potent in explaining entrenchment of protectionism, but have little analytical instruments to explain trade policy dynamics and liberalisation. While endogenizing policy (by considering aggregation of preferences and interests), PE explanations pay little regard to

the content and origins of economic interests, goals of actors, formation of policy rules and institutions, as well as policy agency.

2.5. Contractarian and constitutional economics explanations

In contrast to political economic models that demonstrate contradictions and failures in the policy domain and point to the stability of this state, contractarian and constitutional economics (CCE) is preoccupied with change and dynamics issues – how trade protectionist entrenchment can be overcome and how the formation of a liberal regime can be facilitated. CCE accentuates institutions as driving forces of policy regime change – rules and procedures are assumed to mitigate protectionist preferences and channel political action into a more liberal direction. CCE sees incompatibility between existing protectionist and interventionist policies and individual welfare (which necessarily presumes the right of individuals to enter freely into contracts, i.e. "right to free trade") – hence rules have to be devised and effectively enforced that would ensure contractual freedom and thereby individual welfare (Gwartney and Wagner 1988, Buchanan 1986, Buchanan 1987).

Thus, the only mechanism to prevent vested interests from benefiting from protection is to erect constitutional constraints that decrease the attractiveness of achieving economic goals by political means (*e.g.* by lobbying). These constraints will obviously have to be imposed at the domestic level (*i.e.* at the origin of the problem) and be complemented by international commitments by individual states, subjecting their national policies to mutually acceptable terms, which thereby have a similar function to national constitutional rules (Moser 1989, Tumlir 1983).

Several practical constitutional constraints were proposed for trade policy at domestic level – restricting the power of legislatures to impose trade barriers (Rowley *et al*. 1995); "generality constraint" on trade policy and the introduction of a flat tariff that would preclude non-uniform protection across industries (Parisi 1998).

At international level, the following constitutions were proposed - establishment of a set of rules (international legal regime) that provide a structure of obligations and liabilities that prevent free riding and opportunism (Guerrieri and Padoan 1988, Kovenock and Thursby 1992); a set of reciprocal obligations imposed on each nation state that allows each to contribute to the public good, conditional on the assurance that others would do the same (Sugden 1984).

It was noted that reciprocity was working well in the case of industrial products' trade liberalization, but not in agriculture. The problem was attributed to the lack of distinction between policies that had to be regulated by domestic rules and those that had to be regulated by international ones; the lack of distinction between the distorting effects of different trade policy instruments and the lack of legal control over the most distorting ones; as well as the weak enforcement of international trade rules in the GATT dispute settlement mechanism (Petersmann 1988, Reinhardt 2001).

The major contribution of the CCE to policy analysis was in pointing to the core issue of public policy – stable order is achieved "only if the differing interests … can be traded-off or compromised, actually or symbolically, in a social contract." (Buchanan and Vanberg 1977, 171). Emergence of a liberal (or any) trade policy regime was thus seen as a result of the reduction of contradictions between various interests.

However, not all contracts satisfy the normative requirements mentioned by Buchanan: while the social contract is to rest (to the highest possible degree) on liberty, in real life it frequently compromises natural rights, particularly the "right" of free trade. Also, there is no embedded mechanism that ensures attainment of superior social contract (constitution) due to ideological and material conflicts pervading the policy system.

Buchanan is certainly right in that "good" rules are the prerequisite for non-contentious political behaviour: for instance, the post-war GATT conflicts in the agricultural domain were the result of "bad" rule writing (agricultural exceptionalism) at the outset. We, following Wegner (2004), see it as unrealistic however that constitution making and creation of social contracts (policy order) are non-conflictual processes with consent and constitutions achieved/changed effortlessly and instantaneously by some constitutional designer or reformer.

Thus, trade liberalisation analysis has to answer the following questions. Who will instigate and drive the above processes. Will that someone think and act in a re-distributional or collective welfare fashion? Will entrenched actors desist from opposition? Will pro-change actors be powerful enough? And so on. It is thus necessary to endogenize constitution making – indeed Herrmann-Pillath (2006) proposes seeing GATT reciprocity rules as an outcome of continuous constitutional bargaining.

2.6. Political institutions explanation

Political institutions literature examines the influence of formal policy and decision-making procedures, structures and configurations on policy outcomes, and argues that modifications to political institutions are likely to result in protectionist (or in contrast free trade) policies.

Early literature on trade policymaking institutions (Goldstein and Lenway 1989, Destler 1996) attempted to explain trade protectionism as a result of how easily organised interests can penetrate legislatures. In contrast, more liberal policies result from greater power of executive branch in trade policymaking. Later research (Persson and Tabellini 1999, Olper 2001, Thies and Porche 2007) focused on comparisons of the protection levels in democratic versus non-democratic systems, on the effects of different party structures, decision rules, organisation of legislatures, federations, and civil liberties levels on protectionism. It was shown (Ruppel *et al*. 1991, Lohmann and O'Halloran 1994) that protection levels positively correlate with multi-party democratic institutions (where legislatures are less insulated from organised interests and multiple veto players are present), and federal systems (lobbying at multiple levels of government, possibility of free-riding at sub-national level).

Literature on delegation of authority to executive branch (Destler 1996, O'Halloran 1994; Bauer *et al*. 2007) stresses the need to insulate trade policymaking from domestic pressure, as well as ensure efficiency of trade negotiations.

European research focused on complexities of decision and policy making within EC trade policy system. Pollack (1997) argues that despite original intent of European Commission autonomy, then European Commission was frequently subverted by protectionist interest (particularly in case of agricultural trade policy formulation and operation of Directorate General for Agriculture). The relationship between Commission and members of protectionist networks were poorly articulated too (Mazey and Richardson 1993, Daugjberg 1999). Likewise, unanimity rule and the need to accommodate the preference of protectionist members of EC (Murphy 1990, Meunier and Nicolaidis, 1997) were leading to increased transaction costs associated with time and efforts of reaching consensus. Specific issue of EU decision-making related to EU policy preference formation: i.e. whether EU was a transformer of member states' preferences (Wendt 1994), or purely messenger with ultimate negotiation and international treaty approval power resting with member states (Moravcsik 1991).

Institutionalist literature identified several possibilities for institutional reform:

1) Formation of new institutional arrangements that would decrease the costs of organising, and introduce new actors (*e.g.* consumer interests) into closed policy communities, thereby helping to detach policymakers (the Commission) from vested protectionist interests (Rausser and Foster 1990).

2) Creation of institutional structures that would prevent rising external costs and appropriation of other actors' benefits, for example, by re-nationalising policies that operate at supra-national level and preventing free-riding by EC member states, or by delegating income redistribution policies to the national level, while retaining structural and efficiency improvement policies at the supranational one (Koester 1991).

3) Reform of voting and separation of power arrangements that would reduce veto points in the decision procedure and allow the executive branch to work in tandem with the stable parliamentary majority. That is, adoption of a majoritarian rather than presidential or proportionate representation system (Tsebelis and Yataganas 2002).

4) Legitimisation of direct democracy instruments (referenda) that can help bypass protectionist opposition in legislatures (Feld and Schnellenbach 2007).

It appears that the major shortcoming in institutionalist literature is as follows:

Assessment of political institutions literature suggests that it is not sufficient to write up new procedures and erect new political structures that would stipulate a particular course of decision making. Formal institutions cannot change the preferences of actors and predominant consensual views on policy. It still does not eliminate possibilities that protectionist policies would be formulated and adopted, because underlying consensual policy ideology is left intact.

Also, political institutions literature seems to underestimate the role of political machinations that lead to adoption of particular formal political institutions and, most importantly, the actual processes of policy construction that may vary dramatically even within the same formal institutions and structures, thereby indicating supremacy of agency analysis over the study of structures.

2.7. International economic power and cooperation explanations

International relations and politics literature has long related the shape and content of international economic policies and economic order to the stability, hegemony, or in contrast, anarchy in international system.

As put by Kindleberger (1986) and Lake (1993) among others, the early thinking about the problem considered that stability of the international system can be achieved in the presence of one power-hegemon

(hegemonic stability) using its power to structure international economic regime as well as prevent the enactment of undesirable changes. It was argued that US hegemony after WWII until early 1960s allowed preventing within GATT system protectionism and closure of international markets in many trade areas (industrial products), while allowing (or not preventing) protectionism in others (*e.g.* agricultural trade). US hegemony has been gradually eroding (including in trade domain) over the post WWII era.

The inadequacy of hegemonic stability explanations to account for the realities of the 1970s-1980s (rise of new economic powers) led theorists to recognise that the demise of the dominant power returns the international system to a state of anarchy, in which economic interdependence enhances and is a source of international economic frictions (Keohane 1998).

Thus, analytical focus shifted towards analysis of "soft" power, as was demonstrated by pro-liberalisation position of the USA in the Uruguay Round (Wiener 1995), or the analysis of international cooperation and conflict resolution in complex and interdependent setting (Nye 1990, Stein 1990).

The latter research stream stressed the need for rules and norms that ensure stability of interactions between states; minimise certain "bargaining perversities" (defection, free riding, heterogeneous interests etc.) preventing the achievement of international policy outcomes that are mutually beneficial to all involved; as well as ensure the modification and adjustment of countries' policies - which would all lead to greater cooperation (Webb 1995).

Cooperation models, applied initially to the analysis of international macroeconomic cooperation (McKibbin 1988) stressed Pareto-improving nature of cooperation, delivering benefits to all members of international system, and eliminating negative externalities (*e.g.* currency wars). The early analysis of cooperation in international trade policy (Mayer 1991) examined three types of international trade games: pre-emption game between two countries, where each (or only one) country tries to set pre-emptively the tariffs above Nash equilibrium level; exploitation game, where one country chooses free trade, while other sets tariff; and cooperation game, when both countries set optimal tariffs and where welfare of both parties is maximized.

The contributions of the "new economics of organisation" and "transaction costs economics" (Williamson 1990) to international economic cooperation field were also salient, specifically application of such concepts as credibility and reputation in policy cooperation; opportunistic behaviour and associated tendencies to renege on agreements and free-rise; bounded rationality of individuals and the associated problems of the imperfect information; and the like.

Scholars thereby called for such international institutions and practices, as establishment of the bilateral ordering of the international disputes, damage limitation through third-party arbitration, an alignment of incentives in international trade policymaking through hostage-like arrangements, as well as further strengthening of the reciprocity principle as a way of signalling continuity and predictability of relations among trading parties (Yarbrough and Yarbrough, 1986, 1990, Weber 2000).

None-withstanding the above advances, political science recognised the importance of domestic cooperation for achieving international cooperation (Milner 1997), giving rise to conceptualisations, where preferences and payoffs are determined domestically.

Two-level games models (Putnam 1988) are indicative of this development. These models point to the impact of domestic constraints (principally due to need for domestic ratification of international agreements) giving international negotiators advantage during talks and preventing them from making concessions. Two aspects associated with domestic ratification are emphasized - domestic institutional structure, that allows (or prevents) easy passage of the agreement concluded at the international table, such as President's "fast-track authority" in the US (Destler 1996); and the presence of domestic constituents or impediments in domestic system that may delay/preclude ratification (*e.g.* Council of Ministers in EU and national parliaments in member states). Applications of two-level games to trade policy have been numerous including non-formal (Mayer 1998) as well as mathematical models (Grossman and Helpman 1995).

Related stream of research (Schoppa 1993, Mulgan 1997) examined the ways to release and work through domestic constraints in the country resisting liberalisation, and finding domestic allies in a target country that support foreign demands. Several strategic actions (threats, reverberation, tying hands and linkage) were identified.

Early two-level game and cooperation models, whilst introducing dynamics and agency into the analysis, tended to adopt rather rigid view of two-level interaction (international talks followed by domestic ratification), when in reality a more complex interplay between domestic and international processes could be possible. Likewise, smaller consideration was given to instrumental issues and negotiation technology (actions and behaviour that would make agreement possible, leadership and control during talks, change in domestic preference and the like).

These shortcomings have been remedied by adopting and applying concepts from a broader literature on international negotiation that examines other areas as well – international security, environment and others (Davis 2005, Meunier 2005).

The following concepts and dimensions were incorporated among others in the trade policy analysis – information, commitment and credibility as sources of bargaining advantage (Lake and Powell 1999); negotiation context, including context of the two-level game (Davis 2005); type (offensive/defensive) of negotiation (Meunier 2005); the choice of and influence of negotiation forum (Morrow 1994, Fearon 1998); legitimacy of negotiation demands (Schoppa 1993); negotiation styles, personality of negotiators and their leadership and steering capability (Winham 1979); behavioural orientations (Walton *et al*. 1994, Odell 2002); presence of external stakeholders and expert groups (Sebenius 1992); coalition-building in a multilateral setting, multilateral cooperation, as well stages, including agenda-setting processes (Hampson and Hart 1995).

3. Theoretical approaches – state of affairs

The policy theories discussed above vary in terms of holistic and agency-based analysis of trade policy. The normative international trade theory view is manifestly non-dialectical, assuming that trade policies could automatically follow from economists' prescription. In contrast, the systemic view attends to change and policy transformation, but treats them as processes that are exogenously induced from outside the policy system. Hence, the review of endogenous policy formation approaches is required. The first of them (public interest explanation), however, trivializes endogeneity, resting on the unrealistic "single decision maker" assumption and ignoring policymaking conflicts by concealing them in social welfare and political preference functions. The second approach (political economic) clearly elucidates the clash of interests and contradictions in the policy system, which results in policy sub-optimality, but does not show how the resolution of these contradictions can be instrumental in reforming the old and creating new policy orders. Instead it sees policies as stable and (when Chicago-style political economy is concerned) efficient equilibria. In this respect, the contractarian-constitutionalist perspective is useful in outlining the conditions of contradictions' resolution (writing rules and establishment of constitutional framework), but is more naïve about the effectiveness of constitutional rules and the feasibility of constitutional reform (not specifying how the rules are created). Likewise, political institutions analysis, while specifying procedures and mechanisms that could decrease the degree of protectionist entrenchment and thereby bring liberal policy regime, assumes away the actual processes of formal institutions' formation. The final approach that was examined (international cooperation) is essential in that it adopts the dynamic view of policymaking and also integrates international and domestic policy domains. While some models within the approach attempt to specify the exact actions that policy participants make to agree upon policy, nonetheless the approach is mostly concerned with negotiation aspect of trade liberalization, while disregarding broader processes of institutional formation, agenda setting, consensus-making and policy experimentation.

Overall, despite clear advances (identification of key prerequisites for policy formation and change, including institutional and ideational factors, and consideration of interactive aspects of policymaking in some explanations), a complete framework of policy dynamics in trade domain is still beyond reach. The analysis of Canada-US trade negotiations (Dawson 2005) that incorporates agenda-setting models (adopted from public policy and administration literature) within two-level negotiation framework stands as notable exception.

Conclusion – requirements for holistic and agency based analysis

Prospective frameworks for trade liberalization analysis are likely to address following matters.

Firstly, it appears that analysis of trade protectionism entrenchment and of trade liberalisation (which necessarily takes place at both domestic and international domains) are two distinct methodological undertakings. While it is true that removal of factors that encourage protectionist, policies is a necessary condition for trade liberalization, it is unlikely to be a sufficient condition. This is due to the fact that even most favorable prerequisites for free trade policies need to enhance and amplified by relevant policy action.

Secondly, due consideration should be given to those methodologies and theories that are suited specifically for the analysis of policy change, rather than policy entrenchment. In this connection, constitutional economics that stresses importance of rules and constraints will be useful only as a starting point for the framework construction (McKeown 1986). This is confirmed by Lieberman (2002, 698) stating that:

"Institutional theories share an emphasis on finding order and stability, comprehensiveness and coherences, patterns and models that elucidate more or less general propositions about a class of political phenomena. Because of their emphasis on eliciting ordered patterns and regularities from observations about politics, institutional theories in general run into trouble in accounting for political change."

Likewise, as put by Peters *et al*. (2005, 1278):

"…without including some dynamic conceptions of agency, the approach [institutionalism] cannot provide an adequate explanation of change. … it is crucial to build a greater role for agency into this structuralist theory. The identification of agent(s) becomes the means through which internal disagreement can be translated into change activity."

We argue that a more fruitful way forward is to start with negotiation and international cooperation models, but also to conceptualize trade liberalization as negotiation in the broadest possible sense, as negotiation along various lines and within broad political-economic context (this approach should be contrasted to usual negotiation models that tend to preoccupy with negotiation "technology" and processual details).

Another methodological issue that requires attention is the multi-layered and contradictory nature of trade liberalization. Firstly, the path and speed of liberalization process is important. The literature on policy paradigms (Hall 1993, May 1992) suggests that reform of any policy is triggered and enabled by failures/malfunctioning of existing policies (and importantly requires recognition/learning by policymakers of the fact that old policies stop working). Thus, the phenomena of accumulating inconsistencies, modest liberalization and in contrast, qualitative leaps and jolts in the policy system that allow speedy progression to free trade need to be accounted for. Secondly, the completeness and degree of trade liberalization is salient. Depending on the change processes, the outcomes may include either complete disappearance of previous protectionist order or more moderate results (when some of the older features are retained). Varying liberalization progress in GATT/WTO across negotiation areas (e.g. agriculture versus manufactured goods) or even within area (varying treatment of agricultural support instruments) attest to complexities of compromise and concession making, as well as insufficient policy leadership and advocacy in many areas. Thirdly, the new policy formation is likely to require two building blocks (Harris and Milkis 1996, Wilson 2000) - construction of policy instruments and mechanisms in the course of policy negotiations, as well as construction of underlying policy institutions. The latter process is likely to involve rational calculation, but also contestation of ideas, (counter-) framing and eventually achievement of consensually-held view that will be translated in formal rule (institution). The important feature of new policy formation process is that institutional construction is likely to delay policy negotiation. The experience of latest GATT/WTO rounds suggests that little breakthrough in international talks will be attained until consensual institution (based on shared frame or view) germinates.

On an applied side, several avenues for holistic and agency based research in trade policy are present. Firstly, the policy agenda-setting theories may be useful, specifically multiple stream model of Kindgon (1995) that examines policy problem recognition, proposal of solutions and political selection processes. Secondly, the "advocacy coalitions" framework (Sabatier and Jenkins-Smith 2007) may be instrumental in identifying ways to establish consensus or facilitate convergence between opposing coalitions. Thirdly, models of policy learning (Hall 1993) and punctuated policy changes (Baumgartner and Jones 1993) may contribute to understanding incremental and non-incremental changes in protectionist policies at domestic level. Finally, a policy entrepreneurship approach (see Shockley 2007 for tentative outline) that classifies and analyses multiple types of entrepreneurial behaviour at agenda-setting and negotiation stages (leadership, incremental experimentation, facilitation, advocacy and consensus-building, operationalization of problems) may be applicable.

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OPINIONS ON THE THEORIES OF SAVAGE AND DE FINETTI

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Abstract:

Feduzi, Runde and Zappia (2012, 2014, 2017) have claimed repeatedly that de Finetti and Savage formally allowed imprecise , indeterminate, non-additive probabilities to be used by decision makers in their normative theory of decision making .The only way that non additivity can be formally incorporated into a decision theory is by the use of a variable similar to Keynes's w or Ellsberg's ρ. Nowhere in anything written by de Finetti and/or Savage in their lifetimes does any such variable appear in their formal theoretical analysis or in any of their supporting axioms. Savage stated that he did not know how to integrate such a variable that would take account of vagueness, into the additive probability measure that represented his formal, normative theory. Feduzi, Runde and Zappia (2012, 2014, 2017) have misinterpreted the de Finetti and Savage concerns and sympathy for vacillating ,indecisive decision makers, who were confronted with vague and ambiguous evidence, with their recognition that defining one's personal probabilities can be a difficult task ,with the erroneous and mistaken belief that de Finetti and Savage incorporated a role for imprecise and indeterminate probabilities within their formal, subjectivist, normative theory of probability and their SEU decision theory ,which rests completely on additive probability.

Keywords: indeterminate; imprecise and precise probabilities; interval valued probabilities

JEL Classification: B10; B12; B16; B20; B22

1. Introduction

This paper is organized in the following manner. Section Two presents Savage's formal, normative theory of subjective probability that underlies his normative theory to maximize subjective expected utility (SEU). This formal, normative theory is based on several axioms. A brief summary of these axioms and the normative rule to maximize SEU is covered. There is no role in the formal, normative theory for imprecise, and certainly not indeterminate, probabilities that are interval valued. Savage's normative theory is representative of de Finetti 's normative theory and of any developments of the normative theory carried out by means of co-authorship between themselves. Section Three looks at Keynes's mathematical representation and incorporation of sub and non-additivity in his conventional coefficient of weight and risk, c, and his corresponding, explicit introduction of non-additivity into Part II of the A Treatise on Probability. Section Four demonstrates that NOWHERE in any of the articles published by Feduzi, Runde and Zappia (2012, 2014, 2017) do they ever show where Savage, de Finetti, and Savage and de Finetti, supposedly introduced into their formal, normative theory ANY role for sub or non-additive probabilities.

2. Savage's Formal, Normative Theory of Maximizing SEU

Savage's formal, normative theory, to maximize SEU using additive probabilities, is based on the following seven axioms that are presented in summary form below. All seven of these axioms were accepted by de Finetti.

Axiom A.1 states that "the preference relation is transitive and that all acts are comparable." (Karni 2005, 5; Savage 1954).

Axiom A.2 states that "the preference between acts depend solely on the consequences in states in which the payoffs of the two acts being compared are distinct." (Karni 2005, 5; Savage 1954).

Axiom A.3 states that" the ordinal ranking of consequences is independent of the event and the act that yield them." (Karni 2005, 5; Savage 1954).

Axiom A.4 states that "the betting preferences be independent of the specific consequences that define the bets." (Karni 2005, 5-6; Savage 1954)

Axiom A.5 states that "the decision-making problem and the qualitative probabilities (are) nontrivial by ruling out that the decision maker is indifferent among all acts." (Karni 2005, 6; Savage 1954).

Axiom A.6 states that "no consequence is either infinitely better or infinitely worse than any other consequence". It "implies that there are infinitely many states of the world and that if there exists a probability measure representing the decision maker's beliefs, it must be nonatomic. Moreover, the probability measure is defined on the set of all events, hence it is finitely additive (that is, for every event E, $0 \leq \pi(\mathrm{E}) \leq 1, \pi(\mathrm{S}) = 1$ and for any two disjoint events, E and E_0, $\pi(\mathrm{E} \cup E_0) = \pi(\mathrm{E}) + \pi(E_0)$)." (Karni 2005, 6; Savage 1954).

Axiom A.7 states that there is a "is a monotonicity requirement asserting that if the decision maker considers an act strictly better (worse) than each of the payoffs of another act on a given non-null event, then the former act is conditionally strictly preferred (less preferred) than the latter." (Karni 2005, 6; Savage 1954).

Savage's formal normative theory, Subjective Expected Utility (SEU) states that "Let < be a preference relation on F. Then the following two conditions are equivalent:

(i) "<" satisfies axioms A.1-A.7.

(ii) There exists a unique, non-atomic, finitely additive, probability measure π on S such that $\pi(\mathrm{E}) = 0$ if and only if E is null, and a bounded, unique up to a positive affine transformation, real-valued function u on C …" (Karni 2005, 7-8; Savage 1954)

Thus, the formal, normative goal of the decision maker is to Maximize SEU.

There is absolutely no role in this formal, normative theory for non-additive or sub additive probabilities (imprecise or indeterminate interval valued probabilities) whatsoever.

3. Keynes's normative theory of indeterminate and imprecise probability based on Boole's upper and lower probabilities.

Keynes's logical theory of probability was developed technically in Part II of the *A Treatise on Probability* (TP 1921). In Chapters 10-14 of the TP, Keynes provides the first formal foundation in mathematical logic for the probability calculus based on additivity. However, at the same time, he introduces non-additivity explicitly into the discussion. In chapters 15-17 of the TP, Keynes provides the reader with 17 worked out problems, based on Boole's lower-upper interval valued probability approach presented on pp.265-268 of *The Laws of Thought* in 1854, that show how an interval valued approach to probability works. Many of the probability intervals are indeterminate, meaning that the additional, missing evidence is not going to become available to the decision maker in the future. Boole was the first to introduce indeterminate probability. In chapter 29 of the TP, Keynes introduces imprecise probability based on the application of Chebyshev's Inequality as a lower bound.

The introduction of non-additivity by Keynes is explicit. Apparently, no economist read this material in the 20th century. Let us start by providing Bertrand Russell's assessment of Part II of the TP. (see Russell 1931, 1932, 1959, 1996):

"Part II. "Fundamental Theorems", gives the definitions and axioms upon which the formal reasoning of the rest of the book is based, together with some propositions readily derivable from the definitions and axioms. It is impossible to summarize this Part, since it is already as condensed as possible. I cite only, as essential to the whole formal structure, the definitions of addition and multiplication: Addition: $\mathrm{ab/h} + \mathrm{a}\bar{b}/\mathrm{h} = \mathrm{a/h}$ (where $\bar{b}$ stands for not $-b$). Multiplication: $\mathrm{ab/h} = \mathrm{a/bh} \cdot \mathrm{b/h} = \mathrm{b/a\,h} \cdot \mathrm{a/h}$. Thus, addition and multiplication are not defined for any pair of probabilities, but only for such as have certain forms. This, of course, is connected with Mr. Keynes's view that probabilities are in general non-numerical. It is surprising how successful he is in raising his mathematical superstructure upon foundations which might have been thought inadequate to support" (Russell 1922, 121; boldface added).

Thus, Russell immediately understood that Keynes was introducing non-additivity explicitly. Note Russell's correct assessment above that Keynes's probabilities are generally non-additive. The probabilities of Savage and de Finetti are always additive (see Vicig and Seidenfeld 2012).

Keynes repeats his concerns about the general non-additivity of probability all through Part II of the TP.

Keynes's First statement concerning non-additivity is that

"IX. The Definition of Addition: $\mathrm{ab/h} + \mathrm{a}\bar{b}/\mathrm{h} = \mathrm{a/h}$, where $\bar{b}$ stands for the contradictory of b.

X. The Definition of Multiplication: ab/h = a/bh·b/h = b/ah·a/h. The symbolical development of the subject largely proceeds out of these definitions of Addition and Multiplication. It is to be observed that they give a meaning, not to the addition and multiplication of any pairs of probabilities, but only to pairs which satisfy a certain form. The definition of Multiplication may be read: 'the probability of both a and b given h is equal to the probability of a given bh, multiplied by the probability of b given h. (Keynes 1921, 120-121).

Keynes's Second statement:

"6. Addition and Multiplication. If we were to assume that probabilities are numbers or ratios, these operations could be given their usual arithmetical signification. In adding or multiplying probabilities we should be simply adding or multiplying numbers. But in the absence of such an assumption, it is necessary to give a meaning by definition to these processes. I shall define the addition and multiplication of relations of probabilities only for certain types of such relations. But it will be shown later that the limitation thus placed on our operations is not of practical importance. We define the sum of the probable relations $\mathrm{ab/h}$ and $\mathrm{a}\bar{b}/\mathrm{h}$ as being the probable relation a/h; and the product of the probable relations a/bh and b/h as being the probable relation ab/h. That is to say:

IX. $\mathrm{ab/h} + \mathrm{a}\bar{b}/\mathrm{h} = \mathrm{a/h}$ Def.

X. ab/h = a/bh · b/h = b/ah · a/h Def.

Before we proceed to the axioms which will make these symbols operative, the definitions may be restated in more familiar language. IX. may be read: "The sum of the probabilities of "both a and b" and of "a but not b", relative to the same hypothesis, is equal to the probability of *a* relative to this hypothesis." X. may be read: "The probability of "both a and b", assuming h, is equal to the product of the probability of b, assuming h, and the probability of a, assuming both b and h." Or in the current terminology we should have: "The probability that both of two events will occur is equal to the probability of the first multiplied by the probability of the second, assuming the occurrence of the first." It is, in fact, the ordinary rule for the multiplication of the probabilities of events which are not 'independent'. It has, however, a much more central position in the development of the theory than has been usually recognized." (Keynes 1921, 134-135)

Keynes's Third statement:

"Thus, we have to introduce as definitions what would be axioms if the meaning of addition and multiplication were already defined. In this latter case, we should have been able to apply the ordinary processes of addition and multiplication without any further axioms. As it is, we need axioms in order to make these symbols, to which we have given our own meaning, operative. When certain properties are associated, it is often more or less arbitrary which we take as defining properties and which we associate with these by means of axioms. In this case I have found it more convenient, for the purposes of formal development, to reverse the arrangement which would come most natural to common sense, full of preconceptions as to the meaning of addition and multiplication. I define these processes, for the theory of probability, by reference to a comparatively unfamiliar property, and associate the more familiar properties with this one by means of axioms. These axioms are as follows:

(iv.) If P, Q, R are relations of probability such that the products PQ, PR and the sums P + Q, P + R exist, then:

(iv.a) If PQ exists, QP exists, and PQ = QP.

If P + Q exists, Q + P exists and P + Q = Q + P." (Keynes 1921, 136-137)

Keynes's Fourth statement:

"A meaning has not been given, it is important to notice, to the signs of addition and multiplication between probabilities in all cases. According to the definitions we have given, P + Q and PQ have not an interpretation whenever P and Q are relations of probability, but in certain conditions only. Furthermore, if P+Q = R and Q = S+T, it does not follow that P + S + T = R, since no meaning has been assigned to such an expression as P + S + T. The equation must be written P + (S + T) = R, and we cannot infer from the foregoing axioms that (P + S) + T = R. The following axioms allow us to make this and other inferences in cases in which the sum P + S exists, i.e. when P + S = A and A is a relation of probability…

in every case in which the probabilities ….

exist, *i.e*., in which these sums satisfy the conditions necessary in order that a meaning may be given to them in the terms of our definition.

….. if the sum R + S and the products

PR and PS exist as probabilities.

"7. From these axioms, it is possible to derive a number of propositions respecting the addition and multiplication of probabilities. They enable us to prove, for instance, that if P + Q = R + S then P-R = S-Q, provided that the differences P-R and S-Q exist; and that (P+Q)(R+S) = (P+Q)R+(P+Q)S = [PR+QR]+[PS+QS] = [PR+QS]+[QR+PS], provided that the sums and products in question exist. In general, any rearrangement which would be legitimate in an equation between arithmetic quantities is also legitimate in an equation between probabilities, provided that our initial equation and the equation which finally results from our symbolic operations can both be expressed in a form which contains only products and sums which have an interpretation as probabilities in accordance with the definitions. If, therefore, this condition is observed, we need not complicate our operations by the insertion of brackets at every stage, and no result can be obtained as a result of leaving them out, if it is of the form prescribed above, which could not be obtained if they had been rigorously inserted throughout. We can only be interested in our final results when they deal with actually existent and intelligible probabilities." (Keynes 1921, 137)

Keynes's Fifth statement:

"1. The possibility of numerical measurement, mentioned at the close of Chapter III., arises out of the Addition Theorem (24.1). In introducing the definitions and the axiom, which are required in order to make the convention of numerical measurement operative, we may appear, as in the case of the original definitions of Addition and Multiplication, to be arguing in an artificial way. This appearance is due, here as in Chapter XII., to our having given the names of addition and multiplication to certain processes of compounding probabilities in advance of postulating that the processes in question have the properties commonly associated with these names. As common sense is hasty to impute the properties as soon as it hears the names, it may overlook the necessity of formally introducing them. "(Keynes 1921, 158)

Keynes's Sixth statement:

"3. From these axioms and definitions combined with those of Chapter XII., it is easy to show (certainty being represented by unity and impossibility by zero) that we can manipulate according to the ordinary laws of arithmetic the "numbers" which by means of a special convention we have thus introduced to represent probabilities." (Keynes 1921, 159).

Keynes's Seventh statement:

"Many probabilities—in fact all those which are equal to the probability of some other argument which has the same premiss and of which the conclusion is incompatible with that of the original argument—are numerically measurable in the sense that there is some other probability with which they are comparable in the manner described above. But they are not numerically measurable in the most usual sense, unless the probability with which they are thus comparable is the relation of certainty. The conditions under which a probability a/h is numerically measurable and equal to q/r are easily

seen. It is necessary that there should exist probabilities a_1/h_1,

a_2/h_2 …, a_q/h_q …, a_r/h_r, such that

$a_1/h_1 = a_2/h_2 = \ldots = a_q/h_q = \ldots = a_r/h_r$,

$a/h = \sum a_s/h_s$, and $\sum a_s/h_s = 1$." (Keynes 1921, 159-160.)

Thus, exact numerical measurability requires additivity. Inexact numerical measurability will be non additive because, in general, you can't add intervals together so that the interval probabilities sum or equal to 1 .

Keynes provides the reader in chapter 26 of the TP with a formal, mathematical theory that explicitly integrates his weight of the evidence variable, w, into an explicit decision theory. Note that if w=0, then no probability exists.

Keynes's technical analysis is presented on p.315 and ft. 2 on p. 315 of the TP. The heart of Keynes's theory is that decision makers use decision weights that are non-additive or sub or super additive (sub-proportional or super-proportional), as opposed to the additive probability concept that assumes linearity. Keynes called his decision weight a "conventional coefficient of risk and weight, c" and presented it as

$$c=2pw/ [(1+q) (1+w)], \quad (1)$$

where p is the probability of success, q is the probability of failure, p+q =1, and w represents the weight of the relevant evidence, defined on the interval [0, 1]. That is, w measures the completeness of the relevant evidence upon which the probability estimates for p and q are based. Keynes defined w in the first paragraph of Chapter 6 on p. 71 of the TP to be a measure based on the absolute amount of relevant knowledge and relevant ignorance just as a probability measure was based on the total amount of favorable and unfavorable evidence. Note that w is not logical relation or entity V.V is the logical entity or relation w is a mathematical variable.

The conventional coefficient of risk and weight is easily rewritten as

$$c=p [1/(1+q)][2w/(1+w)] \quad (2)$$

In this rewritten version, c consists of the usual linear, additive p multiplied by two weights-the first weight,

$$[1/(1+q)], \quad (3)$$

deals with the problem of nonlinear probability preferences, while the second weight,

$$[2w/(1+w)], \quad (4)$$

deals with the problem of sub and non-additivity. The conventional coefficient, c, is directly connected to Keynes's interval valued probability discussed in Parts I, II, and III of the TP. If w=1 and we ignore nonlinear probability preferences, then the probabilities become additive. If w<1, any conventional coefficient can be translated into an interval valued probability.

Thus, Keynes argues that a decision maker should normatively take into consideration w. Define A to be the outcome and U(A) to be a utility function of A.

Then Keynes's formal, normative theory in the TP is to

Maximize either

$$cA \text{ or } cU(A) \quad (5)$$

where, given Keynes's discussions of the St. Petersburg Paradox in chapter 26 of the TP, U(A) is thrice differentiable.

Savage' s formal normative theory is to

$$\text{Maximize } pU(A), \quad (6)$$

where U(A) is a von Neumann-Morgenstern utility function and p is an additive subjective probability.

The reader should note that Keynes 's theory (see Arthmar and Brady, 2012, 2016 and 2017; Brady, 1993, 1994, 2004a, 2004b) built on Boole (1854) and incorporated Savage's theory as a special case. Savage's theory, as well as de Finetti's, and Savage and de Finetti, assumes additivity and linear probability preferences. Keynes's theory allows for additivity or non-additivity, as well as linear probability preferences or nonlinear probability preferences

4. Feduzi, Runde and Zappia (2012, 2014, 2017)

Feduzi, Runde, and Zappia (2012, 2014, 2017) claim that Savage (see 1954, 1962, 1967, 1971), de Finetti (1930, 1931, 1955, 1964, 1967a, 1967b, 1967c), and/or Savage and de Finetti (1962) incorporated into their theoretical, formal, normative theory an explicit role for interval valued probability that was both imprecise and indeterminate:

"Viewed in this light, the possibility that there may be room for imprecision in probabilistic reasoning after all in de Finetti's *theoretical construct*, and in particular in its development and defense pursued jointly with Savage, is therefore an intriguing one." (Feduzi, Runde and Zappia 2017, 2; boldface and underline by the author)

The theoretical construct developed by Savage, de Finetti, and Savage and de Finetti as their normative theory was TO ALWAYS IN THEIR LIFETIMES maximize SEU. It is impossible to find any "…room for imprecision in probabilistic reasoning after all in de Finetti's *theoretical construct*."

Feduzi, Runde and Zappia (2012, 2014) put forth the claim that Savage, de Finetti, or Savage and de Finetti supported the use of interval valued probability in their theoretical, formal, normative theory:

"Relying on usually overlooked excerpts of de Finetti's works commenting on Keynes, Knight and interval valued probabilities, we argue that de Finetti suggested ***a relevant theoretical case for uncertainty to hold even when individuals are endowed with subjective probabilities***". (Feduzi, Runde and Zappia 2014, 1; boldface added by the author)

and

"The purpose of this article is to show that Bruno de Finetti, famous as one of the three founding fathers of the subjective approach to probability assumed by the standard model, actually made ***a theoretical case for uncertainty within the subjectivist approach"***. (Feduzi, Runde and Zappia 2012, 329; boldface added by the author).

Of course, this is impossible to show because nowhere in any published work done by Savage, or de Finetti, or Savage and de Finetti, did they ever change their formal, theoretical, normative rule to maximize SEU. Feduzi, Runde and Zappia (2012, 2014, 2017) do not provide one piece of evidence that they did.

Feduzi, Runde and Zappia (2012, 2014, 2017) have confused and conflated the separate prescriptive, normative and descriptive roles that are used in decision theory .de Finetti, de Finetti and Savage, and Savage made it clear that there would and could be many descriptive violations of their normative theory. However, this was due to problems of ignorance and error on the part of the decision maker in failing to deal properly with vagueness or uncertainty.

Feduzi, Runde and Zappia (2012, 2014, 2017) provide evidence that Savage or de Finetti or Savage and de Finetti acknowledged that there would be significant descriptive violations of their theory. They prescribed their formal, theoretical normative theory for all decision makers who accepted their axioms. They never stated that all decision makers must accept their axioms. However, their formal theory to maximize SEU using additive probability never changed in their lifetimes. If Feduzi, Runde and Zappia continue to dispute this, then it is time for them to show exactly where in the published literature in the 20th century that changes to their formal, theoretical construct took place. If they can nor do so, they must withdraw their claims.

Conclusions

Feduzi, Runde and Zappia (2012, 2014, 2017) provide no evidence whatsoever that Savage, or de Finetti, or Savage and de Finetti ever altered their theoretical formal, SEU construct. That construct was to Maximize SEU. The probabilities were at all times additive probabilities. These probabilities were obtained through proper scoring rules and elicitation techniques that aimed to explicitly eliminate vagueness, uncertainty, and ambiguity, and not deal with such issues. Their remedy for vagueness, uncertainty, and ambiguity on the part of decision makers was to provide additional training, practice, instruction, exercises and help to vacillating and unsure decision makers in order to help them in eliminating vagueness, uncertainty, and ambiguity. The remedy explicitly excluded any attempt to incorporate vagueness, uncertainty, and ambiguity into any formal, theoretical, normative approach to decision making.

Feduzi, Runde and Zappia (2012, 2014, 2017) are extremely confused. Their confusion results from their severe misinterpretation of discussions made by Savage, or de Finetti, or Savage and de Finetti that deal with descriptive or prescriptive issues. None of their articles provide a single instance where Savage, or de Finetti, or Savage and de Finetti EVER change their formal, theoretical, normative theory to include variables representing imprecise or indeterminate interval valued probability.

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AGGREGATION WITH SEQUENTIAL INDIVISIBLE AND CONTINUOUS LABOR SUPPLY DECISIONS AND AN INFORMAL SECTOR

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Abstract:

The purpose of this paper is to explore the problem of non-convex labor supply decision in an economy with both discrete and continuous labor decisions. In contrast to the setup in Vasilev (2016a), here each household faces a sequential labor market choice - an indivisible labor supply choice in the market sector, and conditional on non-working in the official sector, a divisible hours choice in the informal sector. We show how lotteries as in Rogerson (1988) can again be used to convexify consumption sets, and aggregate over individual preferences. With a mix of sequential discrete and continuous labor supply decisions, aggregate disutility of non-market work becomes separable from market work, and the elasticity of the latter increases from unity to infinity.

Keywords: Aggregation; Indivisible labour; Sequential Lotteries; Discrete-continuous mix; Informal economy; Non-convexities

JEL Classification: E1; J22; J46

1. Introduction and Motivation

The purpose of this paper is to explore the problem of non-convex labor supply decision in an economy with both discrete and continuous labor decisions, and explicitly perform the aggregation presented in Vasilev (2015a) without a formal proof, and thus provide - starting from micro-foundations - the derivation of the expected utility functions used for the aggregate household. In contrast to the setup in Vasilev (2016a), here each household faces a sequential labor market choice - an indivisible labor supply choice in the market sector, and conditional on non-working in the official sector, a divisible hours choice in the informal sector. Such a modelling choice is along the lines of Vasilev (2016b, 2016c). The novelty relative to those studies is that the earlier setups were dealing with private-public sector and full-time work vs. overtime, respectively, while here the focus is on the market vs unofficial work margin. In this paper, we show how lotteries as in Rogerson (1988) can still be used to convexify consumption sets, and aggregate over individual preferences. With a mix of sequential discrete and continuous labor supply decisions, aggregate disutility from informal sector work becomes separable from market work, and the elasticity of the latter increases from unity to infinity

2. Model Setup

The theoretical setup follows to a great extent Vasilev (2015a). The economy is static, there is no physical capital, and agents face a sequential convex decision, followed by a continuous labor supply decision in a two-sector economy. Since the focus is on a one-period world, the model abstracts away from technological progress, population growth and uncertainty. There is a large number of identical one-member households, indexed by *i* and

distributed uniformly on the [0,1] interval. In the exposition below, we will use small case letters to denote individual variables and suppress the index *i* to save on notation.

2.1. Description of the Model

Each household maximizes the following utility function:

$$U(c,l)=\ln c+\alpha\ln l, \quad (1)$$

where *c* denotes consumption of market output, *l* is the leisure enjoyed by each individual household, and $\alpha>0$ is the relative weight attached to utility of leisure. Each household is endowed with a time endowment of unity, which can be split between hours worked in either the official sector, h_m, hours worked in the informal economy ("black market"), h_b, and leisure *l*, so that

$$h_m+h_b+l=1 \quad (2)$$

The households make a sequential labor supply choice: The first is whether to work full-time in the market sector, or not at all. In other words, $h_m \in \{0;\bar{h}\}$. Conditional on not working in the market sector, a household may decide to go and work in the grey sector, where it can supply any number of hours, *i.e.* $h_b \in [0,1]$. That is, the first labor choice is indivisible, while the second is divisible. Also, it will be assumed that h_b=0 whenever $h_m=\bar{h}$, or a household employed full-time in the market sector would choose not to supply any hours in the grey economy. This assumption is put in place to guarantee that each worker can only participate in one of the production sectors. Next, the hourly wage rate in the official ("market") sector and the implicit rate in the informal economy ("black market") sectors are denoted by w^m and w^b, respectively. Finally, the households own the firm in the market economy, and are entitled an equal share of the profit (π).

The problem faced by a household that decides to work full-time in the market sector is then to set $h_m=\bar{h}$ and enjoy

$$U^m=\ln(w^m\bar{h}+\pi)+\alpha\ln(1-\bar{h}), \quad (3)$$

while a household that decides not to work in the market sector chooses $h_b \in [0,1]$ to maximize its utility function

$$\max_{h_b} U^b=\ln(w^b h_b+\pi)+\alpha\ln(1-h_b) \quad (4)$$

The optimal labor choice in the grey economy is then characterized by the following first-order condition:

$$\frac{w^b}{w^b h_b+\pi}=\frac{\alpha}{1-h_b}, \quad (5)$$

or

$$h_b=\frac{w^b-\alpha\pi}{(1+\alpha)w^b} \quad (6)$$

That is, optimal choice of hours worked in the informal economy is a function of both the wage and profit rate in the official sector, which the household takes as given (and which in equilibrium would depend on the aggregate hours supplied to the firm operating in the market sector; therefore, non-market hours are a function of total market hours).

2.2. Stand-in firm: market sector

There is a representative firm in the model economy, which operates in the market sector. It produces a homogeneous final product using a production function that requires labor H_m as the only input. For simplicity, output price will be normalized to unity. The production function $f(H_m)$ features decreasing returns to scale: $f''(H_m)<0$, $f'(H_m)>0$, $f'(0)=\infty$, $f'(\bar{h})=0$. The representative firm acts competitively by taking the wage rate *w* as given and chooses H_m to maximize profit:

$$\pi=f(H_m)-w^m H_m \qquad \text{s.t. } 0 \le H_m \le \bar{h}\,. \tag{7}$$

In equilibrium, there will be positive profit, which follows from the assumptions imposed on the production function.

2.3. Stand-in firm: unofficial sector

Each worker in the unofficial sector has access to an individual concave production function ("backyard technology") that uses only labor, $g(h_b)$, where $g'(h_b)>0$, $g''(h_b)<0$, $g'(0)=\infty$, $g'(1)=0$. Each firm in the unofficial sector will then hire labor h_b in every period to maximize static profit

$$\max_{h_b} g(h_b)-w^b h_b \qquad \text{s.t. } 0\le h_b\le 1. \tag{8}$$

With free entry, there are zero profits in the sector, hence the implicit wage w^b in the unofficial sector equals the average product of labor, *i.e.*

$$w^b=\frac{g(h^b)}{h_b}. \tag{9}$$

2.4. Decentralized competitive equilibrium (DCE): Definition

A DCE is defined by allocations $\{c_m,c_b,h_m,h_b\}$, wage rates $\{w,w^b\}$, and aggregate profit $(\Pi=\pi)$ s.t. (1) all households maximize utility; (2) the stand-in firm in the unofficial sector maximizes profit; (3) the implicit wage rate in the unofficial sector is such that profits in the grey economy are zero; (4) all markets clear.

3. Characterization the DCE and derivation of the aggregate utility function

It will be shown that in the DCE, if it exists, only some of the households will be employed in the official sector and work full-time, while the rest will fo to the unofficial sector and chose how many hours to work. Following the arguments in Rogerson (1988) and Hansen (1985), it can be easily shown that polar cases in which each household either works in the official, or in the unofficial sector, cannot not be equilibrium outcomes. Therefore, it must be the case that a proportion of the agents in the economy are working in the unofficial sector, while the rest will be supplying labor services in the official sector. Denote this mass of officially employed by λ, and the officially unemployed by $1-\lambda$. Workers in the official sector will receive consumption c_m, while those working in the unofficial sector will consume c_b. Note that λ can be interpreted also as the probability of being chosen to work in the unofficial sector: This probability is determined endogenously in the model, as workers would seek for the optimal balance between the net return from working across the sectors (at the margin). No matter of the employment outcome in the market sector, ex post every household enjoys the same utility level. Thus, in equilibrium $H_m=\lambda\bar{h}$. From the firm's point of view then the market wage is set equal to:

$$w^m = f'(\lambda\bar{h}) \tag{10}$$

Firm's profit is then

$$\pi=\Pi=f(\lambda\bar{h})-f'(\lambda\bar{h})\lambda\bar{h}>0\,, \tag{11}$$

which follows from the dreasing returns to scale featured by the production function. Next, to show that the DCE actually exists, it is sufficient to show the existence of a fixed point $\lambda\in(0,1)$ by analyzing a non-linear equation using the fact that in equilibrium utility is the same for all households. Note that from the result that grey-sector hours are a function of total market hours, it follows now that unofficial hours are a function of the proportion of households employed in the market sector (since $\bar{h}$ is now a parameter). Furthermore, using the Implicit Function Theorem on the first-order condition for h_n, we can show $dh_n/d\lambda>0$, which follows from the complementarity between the two types of income: from labor in the unofficial sector, and the capital income from the claim on profits. In other words, the more people work in the official sector, the lower the profits are; profit is zero if everyone works in the market sector. This in turn stimulates the household to work more in the unofficial

sector in order to increase total income and achieve higher consumption in the household's utility function (while also trying not to decrease utility from leisure that much).

It is trivial to show that everyone working in the market sector (λ=1) is not an equilibrium, since then w^m=0. From the ex-ante symmetry assumption for households, market consumption would be the same for both market workers and those not selected for work in the official sector, while the latter would enjoy higher utility out of leisure (holding h_m fixed), hence there is no benefit of working. Similarly, nobody working in the market sector (λ=0) is not an equilibrium outcome either, since the firm would then offer a very high wage for the first unit of labor, and by taking a full-time job a marginal worker could increase his/her utility a lot.

Thus, if there is a DCE, then it must be that not all households would receive the same consumption bundle. If $\lambda \in (0,1)$ is an equilibrium, then total utility for households that work in the market sector should equal to the utility of households that do not supply any hours in the market sector. This equation is monotone in λ, as the utility function is a sum of monotone functions, and the $h_b(\lambda)$ term is quantitatively small. Thus, we can explore the behavior of that function (the difference between the utility of working in the market sector and working in the grey economy) as we let λ vary in the (0,1) interval. As $\lambda \to 0$, the left-hand-side dominates (utility of working is higher), while when $\lambda \to 1$ the right-hand-side dominates (utility of not working is higher), where the results follow from the concavity of the utility functions and the production technologies. In addition, from the continuity of those functions, $\exists \lambda \in 0,1)$, which is consistent with equilibrium. The unique value of λ follows from the monotonicity of the utility and production functions. Let c_m^* and c_b^* denote equilibrium consumption allocations of individuals selected for work in the market sector, and those who will work in the informal sector.

Given the indivisibility of the labor supply in the market sector, the equilibrium allocation obtained above is not Pareto optimal, as demonstrated in Rogerson (1988). More specifically, a social planner (SP) could make everyone better off by using an employment lottery in the first stage and choosing the fraction λ of individual households to work in the market sector and give everyone consumption $\lambda c_m^* + (1-\lambda)c_b^*$. In order to show this, we need to check that such an allocation is feasible, and that it provides a higher level of total utility. Showing feasibility is trivial as total market labor input and total consumption are identical to the corresponding individual equilibrium values.

Next, we will show that the new allocation, which is independent of household's employment status in the market sector, makes households better off since it generates higher utility on average. This is indeed the case, where the strict inequality follows from the convexity of the CES aggregation and the concavity of the logarithmic function. Thus, the SP is indeed giving in expected utility terms an allocation that is an improvement over the initial equilibrium allocation. If households can pool income together and doing so, they will be able to equalize consumption across states, *i.e,* $c = c_m^* = c_b^*$. Substituting the expressions for consumption and total hours in the aggregate utility and rearranging terms yields

$$\ln c + AH_m + B\ln(1-h_b). \qquad (12)$$

where A >0 and B>0 are functions of model parameters. The resulting aggregate utility function is of an interesting and novel form. On the aggregate, when each household faces a sequence of indivisible and divisible labor choices, the representative agent obtained from the aggregation features different preferences of work: as in Vasilev (2016a) with home production, the disutility of work in the market sector is now linear, while the disutility of labor in the informal sector h_b is logarithmic as in the individual utility function, built separated from market hours. The split of the two types of labor is driven by the fact that market labor was indivisible, while hours supplied in the informal sector were divisible. In addition, the sequential discrete-continuous labor supply decision could be quantitatively important for the transmission of business cycle shocks and welfare effects of different government policies. However, such investigations are left beyond the scope of this note. In general, in terms of moment matching at business-cycle frequencies, models with indivisible market hours, *e.g.* the original Hansen (1985) and Vasilev (2015c) with home production sector, are an improvement over identical models with divisible labor supply in the official sector. Therefore, the model could be useful to policymakers interested in implementing labor policies in countries with large informal sectors.

Conclusions

This paper explored the problem of non-convex labor supply decision in an economy with both discrete and continuous labor decisions. In contrast to the setup in Vasilev (2016a), here each household faces a sequential labor market choice - an indivisible labor supply choice in the market sector, and a divisible hours choice in the informal sector. The novelty was that the aggregated utility function produced interesting non-linearities that were not present at individual level. With a mix of sequential discrete and continuous labor supply decisions, the disutility from informal sector hours work becomes separable from official sector hours, and the elasticity of the latter increases from unity to infinity.

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COMMUNISM, VALUE NEUTRALITY AND MONETARY NEUTRALITY

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Abstract

One of the most puzzling aspects about the functioning of the floating exchange rate regime of the 1980s has been that huge swings in exchange rate have had only muted effects on anything real. To understand this phenomenon, we study the relationship between communism and value neutrality and monetary neutrality. We find that the symmetry of communism is bound to lead to value neutrality. In the case of value neutrality, the economic man will certainly accept monetary neutrality. If money is neutral in the long run then even if purchasing power parity (PPP) is not valid in the short-run it will valid over the long run. However, without considering the time factor, communism is a kind of symmetry that is almost impossible to achieve. While considering the time factor, the symmetry of communism can be achieved in theory!

Keywords: communism; symmetry; value neutrality; monetary neutrality; purchasing power parity

JEL Classification: A13; D24; D3; E5; F3

1. Introduction

One of the most puzzling aspects about the functioning of the floating exchange rate regime of the 1980s has been that huge swings in exchange rate have had only muted effects on anything real (Krugman 1993).

To understand this phenomenon, we study the relationship between communism and value neutrality and monetary neutrality.

We find that the symmetry of communism is bound to lead to value neutrality. In the case of value neutrality, the economic man will certainly accept monetary neutrality. If money is neutral in the long run then even if purchasing power parity (PPP) is not valid in the short-run it will valid over the long run.

However, without considering the time factor, communism is a kind of symmetry that is almost impossible to achieve. While considering the time factor, the symmetry of communism can be achieved in theory!

After the collapse of the Bretton Woods system, the evidence on long-run PPP is still a matter of debate.

The difficulties of the problem are the possible nonstationarity of relative price indices and nominal exchange rates. The traditional ways to deal with nonstationarity such as unit root model and cointegration have some problems. To deal with nonstationarity, we apply the Hodrick—Prescott(HP) trend-cycle filter in real business cycle literature which can give a nonlinear smooth-trend, and we find that after the 1970s float, the monthly HP trends of US dollar/UK sterling and Deutsche marks/US dollar have certain relevance with their corresponding HP trends of relative consumer price indices. This result indicates that there is no strong evidence to directly deny that the PPP is valid in the long run. In this sense, it is not reliable to directly deny the belief of monetary neutrality (Luo 2016)!

2. Without considering the time factor, communism is a kind of symmetry that is almost impossible to achieve

How to understand communism? Some people think that communism is the ideal that can never be realized. We think it involves people's morals and some mysterious things that are not well defined! Therefore, we should look at communism from the perspective of reality. From the objective point of view, communism requires symmetry in the process of social production and distribution!

In the following, we point out that the symmetry required by communism is almost impossible to achieve without considering the time factor!

Since the process of social production and distribution is closely related to resources, we can look at the problem from the perspective of resources!

We can assume that the resources are completely distributed in a straight line, the total resource is B and the total population is M.

Real numbers can be thought of as points on an infinitely long line called the number line or real line.

In basic mathematics, a number line is a picture of a graduated straight line that serves as abstraction for real numbers. Every point of a number line is assumed to correspond to a real number, and every real number to a point.

In advanced mathematics, the expressions real number line, or real line are typically used to indicate the above-mentioned concept that every point on a straight line corresponds to a single real number, and vice versa.

The real numbers include all the rational numbers, such as the integer −5 and the fraction 4/3, and all the irrational numbers, such as $\sqrt{2}$ (1.41421356…, the square root of 2) and π (3.14159265…), the ratio of the circumference of any circle to its diameter.

In mathematics, a rational number is any number that can be expressed as the quotient or fraction p/q of two integers, a numerator p and a non-zero denominator q. Since q may be equal to 1, every integer is a rational number.

The decimal expansion of a rational number always either terminates after a finite number of digits or begins to repeat the same finite sequence of digits over and over. Moreover, any repeating or terminating decimal represents a rational number. These statements hold true not just for base 10, but also for any other integer base (*e.g.* binary, hexadecimal).

Any number that cannot be expressed as a ratio of two integers is said to be irrational. Their decimal representation neither terminates nor infinitely repeats but extends forever without regular repetition.

Any real number can be approximated to any desired degree of accuracy by rational numbers with finite decimal representations.

As a consequence of Cantor's proof that the real numbers are uncountable and the rational numbers are countable, it follows that almost all real numbers are irrational (Cantor 1955 [1915]).

Therefore, the measure of the set of rational numbers is 0.

Because of the infinite state involved, repeating decimals and irrational numbers do not have practical separability without considering the time factor.

At this time, the symmetry of communism necessarily requires B/M to be a terminating decimal, for only in this way can there be practical separability!

It is shown that B/M as a terminating decimal is an event with zero probability.

Therefore, without considering the time factor, communism is a kind of symmetry that is almost impossible to achieve.

However, from the perspective of modern mathematics, since terminating decimals with practical separability do exist, theoretically communism has its existence! This may be the rationality of communism.

3. Why communism can be achieved

In this section we'll examine the practical separability from the perspective of time.

Space is not necessarily continuous, but the human perception of time is continuous. Thus, people can not only feel the time expressed in a terminating decimal, but also feel the time represented by a repeating decimal or an irrational number. It can be seen that we do not have to distinguish the time expressed in a repeating decimal or an irrational number from the time expressed in a terminating decimal.

So, assuming that T is a certain time point within the bounded range, of course T is greater than zero, then -1/ (t-T) reaches infinity when the time *t* is less than T but tends to T, that is, when t is equal to T, that is to say infinity is achieved at bounded time T.

It can be seen that if the total resource is B and the total population is M, when B/M is a terminating decimal, of course, it has practical separability. When B/M is a repeating decimal or an irrational number, we can achieve B/M by -1/ (t-T) at bounded time T.

Therefore, in theory, communism can be achieved.

4. Communism, value neutrality and monetary neutrality

Economic output is the most important measure of the economic process, and the cost-adjusted economic output is an important criterion for measuring the efficiency of the economic process and constitutes the most important measure of economic value.

The process of economic output is realized by the economic organization, and the economic output of course requires the input of resources. If the same resource inputs have the same economic output and economic value, then the value is neutral.

From the perspective of resources, the symmetry of communism necessarily requires symmetry in the process of social production and distribution.

In the process of realizing the economic output, the economic man will inevitably lead to the result that the same resource inputs have the same economic output and economic value in the case of the realization of the symmetry of communism, that is, the symmetry of communism will inevitably lead to value neutrality.

Monetary neutrality refers that money only affects the price of economic output without affecting economic output. In the case of value neutrality, the economic man will certainly accept monetary neutrality.

In the above analysis, we can find that the symmetry of communism is almost impossible to achieve without considering the time factor, while considering the time factor, the symmetry of communism can be achieved in theory!

In addition, if money is neutral in the long run then even if purchasing power parity (PPP) is not valid in the short-run it will valid over the long run.

After the collapse of the Bretton Woods system, the excessive volatility of nominal exchange rates and the relatively smooth macroeconomic variables in the short run rejects PPP as a hypothesis about the short run relationship between nominal exchange rates and relative price indices. The evidence on long-run PPP is still a matter of debate.

The difficulties of the problem are the possible nonstationarity of relative price indices and nominal exchange rates. The traditional ways to deal with nonstationarity such as unit root model and cointegration have some problems. To deal with nonstationarity, we apply the Hodrick—Prescott (HP) trend-cycle filter in real business cycle literature which can give a nonlinear smooth-trend, and we find that after the 1970s float, the monthly HP trends of US dollar/UK sterling and Deutsche marks/US dollar have certain relevance with their corresponding HP trends of relative consumer price indices. This result indicates that there is no strong evidence to directly deny that the PPP is valid in the long run. In this sense, it is not reliable to directly deny the belief of monetary neutrality (Luo 2016)!

Conclusion

In this paper, we study communism from the realistic and objective point of view. We point out that the symmetry of communism is almost impossible to achieve without considering the time factor!

Then we point out that the symmetry of communism is bound to lead to value neutrality. In the case of value neutrality, the economic man will certainly accept monetary neutrality. If money is neutral in the long run then even if purchasing power parity (PPP) is not valid in the short-run it will valid over the long run.

After the collapse of the Bretton Woods system, the excessive volatility of nominal exchange rates and the relatively smooth macroeconomic variables in the short run rejects PPP as a hypothesis about the short run relationship between nominal exchange rates and relative price indices. The evidence on long-run PPP is still a matter of debate.

The difficulties of the problem are the possible nonstationarity of relative price indices and nominal exchange rates. The traditional ways to deal with nonstationarity such as unit root model and cointegration have some problems. To deal with nonstationarity, we apply the HP trend-cycle filter in real business cycle literature which can give a nonlinear smooth-trend, and we find that after the 1970s float, the monthly HP trends of US dollar/UK sterling and Deutsche marks/US dollar have certain relevance with their corresponding HP trends of relative consumer price indices. This result indicates that there is no strong evidence to directly deny that the PPP is valid in the long run. In this sense, it is not reliable to directly deny the belief of monetary neutrality (Luo 2016)!

Therefore, we examine communism from the perspective of time. We point out that the symmetry of communism can be achieved in theory!

Believe it or not, that is your choice!

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INEQUALITY AND GROWTH IN TUNISIA: EMPIRICAL EVIDENCE ON THE ROLE OF MACROECONOMIC FACTORS

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Abstract

The purpose of this paper is to explore the relationships between income inequality, economic growth and the main macroeconomic factors in Tunisia. We investigate two effects: the effect of inequality on growth, and particularly, the effect of growth on inequality. Also, attention has been focused on the role of the monetary policy, via introducing money supply as an independent variable, in affecting inequality and growth. Our empirical study is based on a series of annual data from 1975 to 2015 using the Dynamic Ordinary Least Squares (DOLS) method in order to estimate the cointegrating equations. The findings of the paper show that income inequality increase economic growth in Tunisia. Other factors having significant positive effect on economic growth include money supply and life expectancy at birth. However, inflation rate, primary education and unemployment have statistically significant and negative effect on economic growth. On the other hand, the results indicate that money supply, inflation rate, unemployment and savings are positively and significantly related to income inequality, whereas, life expectancy at birth and gross fixed capital formation decrease inequality in Tunisia. The policy implications of these results are discussed.

Keywords: Income Inequality; Economic Growth; Tunisia, Money Supply; Education; Unemployment; Health

JEL Classification: C32; E52; I24; I14; O2

1. Introduction

Before its 2011 Jasmine revolution, Tunisia had showed its economic growth and macroeconomic performance, and was a success story in North Africa and the Middle East (MENA). Tunisia has built its growth strategy in potential sectors such as health, education, banking system, industry, trade, transport and infrastructure. It has achieved a relatively high average economic growth rate nearly 5% during the last decade. It has kept its inflation rates under control thanks to cautious monetary policy, reached at 2.4% in 2005 against 4.9% in 2015.

Moreover, Tunisia is always an example of a developing country which invested in education since the independence. It has a great deal to provide a free education for all in order to improve the economic well-being of the society and ameliorate the human capital. In 2015, the gross enrolment rate in primary education was 114.17% for both girls and boys combined highlighting that the country has achieved near universal primary education, as a key United Nation Millenium Development Goal.

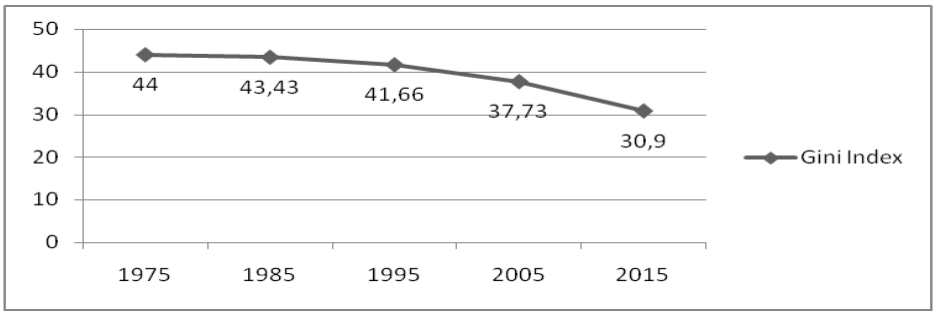
According to the World Health Organisation (WHO, 2017) life expectancy at birth in Tunisia is among the highest in Africa and the Near East, it was reached at 74.97 years in 2015 against 56.79 years in 1975. This implies that Tunisia's health sector is characterized by a relatively balanced geographical distribution of public

infrastructure, in primary and secondary health system, as well as by a dynamic private healthcare sector. Also, Financial protection channels in health are well developed and cover over 80% of the population.

In addition, the country had a favourable attitude toward local and foreign direct investment and is working to create a favourable and certain climate and encourage investment in the interior regions. In this context, Gross fixed capital formation is the third driver of growth in Tunisia with a 26.71% contribution to GDP in 2010 against 21.64% in 2015. The public sector still insufficient to stimulate investment, thereafter, government has integrated a several policy reforms to improve the economic role of the private sector.

However, Unemployment rates are relatively high, it was reached 15% in 2015 against 16,1% in 1995 and 12,8% in 2005. Besides, Poverty rate has largely decreased but still high, it went down from 23,1% in 2005 to 15,2% in 2015. In this way, Tunisia has attached a great deal of importance to facing a structural unemployment crisis and poverty problems for the past two decades, characterized with higher unemployment rate, especially among university graduates and an increase in the poverty rates.

Also, inequalities between the different regions of the country have intensified over time, reflecting major regional imbalances between the inland governorates and the coastal governorates, which triggered the Revolt of 11 January 2011. Indeed, Tunisian people are started talking about the question of regional inequalities just after the revolution due to dictatorship on the top of the state. Inequality has decreased since the 1995s, but remains high, leading the Gini index to hover around 30,9 in 2015, against 37,73 in 2005 and 41.66 in 1995 (Figure1).



Source: World Bank, National Institute of Statistics. own computation.

Figure 1. Gini Index in Tunisia, 1975-2015

Fighting regional inequalities and ensuring the proper sharing of the economic growth's benefits still presents a challenge for Tunisian governments after the revolution of January 11, 2011. Southern and interior regions are the most affected of inequalities and are the first to revolt against the old regime. Regional disparities have produced social tensions that are transformed into a revolt movement.

Tunisia realized a great successful fight against gender inequalities just after the independence; the legislation allows fundamental rights to Tunisian women and children[1] (Decreed in August 13th, 1956) came into effect (January, 1st, 1957). Unfortunately, Tunisian governments couldn't find a solution to regional and socio-economic inequalities. Regional inequality is still a major challenge in Tunisia for some decades.

In this way, economic literature is mainly focusing on how inequality affects economic growth. However, it will be very interesting to explore the effect of growth on inequality because this topic has gained less attention in the empirical studies than the reverse relation. Moreover, this paper tries to answer to the following questions: what's the impact of monetary policy on inequality and economic growth in Tunisia? Do macroeconomic factors, such as unemployment, inflation, savings, real GDP per capita and others, affects inequality in Tunisia?

The purpose of this study is to investigate empirically the main factors causing inequality in Tunisia and its consequences on the country's economic performance, using the Gini index as a measure of the income inequality. Also, our goal is to study the effect of inequality and macroeconomic series, such as unemployment, inflation, savings and others, on economic growth. To our knowledge, this paper represents the first attempts to introduce the money supply, as an independent variable, to explore the impact of the monetary policy on inequality and growth.

The rest of the paper is organized as follows. Section 2 presents a review of the related literature on the interactions between inequality, growth and macroeconomic factors. Section 3 outlines the data description and

[1] Civil rights such as: woman can travel abroad without the consent of her father or husband, criminalizing rape and violence against women and children, right of children custody guardianship, Tunisian Democratic Women Association (ATFD) and some activists in civil society.

empirical strategy. Section 4 presents and analyzes the empirical results. The last section summarizes the main conclusions reached.

2. Literature review

The implementation of a development strategy in a given country is based on the relationship between three main objectives of economic policy: economic growth, poverty reduction and income distribution. In this way, the links between poverty-growth, poverty-inequality and growth-inequality have always been the subject of several research studies attempted to clarify the development debate. Bourguignon (2004) suggest that development strategy, within a population, is totally function of economic growth rate and income inequality. So, he stated that poverty reduction resides more in the interaction between distribution and growth than in the relationships between poverty-growth and poverty-inequality.

From a theoretical point of view, Kuznets (1955) investigates the theoretical starting point of the relation between the inequality and the growth via the Kuznets curve. He suggests that in the long run, modern economic growth would generate an early industrialization phase of rising inequality, followed by a mature industrialization phase of declining inequality. On the other hand, Kaldor (1957) presented an economic model in which the marginal propensity to save would be higher among the rich than the poor. Considering the income distribution between profits and wages, profit holders tend to save more of their income than employees. As a result, higher income inequality increases the saving and improves the capital accumulation, thereby fostering the economic growth. According to Kaldor, assuming a positive correlation between GDP growth rate and national saving, unequal economic growth would then be faster. In the same way, according to D'Arvisenet (2015), inequality could be considered as a favorable factor for growth, as it stimulates the incitement to work, to save and to invest. Barro (2000) conclude that inequality reduces (increases) growth in the initial phase (the stable phase) of economic development. Also, he finds a positive relationship between growth and investment and no evidence link between investment and income inequality.

As for the relationship between inequality and growth, it has been the subject of an important debate in the economic literature because it is not defined in the same way by all authors. There is a vast literature focusing on the effect of income inequality and redistribution on economic growth but a few empirical studies explore the reverse relationship. In this way, a large body of econometric evidence has been dedicated to the analysis of this effect which can be positive or negative, taking into consideration the trends of macroeconomic factors. In this context, Attanasio and Binelli (2004) studied the main contributions related to the impact of non-equal resources distribution on development process, highlighting some implications for redistribution policies. According to them, income inequality reinforces growth through three arguments: individual savings based on Kaldor hypothesis, incentive to invest and considerations of workers' motivation. However, income inequality reduces growth prospects through three channels: social and political instability, fiscal policy and capital accumulation in presence of imperfect credit markets and inefficiency of financial markets. According to Barro (2000), the effect of income inequality on growth can be positive or negative depending on the level of economic development of the country. In addition, Sbaouelgi and Boulila (2013) examine the causality between income inequality and economic growth in a bivariate VAR structure for nine countries of MENA region over the period 1960-2011. Their findings indicate that a long-run relationship between income inequality indicators and growth exist where cointegration is detected in the case of Iran, Israel, Morocco, Tunisia and Turkey. They find that in the cases of Iran, Israel, Tunisia and Morocco, the effect of income inequality on long-run growth is positive. Moreover, they find a positive effect of growth on income inequality for Iran and Tunisia, and a negative effect for Morocco and Turkey. Using Granger causality tests, their results indicate that evidence was found of bidirectional causality and causality from growth to inequality. Using the Granger pair-wise causality tests, Ogbeide and Agu (2015) examine the causal relationship between inequality and poverty in Nigeria for the period 1980 to 2010. Their findings indicate that there is a feedback causality effect between inequality and poverty in Nigeria. They find that unemployment and life expectancy rate causes inequality while there is no causality between poverty and unemployment in Nigeria.

According to Bourguignon (2004), poverty reduction is an objective of development through growth strategies, determined by the average income growth rate, and distributive policies, determined by changes in the income distribution. He stressed that gradual income redistribution strategy for a certain time accelerates poverty reduction and stimulates growth by providing economic policy instruments to ensure that this growth benefit the poor than the rich. In addition, Bourguignon considers that redistribution must focus on wealth rather than current income or consumer spending in order to stimulate growth and economy efficiency in favor of disadvantaged groups. Ravallion (1997) finds empirical evidence for a positive relationship between inequality and poverty despite seemingly favorable growth prospects for 23 developing countries. Moreover, Sboui (2012) evaluates the effects

of growth and inequality on the dynamics of poverty in Tunisia from 1985 to 2005. The results show that the reduction of poverty in Tunisia is mainly due to economic growth. He concluded that changes in inequality that accompanied the process of growth have never been strictly pro-poor in this country. Ncube *et al.* (2013) analyze the patterns of inequality and investigate the effect of income inequality on economic growth and poverty in the MENA region using a cross-sectional data for the period 1985-2009. Their empirical results show that income inequality reduces economic growth and increases poverty in the region.

On the relationship between inequality and other macroeconomic variables, Parker (1999) finds positive correlations between unemployment and income inequality. However, he supports a modest inverse relationship between inflation and inequality. In this context, using a Panel System GMM estimation, Yannick and Ekobena (2014) find a positive correlation between unemployment and inequality for the United States and the countries of the Economic and monetary Community of Central Africa (EMCCA). Also, they conclude that monetary policy shocks can reduce significantly the inequality via an increase in the interest rate in the countries of the EMCCA. On the other hand, Maestri and Roventini (2013) conclude that unemployment is negatively correlated with consumption inequality. Also, they find a negative correlation between inflation, share prices and inequality and a positive correlation between private consumption and consumption inequality, also, there are no long run equilibrium relationships between inequality and most macroeconomic series. Amaral (2017) presents the main channels between monetary policy and inequality by reviewing the inflation tax channel, savings redistribution channel, interest rate exposure channel, earning heterogeneity channel and income composition channel.

3. Data description and empirical strategy

Our approach consists in investigating empirically the relationships between inequality and economic growth in Tunisia. In addition, this paper contributes to the literature by testing the impact of the macroeconomic series (*e.g.* unemployment, investment, saving, etc) on inequality with a special focus on the relationship between monetary policy and inequality using the Dynamic Ordinary Least Squares (DOLS) estimator developed by Stock and Watson (1993).

The data sources are the World Development Indicators (WDI) of the World Bank and the World Institute for Development Economics Research (WIDER) and The National Institute of Statistics.

We use annual data covering 1975 – 2015. We will estimate the effect of inequality on growth and the reverse relationship using a semi-logarithmic linear specification taking the following forms:

$$lnY_t = \alpha 0 + \alpha 1\ lnINEQt + \alpha 2\ lnRM2_t + \alpha 3\ \pi t + \alpha 4\ lnHEAL_t + \alpha 5\ lnEDUC_t + \alpha 6\ lnINVESt + \alpha 7\ lnSAV_t + \alpha 8\ Ut + \varepsilon t \quad (1)$$

$$lnINEQt = \alpha 0 + \alpha 1\ lnY_t + \alpha 2\ lnRM2_t + \alpha 3\ \pi t + \alpha 4\ lnHEAL_t + \alpha 5\ lnEDUC_t + \alpha 6\ lnINVESt + \alpha 7\ lnSAV_t + \alpha 8\ Ut + \varepsilon t \quad (2)$$

Where Y is the growth rate of GDP per capita, INEQ is the income inequality measured by the Gini index, RM2 is the real money stock, π is the rate of inflation, HEAL is the life expectancy at birth indicating the number of years, EDUC is the gross primary school enrollment ratio, INVES is the gross fixed capital formation as a % of GDP, SAV is the gross saving as a % of GDP, U is the unemployment rate. Also, $\alpha 0$, $\alpha 1$, $\alpha 2$, $\alpha 3$, $\alpha 4$, $\alpha 5$, $\alpha 6$, $\alpha 7$ and $\alpha 8$ are the coefficients to be estimated and εt is the error term. The error term represents the influence of the omitted variables in the construction of the data.

Our empirical study is divided in three steps. The first step is to test the degree of integration of the variables using the unit roots tests applying the technique of Augmented Dickey-Fuller (ADF). The second step is to check for cointegration in order to verify the presence of a long-run relation between the variables using the Johanson cointegration tests. Finally, the third step is to estimate a stable long-run equilibrium relationship between inequality and growth using the Dynamic Ordinary Least Squares (DOLS) estimator.

4. Empirical results

Table 1 reports unit root tests in order to assess the time series properties of the data. The Augmented Dickey Fuller (ADF) test rejects the null hypothesis of non stationarity at the 1 % and 5% level. The results of the test with constant only indicate that all series are integrated I(1), implying that they are non-stationary in levels but stationary in first differences. So a cointegration vector may be estimated.

Table 1. Unit root results using ADF test

	Levels	First difference
Variables	Test statistic	Test statistic
lnY	-1.967509	-7.559348***
lnINEQ	0.209053	-5.139999***
lnRM2	-1.883115	-6.398902***
π	-2.372205	-11.20634***
lnHEAL	-1.193746	-5.600028***
lnEDUC	-1.661353	-3.284577**
lnINVES	-0.605555	-8.700983***
lnSAV	-0.315873	-8.008888***
U	-1.780449	-7.455612***

Notes: H0 is that the variable has a unit root.
*** , ** and * denote rejection of the null hypothesis at the 1%, 5% and 10% significance level.

Since the time series of the variables are integrated of order one *i.e.* I (1), they would be tested for the existence of a long run relationship. The next step is to study the cointegration tests between inequality, economic growth, monetary policy and the other variables. The computations are based on the Johansen maximum likelihood procedure to determine the number of cointegration vectors in the regression.

Table 3 shows a strong evidence for at least one cointegrating relation in the (lnY, lnINEQ, lnRM2, π, lnHEAL, lnEDUC, lnINVES, lnSAV and U) system at the 5 % level of significance. The existence of a long run relationship between the variables was assessed using three lags[2]. The null hypothesis of no cointegration based on both the maximum eigenvalue and the trace tests between the variables is rejected at a (5%) level of significance, it also shows that we can't reject the hypothesis of eight cointegrating vectors. According to Granger (1988), the existence of cointegration between the variables under consideration suggests that there is a long run equilibrium relationship between inequality, economic growth, monetary policy and the other variables, and that there exists causality in at least one direction between the variables.

Table 2. Cointegration test results

Hypothesis on the number of cointegrating vectors	Trace Statistic		max –eigenvalue statistic	
	Test statistic	CV** 5%	Test statistic	CV 5%
r=0	463.8773*	197.3709	147.6301*	58.43354
r<=1	316.2472*	159.5297	100.1902*	52.36261
r<=2	216.0571*	125.6154	64.75248*	46.23142
r<=3	151.3046*	95.75366	53.27792*	40.07757
r<=4	98.02666*	69.81889	36.94564*	33.87687
r<=5	61.08102*	47.85613	23.48765*	27.58434
r<=6	37.59337*	29.79707	21.19349*	21.13162
r<=7	16.39988*	15.49471	11.75181*	14.26460
r<=8	4.648070*	3.841466	4.648070*	3.841466

Notes: r is the number of cointegrating vectors.
* denotes rejection of the hypothesis at the 5% level. CV is the critical value

Table 3 indicates the estimation results of the long run relationships between inequality, growth and macroeconomic series in Tunisia, highlighting the monetary policy effects' on inequality using the Dynamic Ordinary Least Squares (DOLS) method. So, the existence of a long-run relationship between variables shows that there is a causal relation, but it doesn't address its direction.

[2] The Akaike Information Criterion were used to determine the lag length of the VAR model.

In equation (1), the results imply that there is a positive relationship between inequality, measured by the Gini Index, and the growth rate of GDP per capita in Tunisia. The estimated coefficient (3,42) is significant with a high magnitude indicating that higher inequality is associated with greater economic growth. This stimulating effect of the income inequality on growth may be explained by the unequal wealth distribution's effects and the process of growth which is not pro-poor in Tunisia. This means that a certain resource concentration allows a fraction of the population, especially in coated regions, to accumulate wealth and create a wealth concentration causing a successful economic development to the detriment of the poor regions.

Table 3. Long run estimations using DOLS method

Eq.(1) Dependant variable: lnY								
lnINEQ	**lnRM2**	**π**	**lnHEAL**	**lnEDUC**	**lnINVES**	**lnSAV**	**U**	**C**
3.420 (5.106)***	0.583 (5.017)***	-1.734 (-2.055)*	10.416 (5.278)***	-3.026 (-6.719)***	0.040 (0.839)	0.038 (0.283)	-17.226 (-5.726)***	-37.159 (-4.184)***
Eq.(2) Dependant variable: lnINEQ								
lnY	**lnRM2**	**π**	**lnHEAL**	**lnEDUC**	**lnINVES**	**lnSAV**	**U**	**C**
-0.071 (-0.299)	0.124 (4.239)***	0.473 (3.339)***	-2.090 (-5.409)***	0.024 (0.129)	-0.042 (-5.459)***	0.251 (5.653)***	5.802 (9.017)***	11.325 (4.766)***

Notes: t-ratios are in the parentheses, ***, **, * indicates significance at 1, 5, 10 percent level, respectively.

Another finding is that money supply, introduced to present the monetary policy, is positively and significantly correlated to economic growth in Tunisia. An expansionary monetary policy, which leads to an increase in money supply, results in lowered nominal interest rate. This allows an improvement of investment, and therefore, enhances the economic activities as well as the growth rate of GDP per capita. Moreover, there is a statistically significant negative relationship between inflation rate and growth rate of GDP per capita. This means that an increase in inflation rate will slow down economic performance while a low rate of inflation is good for economic growth. In addition, we find that higher life expectancy at birth increases the economic growth. This result indicates that a rise in life expectancy, which leads to reduce the mortality rate and improve the population growth and the human capital dynamics, may provide a better education and better conditions for economic development in Tunisia.

The gross primary school enrollment ratio is negatively related to economic growth, and is insufficient alone to accelerate the growth rate of GDP per capita in Tunisia. The effect of the gross fixed capital formation, as a net investment measure, is insignificant and positive on economic growth. The level of savings is a major factor impacting the economic growth. In Tunisia, there is a positive and insignificant relationship between saving and growth rate of GDP per capita. Our results indicate that the unemployment rate is statistically significant and negatively highly correlated with Tunisia's economic growth. Tunisia has a strong unemployment rate, particularly among university graduates, due to imbalance between supply and demand in labor market, which create a mismatch between higher education and needs in private and public sectors. This implies that economic growth reacts negatively when the labor market weakens.

Eq. (2) indicates the estimation results of the effects of economic growth, macroeconomic series and monetary policy on inequality income. The results show that the effect of the growth rate of GDP per capita is negative and not significant on inequality.

Our results indicate also that money supply is significant and positively correlated to inequality in Tunisia. This means that an expansionary monetary policy may lead to an increase in asset price and inflation, which results a higher income inequality. The gross primary school enrollment ratio is insignificant and positively related to inequality. The effect of the gross fixed capital formation is significant and negative on inequality. This result suggests that investment in many industrial sectors, especially in Tunisian interiors regions, may reduce inequality.

In Tunisia, there is a positive and significant relationship between saving and inequality through the positive effect of savings on investment and capital accumulation centralized in Tunisian coasted regions, which boost inequality. Also, empirical results show that inflation is significant and positively correlated to inequality. That means that inflation weakens the household's purchasing power especially for low income households than high income households. On the other hand, the effect of unemployment on inequality is positive and statistically significant. This implies that unemployment aggravates inequalities in Tunisia. Moreover, we find that life expectancy at birth decrease inequality. Tunisia's health care system provides an extensive network of public hospitals and health centers to develop the population health in the 24 governments, which reduce inequality.

Conclusion

The main purpose of this paper is to study the relationships between income inequality, economic growth and macroeconomic factors in Tunisia. We investigate two effects: the effect of inequality on growth, and particularly, the effect of growth on inequality. Also, attention has been focused on the role of the monetary policy, via introducing money supply as an independent variable, in affecting inequality. Our main findings are obtained through using the Dynamic Ordinary Least Squares (DOLS) method to estimate the long run relationships between the variables.

About the effect of inequality on growth, empirical results imply that stimulating effect of income inequality on growth in Tunisia may be explained by the process of growth which is not pro-poor in Tunisia. This means that a certain resource concentration allows a fraction of the population to accumulate wealth causing a successful economic development. Another finding is that an increase in money supply, results in lowered nominal interest rate, which improves the investment, and therefore, enhances the economic activities as well as the growth rate of GDP per capita. Moreover, we found that inflation rate and primary education are negatively related to economic growth. Our results show that economic growth reacts negatively when strong unemployment rate, particularly among youth, because there is an imbalance between supply and demand in labor market, which creates a mismatch between higher education and needs in private and public sectors. In addition, we find that higher life expectancy at birth increase the economic growth.

This study conducts an empirical analysis on the effects of growth, macroeconomic series and monetary policy on inequality. Our findings indicate that economic growth does not affect income inequality in Tunisia. Moreover, the results indicate that an expansionary monetary policy, via an increase in money supply, may lead to an increase in asset price and inflation, which leads to a higher income inequality. Also, this paper showed that savings, inflation and unemployment rate are positively correlated to inequality. In addition, gross fixed capital formation and life expectancy at birth decrease the income inequality in Tunisia.

These findings point to some key policy recommendations for fighting inequality and unemployment reduction growth in Tunisia. First, after the revolution and in the framework of the Tunisia's 2014, Tunisian governments adopts a positive discrimination programs for poor and interiors regions in order to tackle problems related to unemployment, poverty and regional disparities. The problem of unemployment in Tunisia is rather complex to overcome. So, a development funds should be allocated to provide employment opportunities and encourage thousands of unemployed to create their proper projects, especially from interior regions, particularly Gafsa, Kasserine, Medenine, Sidi Bouzid, Siliana, Beja, El Kef and Jendouba. Tunisia needs to improve basic infrastructure in interior region to attract foreign direct investment via national development strategies at a regional level in order to reduce unemployment. In addition, it will be important to develop job creation and entrepreneurship via strategically actions such as: improvement of work experience courses, support programs for employment and creation of income's sources, aid and financing funds and regional development programs.

Second, inflation rate increase inequality in Tunisia. After the revolution, the inflation rate stood at 5,3 % in 2012 and 4,9% in 2015, against 3,3% in 2010, indicate the latest statistics published by the National Institute of Statistics (INS). Inflation may weakens purchasing power of the consumer of Tunisian due to the increase of the price for all products, especially consumer products and usual recent increase of petroleum products, which aggravate more the social instability, the protests and the sit-ins in the country. So, the Tunisian policymakers need to control inflation through a better management of monetary and fiscal policies in order to protect the purchasing power of the Tunisian people.

Third, an expansionary monetary policy, via an increase in money supply, allows to a higher income inequality in Tunisia. Since post-revolution, monetary growth is associated with a surge in labour wages in public and private sectors, which increase the asset price and cause inflation, this leads to improve inequality.

Finally, after the political wake of 2011 revolution, the Tunisian government needs to engage in more active production sector and labour market policies that enable economic growth, which in turn triggers a permanent redistribution schemes, it looks necessary to control the level of inequality in a transition economy.

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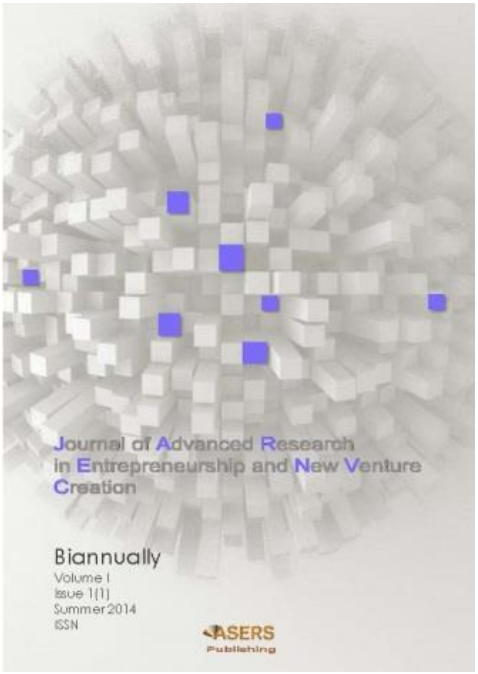

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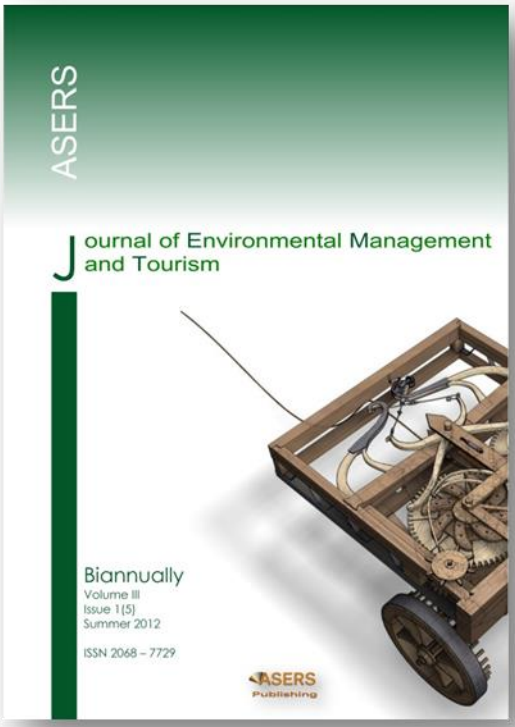

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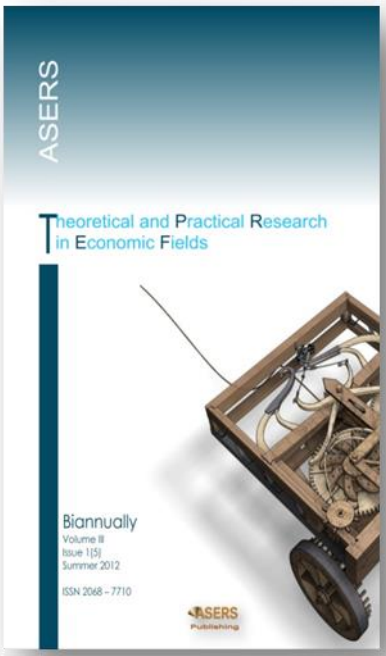

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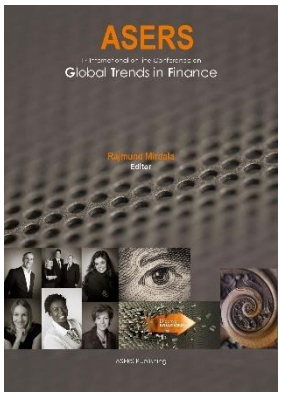

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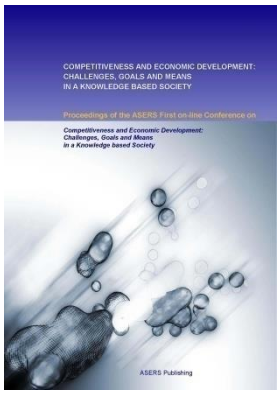

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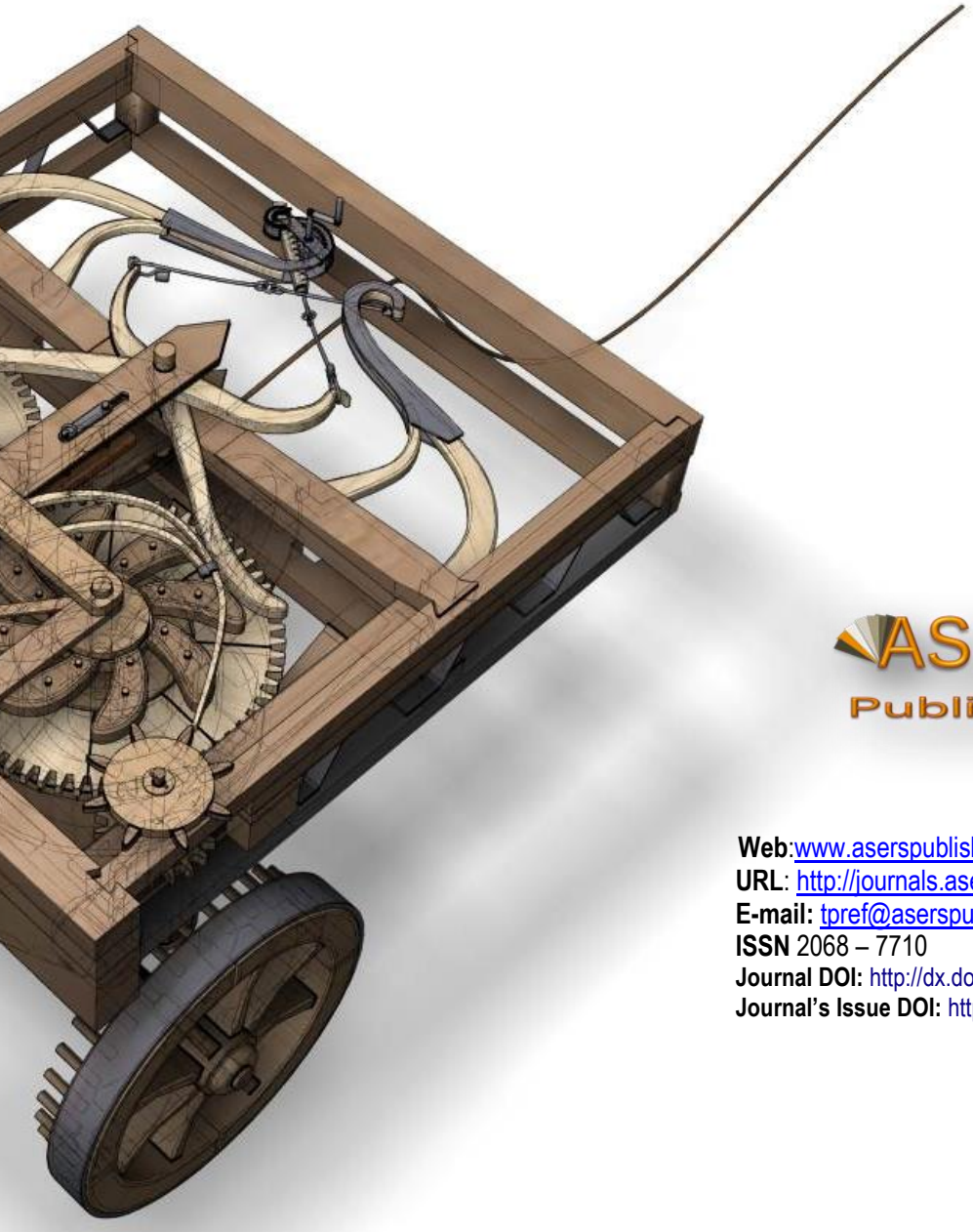

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