



National Statistics: Modern Practices and Influence on Fiscal and Monetary Policy

Jakub Zagdanski, Durham University

“The political economy of statistical measurement is largely terra incognita in the practice of economics”

Charles Hulten

The study of production and prices within a nation is an essential part of modern economic analysis. The controversies and issues that surround production and uses of national accounts however have been insufficiently researched to resolve misunderstandings and systematic inaccuracies, that are still a subject of debates, as described over the years in Ruggles (1994), Ritter (2000), and Greenlees and McClelland (2008). Sources of such inaccuracies exist because despite the technological progress, we are unable to collect large parts of data. Capturing household production for own use in NIPA, or estimating substitution effects immediately to re-balance the weights in price index would require enormous resources, and statistical bodies have to replace unavailable data with reasonable judgement and statistical methods. Another source of such inaccuracies could lie in inadequate accounting treatment and interpretation that does not conform to economic and business principles.

The view taken by this study is that both the inaccuracies and the corrections can impact the quality of data used for decision making purposes. Negative effects can arise from inadequate measurement accuracy, exclusion of essential or inclusion of irrelevant data on the basis of wrong economic rationale and accounting principles, or direct manipulation of the data to favour a particular policy.

The discussion opens with the analysis of the changes to price indices in Section I, followed by the review of changes to national income and production accounts (NIPA) in Section II. Section III offers an insight into the transmission mechanisms for national statistics and the governance of statistical bodies. Section IV provides a summary of the conclusions.

I. Measuring Inflation: Current Issues and Impact

A. Introduction to current developments in measuring inflation

This section provides an introduction to recent developments in measuring inflation, presents the sources of inflation bias (high and low level substitution, new products and new outlets) and the adopted methodologies. It further examines the implications of different types of bias and recently applied corrections.

Indices composed by statistical bodies are an object of discussion at the frontiers of economic research (Shapiro and Wilcox 1996). In the second half of the 20th century international bodies, such as the IMF, the UN, the OECD and the EU, were involved in designing the framework that provides guidance and establishes universal treatment of economic flows in national accounts (Ruggles 1994). Since the 1980s the growing interest in methodologies grew apparent, most likely because of the fact that any mismeasurements became much more significant in times of stabilised, low inflation dominant in developed countries (Rodriguez-Palenzuela and Wynne 2004). Measurement problems that received much interest are substitution bias, new items and outlet bias, and quality change assessment. Other issues relating to the core purpose of measuring inflation, like the difference between expenditure defined and income defined inflation, are even less transparent in economics terms, being dependent on the user and have been addressed by statistical bodies by producing a wider array of specialised indices (Shapiro and Wilcox 1996).

Most applicable issues that are considered to be the source of mismeasurement are problems with maintaining representativeness of the sample. The weights on products and points of sale are determined with a lag, i.e. the attributed weights for products, also called “the marketbasket”, refer to an earlier period to the one when prices are surveyed. As the link period and the base period typically would be separated by two years, CPI formula diverges from the standard Laspeyres index. The magnitude of CPI-U bias in the US attributed to the divergence in weights from true was estimated to be 0.5% by the Advisory Commission (1995). European HICP¹ can have its elementary aggregates based on weights from periods of up to 7 years, although many countries update yearly (Rodriguez-Palenzuela and Wynne 2004). To correct the bias Tornqvist index was introduced as a second order approximation of the true cost of living index, a move commonly known as a move towards geometric mean indices. It is important to note however that a consistent bias may not have implications on policy objectives, such as the goal of stabilising business cycle: positive bias in GDP deflator affecting growth figures would mean that these figures have also been consistently underestimated in the past, thus as a measure of relative acceleration they remain robust.

An alternative approach to measuring the bias, following the idea of Nordhaus (1998), is to compare the deflated measure of median income with the self-assessed household wellbeing. As households report whether they are better or worse off (dependent variable: households declaring being better off minus households declaring being worse off), the independent variable is a deflated percentage change in median household income. Under a set of strong assumptions, provided that the price index is not biased, the regression intercept of such model should equal to zero, and a positive correlation between the variables should be present. Rodriguez-Palenzuela and Wynne (2004) researching the possible bias in HICP in the UK, Italy and France find that households tend to declare themselves being worse off, despite rising median income. In the US the estimated number of people declaring themselves better off was equal to the number declaring worse off when deflated (by CPI-U) median income was declining by 1.1%, giving contrary results.

B. Item substitutions and quality change

Quality bias comes into existence when the sample is not adequately reflected because of the imperfections in the process of replacing items. A number of methodologies have been developed by statistical bodies, mainly relying on product matching on the basis of a checklist for surveyors or hedonic models for some categories (Shapiro and Wilcox 1996). Nevertheless, the nature of methodologies requires certain imputations, as in the case of link pricing. The importance of correct measurement when the sample is rotated is reflected in the numbers: from 78 to nearly 96 percent of change in price level of studied items was directly attributed to rotating items by Armknecht and Weyback (1989) and Armknecht (1984). In some categories product lifetime is so short that surveyors are unable to reconcile the two principal attributes: measuring change in price of the same item in two periods and at the same time maintaining representativeness of the sample (Bascher and Lacroix 1998). Class mean imputations² of the price change invariably lead to a bias given the prevalence of “menu-cost” price setting custom, with changes in prices correlated with item replacement. Sample attrition also leads to a positive sample bias, as the products that survive to the comparison period come from the right side of the price change distribution. Products that become unavailable have become obsolete and would have to be sold at discounts which would have rendered them unprofitable (Pakes 2005). Sample attrition bias remains present in matched

¹ Harmonised Index of Consumer Prices is an indicator of inflation and price stability for the European Central Bank (ECB). A counterpart of UK's and US CPI.

² Class mean imputations equate the price level change with the mean for the product category, when no direct sample substitute is available.

and hedonic models, current attempts to minimise its size are based on a substantial increase in the number of prices surveyed, allowed by technological progress (scanner data, digital databases).

Tackling quality change issue, “brute force” methods have been used with tendency to concentrate on categories where the bias is likely to be very high (information technology, household durables), posing a risk that categories with less explicit improvement trends are being neglected, especially if the indices in these are downward biased (Rodriguez-Palenzuela and Wynne 2004).

The Boskin Commission findings were a subject to a famous critique known as the “Hulten-Bruegel Paradox” (Gordon 2009). If the current estimates of price level increase are extrapolated, the deflated income of the peasants from Bruegel’s paintings would be insufficient to feed them on a diet of potatoes, yet they are portrayed as well clothed and well housed. The paradox indicates a zero or a negative bias in inflation estimates at some point in history, yet the current research of statistical bodies is concentrated on categories where the bias is thought to be positive. Studies by Gordon on apparel prices (1996) and cars (1990), and Moulton and Moses (1997) on food and beverages category point towards a bias in Boskin commission report, overestimating the quality improvements.

C. New products bias

New items enter the indices with a lag, and the customer surplus remains unaccounted for when consumers shift their expenditure. Major price decreases occur before the products enter the sample, as in the case of mobile phones, present on the market for a decade before their inclusion in US CPI. While for most goods with a high substitution elasticity it has a negligible effect, some products, such as introduction of personal computer, allow customers to benefit from previously unavailable or prohibited by costs qualities (Shapiro and Wilcox 1996). Estimates (Lebow, Roberts and Stockton 1994) claim that categories where new product bias is particularly important account for 2.4% of total expenditure and the estimated bias is 0.5%, although the research is based on a rather thin scientific background, as admitted even by the authors.

Studies by Reinsdorf (1996) and Gordon (1990) concerned with explaining the post 1970s slowdown in growth are also considering the implications of the new product bias. The findings point towards a recent decline in the quality change effect, which is an inherent component of economic growth through the process of innovation. Under the category of new products also come illegal activities, which recently were included in GDP measurements across the European Union³, but will remain excluded from the HICP index.

D. New outlets

New outlets component is another category of substitution bias, as during the first period prices of the new retailers are not linked to the index. As consumers enjoy the surplus, CPI remains blind on prices. There are however two kinds of processes that lead to different estimates of such bias: when a fraction of consumers discovers lower prices and incumbent outlets are able to charge premium, or the second instance when all consumers discover lower prices in new outlets and incumbents have to match prices to a competitive level. Another problem occurs if it cannot be established whether in the first case the outlet offers inferior satellite characteristics that are not captured by the prices alone, making transactions incomparable due to differences in dimensions such as location and the quality of service. This however would be dependent on heterogeneity of

³ The discussion of changes to NIPA is presented in Section II

consumers’ tastes and any estimates would have to follow discovery of preferences or at least a reasonably well documented set of assumptions.

Table 1. presents the bias direction in the matrix form under three assumptions: that the change in the quality of satellite services remains unnoticed by the statistical body for both the incumbent and the entrant; that the new outlet does not introduce innovation, but offers a different mix of unobserved satellite services; and that the consumers have homogenous preferences. The basket weights are updated with a lag of one period, so that New Outlet market share is zero in period 1. New Outlet’s entry and Incumbent’s reaction happen simultaneously in period 1.

Table 1. Bias Direction for New Outlet Bias

		Incumbent’s reaction: satellite services quality choice		
		Lower	Same	Higher
New Outlet – quality of satellite services	Lower	Negative bias in period 1, no bias in period 2	No bias in period 1 and negative bias in period 2	Positive bias in period 1 and negative bias in period 2
	Same	Negative bias in period 1 and no bias in period 2	No bias	Positive bias in period 1 and no bias in period 2
	Higher	Negative bias in period 1 and positive bias in period 2	No bias in period 1, positive bias in period 2	Positive bias in period 1, no bias in period 2

E. Political economy of price measurement

Process of approval of the modern price index methodologies involves both scientific and political factors. Scientific criteria revolve around the accuracy and precision of measurement when comparing methodologies. The political criteria are dictated by the purpose of the indices and are subject to perceived credibility standards, and these standards seem to be considerably higher than academic consensus requirements. With the introduction of new methodologies the issue of policy-user learning curve known from the tax policy studies becomes apparent: Revisions of methodologies cause changes in measured price level and in what exactly is measured. Users adjust how they process the information, for example the United States Federal Reserve, which made explicit decision to target Core-CPI-U and devised its own interpretation that the FED believes CPI contains an upward bias of a range from 0.5% to 1.5%, evidenced by the comments made in 1995 by the chairman A. Greenspan (1997).

As Hulten (2004) argues, confidence and the level of professional consensus in the community of researchers translate into perceived credibility among users. Commissions and national economic and statistical associations recommend conservative stance and advise caution when revising methodologies. For example in 2002 the US National Research Council recommended more experimental work and warned against rapid expansion of the use of hedonic methods, as range of issues were raised in academic community. The perceived credibility is built on the grounds of academic consensus, transparency of revisions and provisioning of guidance for the users.

Studying the case of the BLS introducing chained indices provides a valuable insight into the process of building perceived credibility. Prior to 1999, the Laspeyres index formula had been used to compose CPI-U and CPI-W, the two headline indices used to index tax brackets, social security payments and private contracts. In January 1999 geometric mean formula was introduced, leading to a departure of the indices from the upper-bound Laspeyres formula, following years of research and the recommendations of 1996 Boskin commission. While the superlative formula index replaced the upper bound formula index, BLS continued to publish old formula indices for the purpose of comparison and maintaining credibility of the revisions. In 2002 a new index, chained-CPI-U⁴, based on superlative Törnqvist formula allowing for substitution among different CPI categories, was presented. As the index has to be revised twice annually, issues with timeliness prevent it from being used by the policymakers, since the final indices become available with a lag of one year. Constant elasticity of substitution (CES) behavioural models developed by Greenlees (2010) in preliminary results increased the accuracy of early C-CPI-U estimates, with the development specifically aiming to “(...) increase the usefulness of the C-CPI-U to government programs and other users.” CES formula replaced geometric mean formula in the February 2015 data release, along with the introduction of quarterly revisions to C-CPI-U, reducing the lag of the final index to 10 to 12 months.

Implementation of the changes since 1990s serves as a case study to present how sophisticated, lengthy and fragile the process of such adjustments is. With the current advocacy from the policymakers and the FED on the use of C-CPI-U it is very likely that in the near future the federal agencies will move indexation towards it (Congressional Budget Office 2009) (Federal Reserve Board 2004). The question arises on the criteria of improvement for the users, as the move to C-CPI-U and C-CPI-W is a move towards a cost of living index (COLI). In design however, chained index as a COLI, is “(...) restricted to private goods and services and in which environmental background factors are held constant.”(Schutze and Mackie 2002, p.73). The particular interest in allowing for substitution is embraced by the BLS and the users because of its relatively less problematic and less subjective nature, compared to other components of a true COLI.

F. Impact on fiscal and monetary policy

The impact of the bias in price indices received attention from economic historians and growth studies since the GDP deflator corrections re-write the history of economic growth. Studies researching the impact of mismeasurement focus on particular phenomena such as the post-1973 growth slowdown (Triplett 1997) and the divergence of the growth rates in the US and Europe after 1997 (Hartwig 2005). Evidence shows that changes to inflation measuring and its accuracy can explain all, or a part of the difference in growth rates in both cases. The divergence came into existence because some countries, including Germany, still had been using fixed base HICPs formula prior to 2007 (Eurostat 2007), whilst the impact of the changes in the US deflator post 1997 increased the GDP growth rates by 0.49 to 0.59 percent (Hartwig 2005).

Revisions can have a detrimental effect on monetary policy outcome if they are not correctly interpreted and compensated for. The move towards substitution bias corrected index by the FED can be criticised on the grounds of their monetary policy use of the index, because the inflation target moves in pair with corrections introduced to the index. To exemplify: the greater the uniformity of price changes from the assumed variation, the greater the difference between the old and the new, corrected for substitution index, influencing the effective inflation target. Accounting

⁴ Referred to further as C-CPI-U

for the changes to inflation measures, monetary policy bodies can increase their success in accomplishing the goals of price stability and achieving optimum output or employment.

Central banks have to remain aware of these nuances and reflect them in their interpretations. European Central Bank president Mario Draghi in response to questions on the lower than expected inflation numbers in December 2013 data release, calls the results “a quirk” due to technical issues in measuring services inflation (ECB 2014). The implications⁵ of the move to chained HICP and simultaneous seasonal adjustments on the inflation figures for the period had to be communicated to ECB, which in turn devised its understanding and explicitly named them as influential when forming the policy. The explanation however has been made public after the deflationary fears gained momentum in the press and among investors.

Macroeconomic modelling tools used by the policymakers are based on regression analysis, where inflation figures enter the equation as coefficients, which are used to create projections guiding current policy moves. The most important choice in the matter made by central banks is to select the target and the operational indicator in inflation targeting regimes (Knight, Fey and O’Reilly 2002). The political economy of price measurement plays a great role in the decision: the criteria and availability of a suitable measurement have to be assessed, and that warrants a pro-active role of the National Central Bank (NCB) in statistical work. NCBs in inflation targeting regimes require a measure of inflation that has unique properties: it is the best representation of the actual price level, while at the same time it is possibly free from the influence of what policymakers consider interference, such as temporary price moves of volatile commodities. Compiling such measures themselves, central banks face the issue of a conflict of interest, where creation of the inflation indicator is delegated to the agency that has its performance assessed on the basis of the indicator.

Solutions currently in place are based on a model in which central banks take an active role in designing indices, in cooperation with national statistical bodies. This results in contractual delegations and memorandums between NCBs and statistical bodies which specify “core” inflation measures. Core measures exclude statistically most volatile items and remain unaffected by changes to indirect taxation (Knight, Fey and O’Reilly 2002). Since the introduction of core measures in 1990s, NCBs in most inflation targeting regimes moved towards multiple measures that include core indices as operational indicators, while headline measures remained the explicit targets or ranges (Silver 2007). Delegation of the task to statistical bodies however does not solve the issues with credibility entirely; independence of statistical bodies is a subject of analysis in Section III. Another issue arises due to the divergence between the core measures and the broader headline indices, where the exclusion of particular items may be perceived as manipulation of the target (Silver 2007). A number of alternative methods that include trimmed means or trend estimates, are available, however, according to studies there is no clear contender that outperforms other methods using a number of criteria (Wynne 1999). Silver (2007) advises a data driven approach: NCBs should test the performance and rationale of each method given the country’s economy characteristics. The level of economic development, which affects category weights (especially for food and energy), the trade openness, and the importance of commodities in economy are known to be of importance when analysing alternative measures. Transparency of the changes would also be beneficial to the private sector, as more accurate projections lead to better employment and capital expenditure planning, which in turn has effect on macroeconomic policy due to more predictable cyclical moves.

⁵ underestimating inflation in January to November period by 0.1% and overestimating in December by 0.1 % (Mehrhoff, 2014)

Paradigm shifts like the recommendations made by Boskin commission resulted in widespread commentary from the non-academic sources: institutional and personal investment advisors, popular press and political groups. In absence of communication and commentary by the professional national statisticians, the changes were open to interpretation based on assumptions, rather than actual statistical releases. The current moves transforming CPI from Cost of Goods index (COGI) to Cost of Living Index (COLI), despite wide political and welfare implications are not considered to be political decisions. The discussion on the future of CPI as COLI had the audience reduced to professional, rather than political groups, and is not subject to legislative process.

II. National Income and Production Accounts – Modern approach and issues

A. Introduction to current issues in NIPA⁶

The understanding of the process of production of National Income and Production Accounts among economists is very limited: given the complexity of the task, it became a specialisation of a very narrow group of researchers and institutions. The perception of how national accounts are created was compared to a picture of a “great black cauldron, mixed together with data from an alphabet soup of surveys (Haltiwanger 1997, p. 68).” Modern approach to NIPA is directed by a cooperative of the most influential international bodies (European Commission, IMF, OECD, UN and the World Bank), which concentrate the efforts of researchers to set up an extensive set of guidelines known as The United Nations System of National Accounts (SNA). SNA, since the 1950s, has evolved to a harmonised system of measuring flows in economy, which finds use as a guide for policymakers, serving as a barometer of economy, facilitating cross-country comparisons, and is used in a number of international treaties on mutual development (Keuning 1998).

A plethora of issues pertaining to SNA has been identified and only the most significant from the perspective of monetary and fiscal policymaking will be the object of examination. Significance of the issues can be assessed on the basis of their influence on the most widely used headline statistics and on the relevance to the use, i.e. the degree to which the choice of treatment could affect policy decisions. The critical review is intended to appraise the design of SNA against the accounting principles, the criteria of improvement for a given policymaking use, and the fitness for purpose criteria.

The move to alternatives to domestic production and income measures of economic welfare, as discussed by Boarini, Johansson and Mira d’Ercole (2006) and Abraham and Mackie (2005), despite their revolutionary implications in a number of potential uses, is out of the scope of this review. The level of development and specifications of measures such as the welfare or happiness accounting is insufficient, and the interpretation on the side of the policymakers remains uncertain.

B. Capitalisation of R&D

The concept of capitalisation of R&D refers to the recent change in the treatment of expenditure on research and development. No longer treated as immediate consumption, research spending enters accounts as capital formation across private and government sectors (Ker 2014). R&D has already been capitalised in the national accounts of a number of countries including; Australia (2009), Israel (2013), Canada (2013), USA (2013) and EU member countries from 2014 (Ker 2014). The treatment of R&D in microeconomic data accounts (companies, non-profit

⁶ National Income and Production Accounts

organisations) is regulated by accounting principles set by regulations such as GAAP or tax authorities. Due to uncertainty in outcome, on a firm level R&D expenditure is considered as an expense under these principles, with some exceptions in areas such as software production and during acquisitions of patents and research in progress.

The argument for different treatment of R&D in national accounts is based on the averaging out effect. Projects in the entire economy ending up as failure or profitable investments will average to profitable activity, otherwise firms or governments would systematically invest in loss-making ventures, invalidating the assumption of rationality of behaviour (Edworthy and Wallis 2009). A rule of thumb in R&D sector is that for every successful research development there are 10 projects that failed.

Estimated impact of introducing the changes on the headline GDP ranges from 2% in the US for 2007 (BEA 2013), 3.6% in the UK for years 1997-2009 (ONS 2014) to 5% in Sweden (Daniels 2007) with OECD average of 2.2% (Van de Ven 2015). While the need for capitalisation of R&D was a generally accepted consensus for decades, the measurement difficulties were considered an obstacle. These issues relate to the prevailing non-market nature of R&D production, depreciation rate and the rate of return estimates. Non-market nature of the output requires imputations, with models based on the cost of production (Wenzel, Khalid Nadeem Khan and Evans 2009). Depreciation rates for R&D capital are modelled by patent renewal, production function, and amortization and market valuation methods. While there is no strong evidence of superiority of either, studies were critical of the 15% rate assumed by the US Bureau of Economic Analysis in their accounts, estimating it to be significantly higher: from 20 to 40 percent (Hall 2007) or 12 to 38 percent (Li 2012). The required rate of return in the capitalised treatment of R&D affects the GDP and GDI figures through the income side of the accounts, increasing profit and depreciation of private business and increasing consumption of non-profit and government sectors. Also, separating the rate of return to R&D from the rate of return to all capital has proven to be a “thorny” problem for the researchers (Fraumeni and Okubo 2005).

The general stand of statistical bodies on the measurement issues is that while there was little progress in combating them, the importance of R&D has been rising in the modern “knowledge economy”. The benefits and the impact on the accuracy improvement by the means of capitalisation simply followed soaring R&D spending in the economy. From the perspective of the users (policymakers), the assumptions made on the depreciation rate, the rate of return and their uncertain impact on GDP growth and investment figures can add to the complexity of interpreting the data. Amount of R&D spending and the rates of depreciation and return are volatile, being particularly sensitive to cyclical moves, making the estimates less robust in times when data driven policy guidance is of particular importance.

An alternative treatment proposes to account for the intangible investment (Lynch 2014). Treated as a discovery of an original which could be replicated through a transfer of rights, the approach would not increase the level of GDP. The approach is founded on the premise that access to new idea or technology is through discovery (non-produced asset), rather than production. Oltmans and Heine (2015) argue however that production of R&D cannot be considered similar to production of originals (as in the case of original recording or book script).

C. Informal and illegal economies

Monitoring unreported economic activity became an object of interest only in the past two decades, marking the paradigm shift for NIPA. European Standards of Accounting required EU countries to introduce changes to the treatment of non-market activities by 2014, including them in the

official country production accounts (Abramsky and Drew 2014). The magnitude of the impact varies across countries and the scope of activities covered is governed by the discretionary choice of statisticians and does not necessarily reflect the structure of the economy (Gyomai and Van de Ven 2014).

The non-observed economy can be separated into illegal economy and combined “underground and informal” economy, for the purpose of better understanding of the rationale for, and against their inclusion in the headline figures from the point of view of policymakers. The illegal economy, due to limited information, is reduced by statistical bodies to drugs (domestically produced and imported) and prostitution (assumed to be traded only domestically) (Abramsky and Drew 2014). The informal economy in most common approach (as prescribed by OECD) comprises of activities in the economy for the purpose of income and employment that remain unregistered with the government to reduce costs and allow for flexibility (Eurostat 2013). The underground economy consists of the activities deliberately concealed through not registering or misreporting for the purpose of tax and regulation evasion, but which in their nature are not illegal.

The main argument for their inclusion arises from the definition of the purpose of the GDP, which is designed to measure the economic activity exhaustively without making a judgement on what is socially desirable and what is not (Van de Ven 2015). The design of the accounting process is such that the sides of economic activity (production, consumption and expenditure), due to double bookkeeping constraints, would be imbalanced, had illegal activities remained excluded, and would cause discrepancies in other economic indicators, such as savings rates. Outlawing particular activities should not affect the magnitude of the production account, nor impair the international comparability. Cross country comparisons are however a secondary objective, with primary being the exhaustive monitoring of country’s economy (Gyomai and Van de Ven 2014).

From the perspective of monetary and fiscal policymakers, as well as specific uses of the figures in these areas, the arguments lose their impact and relevance. The impact of inclusion of illegal/informal activities on the static GDP figure has far greater impact on the fiscal policy and indexing decisions, than on monetary policy, which relies more on dynamics (growth) of production accounts (the changes increased growth rates less than 0.1% (Van de Ven 2015)). The stock variables however are significantly affected, as presented in Figure 1., ranging from 1.5% to nearly 18% for countries surveyed in 2012. The adjustment as well as its composition (underground, informal and illegal) varies across countries as presented in Figure 2.

Figure 1. Non-observed economy adjustments as percentage of GDP (Gyomai and Van de Ven 2014)

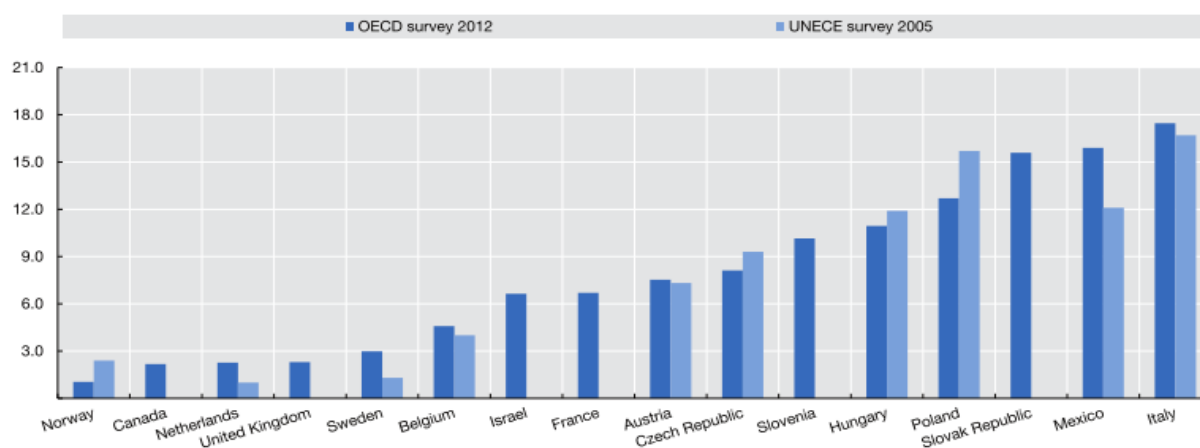
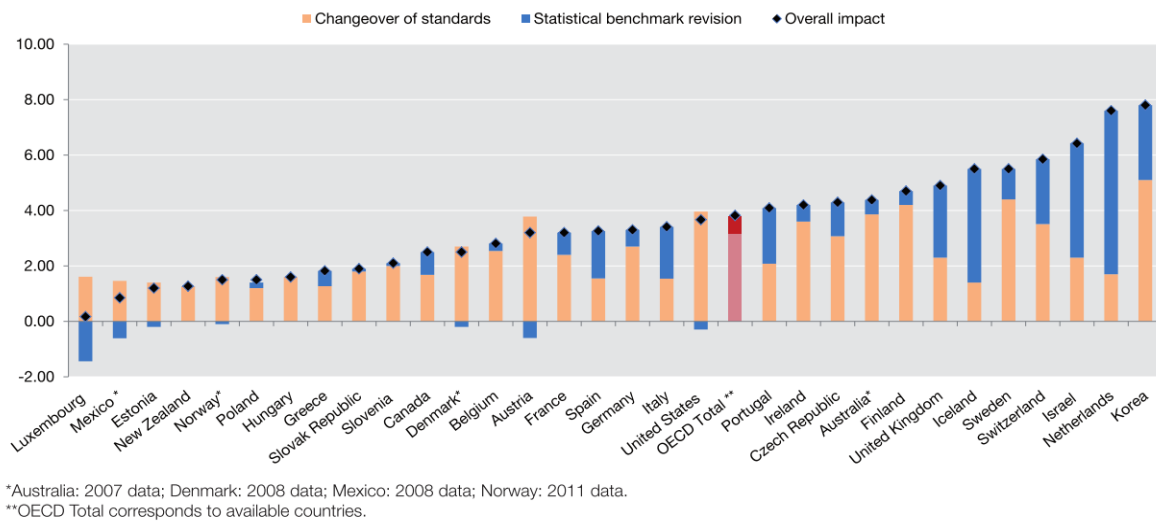


Figure 2. The overall impact of the benchmark revision on GDP-levels, in year 2010 (Van de Ven 2015)



The EMU Stability and Growth pact among its convergence criteria includes a limit of 3% budget deficit to GDP ratio and 60% accumulated debt to GDP ratio as indicators of fiscal prudence. The procedures triggered by violation evolved due to changes in 2005 and 2011, but the criteria remain the same, despite the recent changes to NIPA. With the adjustment of the NIPA treatment of non-observed economy, the meaning of the ratios used as criteria also changed. As a measure of fiscal accountability, the debt to GDP and deficit to GDP ratios become less relevant when included activities do not form a tax base for the government. These activities do not form collateral in the form of available future tax revenues.

The declines in fiscal ratios that followed SNA recommended adjustments are not representative of a real change in economy. Moreover, a part of the informal economy would cease to exist had it been subjected to administrative control, and fiscal burden and arising costs do not make it a readily available source of revenue for the government (Ihrig and Moe 2004). A tendency to move from the formal to informal sector does not affect the fiscal ratios in re-designed SNA, while the actual tax base shrinks and the tax revenue declines. The construction of updated SNA has a detrimental effect on the relevance of the ratios for the purpose.

The critique of the treatment can also be illustrated by differences across countries in classification of activities as permitted or illegal. Suppose that a country does not permit activities that constitute formal economy in other countries, such as gambling, oil extraction using fracking or financial institutions engaging in proprietary trading. The activities may be productive in one country, but in another can be banned on the grounds of unfair social transfers or externalities that render them unproductive when private and public costs are considered. The assertion that identical treatment of these activities under unified SNA improves cross country comparisons is invalidated by the fact that under the assumption of rationality, if these activities lead to the same outcomes, they would be universally permitted or forbidden across countries.

D. The political economy of NIPA: impact on policymaking.

The procedure of evaluating and introducing changes to NIPA is guided by a set of criteria that is largely universal due to the engagement of international bodies in standard setting. Primary measures of the progress are accuracy and consistency, defined as exhaustiveness of the coverage,

credibility and the precision of measures (Novak 1975). The recent changes, as described earlier, are aimed to benefit the national accounts from increased data availability, better processing and classification. Secondary criteria pertain to timeliness and the international comparability of figures. Renewed interest in welfare-based statistics in recent years shows however, that these are not the only criteria, and certainly current accounting does not meet all users' needs.

The exhaustiveness criterion is rather ambiguous, because the challenge in defining what activities are to be measured and included is at the core of the subject itself. The UN standards of accounts call for measuring all activities that belong to informal economy, which could be obtained from the market. To conform to the principles, the desirable property of the accounts is to reflect only the real changes in the economy, so that production is registered in consistent matter, regardless of which sector it takes place in (formal and informal, different industries). Measurement problems aside, productive activities of households, like owner occupied housing services are contenders to enter the satellite accounts group, while services like childcare do not, due to the difficulties in finding a formal economy counterpart of raising children. This is not purely a difficulty in measurement, but rather a question of what is considered a productive activity. We do realise the contribution of activities like raising children, but valuing them is a task difficult not only from the statistical perspective, but from the perspective of defining what constitutes human capital and what the process of production looks like (Abraham and Mackie 2005).

Assessing against criteria of progress declared in the re-designed SNA "all or nothing" accounting approach to non-market economy would be the one based on the accounting principles. The current treatment of beyond the market accounts may be perceived as skewed towards recognising additional output and overseeing the use of inputs (environment, externalities). Overlooking these inputs is equal to implicitly assigning their value to zero (Abraham and Mackie 2005). In comparison to estimates relying on imputations that are to a degree subjective, implying no value is with great certainty an inferior estimate. The experimental systems of extensive non-market accounting at this stage are bound to include double counting at this stage (Abraham and Mackie 2005), but as the accounts grow fully exhaustive, identification of deficiencies could become simpler in the future.

The process of introducing changes to NIPA methodology aims to prepare users for the change and preserve the credibility of the statistics. To achieve that, a number of concepts and procedures were developed, closely reassembling the process of redesigning price level indices. At initial stage the consultations take place in academia and at international conferences, comparing the "as is" state across countries and identifying improvements. In the next stage, the UN-led advisory board can issue recommendations to the national statistical bodies to evaluate the feasibility of introducing changes. Development of satellite accounts begins and cross country comparisons of the experience lead to further recommendations, followed by years of testing that may lead to incorporation of the changes and the satellite account data in the headline statistics. Introduction of major changes, called by the US BEA a "comprehensive revision", happens approximately every 5 years. "Flexible annual revisions" are introduced in between revisions (Seskin and Smith 2009). In the EU the revisions are less coordinated and national statistical bodies are required by the European Commission to introduce changes by a deadline, while revisions happen on a rolling basis, as in the case of ESA 2010 transmission program which requires countries to introduce changes from statistical releases in 2015 by 2018 release at the latest (Eurostat 2015).

The crucial element of the improvement process is to firstly develop satellite accounts. Satellite accounts are designed to "expand the analytical capacity of the economic accounts without overburdening them with detail or interfering with their general purpose orientation" (BEA 1994). Satellite accounts should focus on specific issues, providing a testing ground for new methods and

components (Landefeld and McCulla 2000). Some satellite accounts are collated as means of presenting information otherwise scattered in the main tables (tourism account), while other are developed using entirely new sources of data, such as accounts on household production and environmental accounts. A good example of the process of introducing changes is the case of R&D account in the US. Created in 1994 (BEA 1994) as a satellite account to facilitate experimentation with capitalising methodologies, became the integral part of SNA 2008 and ESA 2010.

Satellite accounts add flexibility needed when dealing with structural changes in the economy. Key developments in the economy often happen on the edges or outside of the area encompassed by the current standards of national accounting, like the growth of investment in R&D and human capital. Production accounts in areas that are outside the market activity can be measured in units different to monetary (tonnage, life expectancy impact) (ONS 2008), and in time move towards monetary measures, as activities transfer to the market. This is the projected path of the environmental accounting where external inputs and outputs are being internalised through regulation, taxation and become market goods. These accounts are a nod towards what is currently considered the welfare accounting; however, they do attempt to retain the approach known from the core of national accounting, relying on imputations based around matching and hedonic measures, rather than less formal approaches known from valuing environmental and public services. such as surveys and questionnaires.

Owner occupied housing NIPA accounting has the same background and consequences as “marrying the housekeeper paradox”. Considering both, the desired property of NIPA is to measure the value production invariant to the shift from formal to non-measured economy (Mayerhauser and Reinsdorf 2007). Accurate measurement of the owner occupied housing services received much attention in previous years, with a number of standards developed due to the significant weight in the economy. “Marrying the housekeeper” paradox encompasses a wide group of other economic phenomena, but two predominant trends have driven the direction of the impact on the GDP measures: the move from subsistence economy to market economy in developing countries, and the increase in the labour market female participation rate in developed countries. Research on the impact on the GDP figures or development of a satellite account, providing an insight into these effects, would be an important step forward. The magnitude of impact, with the example of the US female labour participation rate doubling from 1947 to 1990s, could re-write the economic history and shed light on the policy issues such as post 1973 growth slowdown (Abraham and Mackie 2005). The current estimates (Landefeld, Fraumeni and Vojtech 2009) of the shrinking household production reduce mean annual GDP growth from 3.1% to 2.9% for the 1964-2004 period. The improvement in the knowledge of the informal production, which is disproportionately more important in low-income households (Abraham and Mackie 2005), could also provide valuable insight into the equality policy, shedding light on issues especially relevant in today’s debates.

Another challenge in the interpretation of the national accounts is the counter-cyclical growth of the informal sector. The ratio of the size of the informal sector to GDP tends to decline in boom times and increase in recessions (Elgin 2012). According to the estimates the size of the shadow economy as the percentage of GDP has a negative correlation with GDP growth, with nearly perfect relationship: one percent increase in GDP growth is associated with one percent⁷ decline in the shadow economy to GDP ratio. As it is a substitute to formal economy, some activities are transferred to shadow economy due to the benefits of higher flexibility and lower costs (taxation, regulation)(Schneider and Williams 2013). Counter-cyclical moves of the informal economy have been known to cause overstating of the recession in post-Soviet countries, where the size of the

⁷ Not to be confused with percentage point

informal economy is high compared to other countries of the same development level. Despite the attempts to account for the informal economy, the data is not timely available and relies on historical surveys and imputations. Given these constraints, household production satellite accounts are of limited use and provide a limited insight for the short and medium run policymaking. Provided the relationship remained stable, the impact of formal-informal shifts could be easily controlled for in macroeconomic models. This is often not the case, as over time the relative size of the informal sector changes with the increase in development and the level of substitutability due to tax policy and regulation. Further research estimating the size of these effects could allow for isolation of the endogenous effect of fiscal policy, in similar manner to the approach used by central banks treating financial markets effect as endogenous to the interest rate policy.

III. Credibility of Statistical Bodies: Institutional Arrangements and Independence

A. Introduction to institutional arrangements

The credibility of national statistics and accounts remains little researched subject in the discipline. Studies concentrate on technical, academic criteria of progress, or the development of measures catering for particular users (governments, NCBs). Studies acknowledging the need for building credibility by Silver (2007) and Hulten (2004) highlight the issues of building it through an academic consensus and advocate experimental developments and trials conducted in parallel to the main statistical work. Dziobek and Tanase (2008) remark on the importance of impartial statistics created by independent bodies. In their review of the institutional arrangements for national statistics of the countries subscribed to Special Data Dissemination Standards Scheme (framework for developing countries), offered under the auspices of IMF, main focus falls on the legal framework and the division of roles by institutions across countries. Koch-Weser (2013) in his review finds deficiencies in the quality of Chinese economic data on GDP and price indices due to a deliberate manipulation of the data. According to Koch–Weser’s research, based on comparisons to alternative measures such as electricity consumption, private and state enterprises and local governments misreport data to appease their executives, while the central government attempted to mask the volatility, especially after 2009.

Media outlets and investors expressed their opinions on the recent changes to price level measurements and the income accounts. Reviewing the headlines on the inclusion of illegal activities in ESA the public’s commentary is sceptical about the motivation behind the changes. In the UK the confidence in national statistics can be described as “low” (Dunnell, Laux and Alldritt 2007), which is attributed to the general distrust to government.

The problem of divergence between the perceived and observed inflation has been known for years and received particularly high interest for countries entering the Eurozone, as studied by Stix (2006) and Eife and Coombs (2006). Researchers assign divergence to the psychological effects and a different perception of the price movements that depends on the frequency of purchases, the price move direction (declines tend to remain unnoticed), and the press coverage and expectations during the Euro changeover. The discrepancy between the perceived and the measured inflation not only is a starting point for the discussion on the accuracy of modern price indices, but also on the progress in building their credibility.

Academic and commercial work in the area of national statistics that could be considered comparable to official indices is limited due to the extent of the task. Commercial project Shadowstats (2016) aims to continue compiling the US CPI index using the BLS methodologies

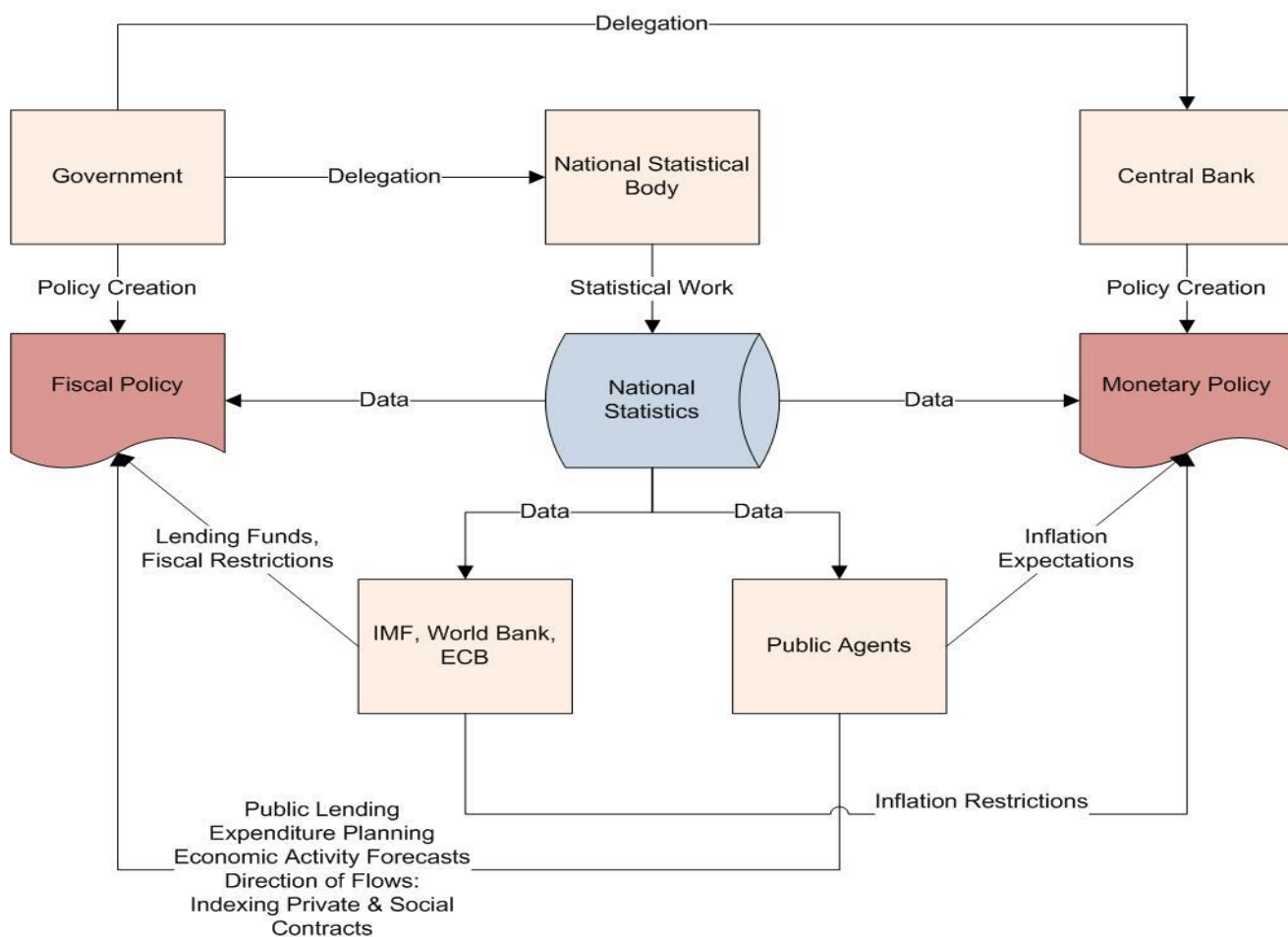
from the 1990, questioning the validity of the changes to the index since. The Billion Prices Project (2016), conducted by MIT professors Alberto Cavallo and Roberto Rigobon, aims to collect data for online retailers and create a real-time index that facilitates research into issues such as inflation expectations (Cavallo, Neiman and Rigobon 2014) and the credibility of official statistics (Cavallo, 2013).

B. Economic rationale for an independent statistical body

Assessment of how the credibility of national statistics is established can be carried out with the help of the experience economists gained measuring central bank independence. The implications of political interference into methodologies and pressure for certain results, as discussed in previous chapters, can have a significant impact on what is being fed as an input to assist fiscal and monetary policy decisions. Similarity allows for drawing certain parallels on how the institutional arrangements should be evaluated and resolved, establishing the independence and credibility of national statistical bodies. Benchmarking analysis that compares the institutional arrangements of the central banks and the process of development of national statistics will provide an insight on how well the solutions adhere to the principles of independence and professional authority.

The credibility of the monetary policy is thought to increase with the degree of independence of the central bank (Sargent and Wallace 1981), and the same effects can apply to national statistical bodies. Diagram in Figure 3. presents simplified policy transmission channels that are affected by the credibility of national statistics. Political influence on statistical body can lead to production of skewed statistical data, which then enters the monetary policy on two sides: the design of the policy by the central bank and the inflation expectations formed by the public. The political influence on national statistics can affect the fiscal policy decisions through obfuscation of fiscal ratios and interference with the perception of risk of lending to the government, both for public and organisational lenders (Bos 2007). Price indices used for indexing wage contracts and welfare spending direct payment flows to individuals and political forces (Malkiel 1978). Government in this simplified view is the only body that exerts political pressure, but it is valid to note that the international bodies have their input in SNA (under aegis of UN) and price measurement methodology (European Commission led the design of HICP). This multilateral arrangement creates a system of checks and balances to the design of methodology, but direct interference and pressure are only available to national governments.

Figure 3. The Transmission Channels of National Statistics



Using components of the existing central bank independence indices by Cukierman (1992) and Grilli et al (1991) as reference, institutional arrangements of national statistical bodies will be assessed. Establishing credibility of statistical bodies on the institutional level consists of freedom from the political interference through appointments, and facilitating development of statistics to a high standard – the issue of adequate legal framework, division of roles and financing statistical work.

Table 2. presents data on governance of national statistical bodies in the US, the UK and Greece. The countries were chosen due to the relative abundance of information, as they embarked on the task of reviewing their statistics and the arrangements in recent years. Data provides answers to assess the independence criteria, closely following the frameworks adopted by Cukierman and Grilli. Criteria are divided into four categories: methods of appointments for executive roles, the relationship and funding from the governments, the governance rules embedded in their operational framework and the public transparency. Descriptive analysis based on data

Table 2. Data and Overview of Institutional Arrangements in Production of National Statistics as of 2015

Country	Appointments			Government Relationship		Legal framework: Code of Conduct and Code of Practice			Public availability
	Board and Executives Appointed by	Average term for the executive	Structure of the board - membership	Reporting relationship and audit	Government Funding	Protecting the integrity of the data	Code of practice: explicit statement on independence	Relationship: Central bank, separate body	Are executive minutes/meetings available to public?
<i>United Kingdom</i>	Open Competition for the chairman, Parliamentary approval of the appointment	4.5 years National Statistician	Executive and non-executive members	National Statistics and ONS are non-departmental body, not under the direct control – civil servants	Funding the Statistics Authority which has full discretion over allocation £200M	Explicitly stated as a role of the national statistics	Explicit Statements on the independence and impartiality. The board of Nat Statistics prepares the code of practice	Separate from the Central Bank, restrictions on RPI – requires the approval of the Bank of England	Meeting Minutes and Papers available to the public
<i>United States</i>	Advisory Committees: Under Secretary of Commerce for Economic Affairs (ex-officio head of ESA) nominated and serving at the pleasure of the government BLS:	BLS: Commissioner: 4 year term, long spells of acting commissioners between nominations (1 to 2 years) Technical Advisory Committee and Data Users	BEA: Advisory Committee recruited from academic community BLS: Technical Advisory Committee: 16 members recruited	BEA is an agency of US Department of Commerce BLS is an agency of US Department of Labor. Executive agencies that report to the President with	ESA US\$113 million BLS \$640.9 million Funding of advisory committees comes from within agencies BEA \$111 million	BEA: Advisory Committee and Federal Economic Statistics Advisory Committee: advising on new methods from the academic and business perspective	BLS: Data Users Advisory Committee “membership consistent with achieving the greatest impact, scope and credibility among	US Code Title 15 chapter 5 for BEA Price measurement delegation – approval obligations required	FESAC meetings open to the public Vintage data for price indices available from the FED

National Statistics and Policy

	Commissioner: Approval of the US Senate Technical Advisory Committee and Data Users Advisory committee: appointed by BLS, approved by Secretary of Labor	Advisory Committee: 3 years	from academia	congressional oversight.	Funding attributed by the president's office, reviewed by the congress	BLS: Technical Advisory Committee: assessing "whether the academic community will regard the work as being technically sound and reflecting best practices" Data Users Advisory Committee: advice from the point of view of users (academia, researchers, business	diverse stakeholders"		
<i>Greece</i>	ELSTAT President nominated by a committee of members originating from Greek Parliament, Eurostat and ESGAB and ESSC	4 year term for the Advisory Committee, only once renewable Good Practice Committee: 2 year term	17 board members of the Advisory Committee nominated by 17 bodies: parliament, government, National	Reports to Greek parliament rather than the government. Audited by Eurostat and EC, also engages in	Funded in 80% from the European Regional Development Fund, Greek contribution part of the budget decoupled from the	Explicitly stated as the responsibility of ELSTAT LAW no: 3832 following Article 12 of the Regulation (EC) No 223/2009	LAW no: 3832 following Article 12 of the Regulation (EC) No 223/2009	Able to impose sanctions on ELSS agencies Advisory Committee member represents the national bank	ELSTAT Sanctions hearings available to the public

	<p>Advisory Committee: Nominees from the 17 represented bodies chosen by the Minister of Finance Good Practice Committee: Minister of Finance nominees from a selection of Parliament and EU bodies</p>		<p>Bank of Greece and EU bodies among others. Additional Good Practice Committee with 5 members representing the Parliament and the EU</p>	<p>voluntary peer reviews.</p>	<p>Ministry of Finance budget</p>	<p>governed by the statistical principles of “professional independence”, “impartiality”, “objectivity</p>			
--	--	--	---	--------------------------------	-----------------------------------	--	--	--	--

C. Country review: United Kingdom

Public scepticism about the credibility of the statistics in the UK is attributed to the particularly aggressive press and distrust to the government. The current shape of the institutional arrangement was formed in 1996 when the Office for National Statistics was created to co-ordinate what is largely a decentralised process with approximately 80% of total work being carried out in administration and governmental departments producing various components (Dunnell, Laux and Alldritt 2007). Creation of an independent statistical body was an election pledge made by the Labour party along with the promise to create the Monetary Policy Committee, with intent to establish the independence of the central bank.

In 2000 a more stringent code of conduct was introduced and the Statistics Commission was established to guarantee the professional independence of the ONS. 2009 Code of Practice for statistical work requires that changes to methods or classifications should be communicated well in advance and that “(...) those producing statistical reports are protected from any political pressures that might influence the production or presentation of the statistics.” (Statistics Authority 2009). On the basis of Statistics and Registration Service Act 2007 the Government Statistical Service, comprising of the ONS and departmental staff, report to the government through the Statistics Authority to guarantee its professional independence. The act also allows the Bank of England to raise an inquest with the Chancellor of the Exchequer, if it considers the changes to RPI to be fundamental and detrimental to the interest of some groups (HM Government 2007).

From the report on the public trust into the national statistics the effect of the new arrangement and the outlook are positive. The number of respondents who disagreed with the statement that national statistics are produced without political interference was 34% in 2014, down from 58% in 2009 (excluding “don’t know” answer) (NatCen 2015; NatCen 2010). Specific questions on the political interference in CPI and GDP revealed that nearly a half of the respondents believe there is a degree of interference (NatCen 2015) and on average rated the level of trust in the Cost of Living Indices in 2009 rated on a scale of 1 to 10 at 5.32.

D. Country review: United States

The Federal Statistical System in the US is different to its counterparts in other countries in that the bodies are decentralised and belong to different departments in the government. The study by Malkiel (1978) reviewed the arrangements and the scope of politicisation of the US statistical system. The findings suggested deficiencies in the quality of the data and the evidence of political interference. Since the time of the study the system was partially reformed, but in 1995 the inquiry by Government Accountability Office found deficiencies in adherence to the principles of transparency and independence (GAO 1995).

Bureau of Labor Statistics, the producer of price and labour indices, is a part of the US Labor Department, a federal agency which serves as a principal statistical body to the US government. Another major office, the Bureau of Economic Analysis (BEA), belongs to the US Department of Commerce. The distinct property of the American system of national statistics is that the statistical agencies are executive agencies under Presidential control, but produce data serving congressional legislation. The agencies thus face the issue of a conflict of interest between the government and the Congress.

Federal Economic Statistics Advisory Committee was established in 2010 to advise the Directors of the Bureau of Economic Analysis (BEA), the U.S. Census Bureau (Census), and the Commissioner of the Department of Labor's Bureau of Labor Statistics (BLS) on statistical

methodology and other technical matters related to the collection, tabulation, and analysis of Federal economic statistics (Federal Register, 2010). Advisory Committee bodies in the US serve as ad-hoc, temporary bodies that provide expertise on particular issues.

Suggestions to consolidate statistical work and create a centralised statistical body re-surface periodically. The rationale behind them is to create a body free from departmental influence with the sole purpose to produce national statistics (Malkiel 1978). The advantages of centralised approach come from a better coordination and superior position to the intra-departmental status of the BLS or the BEA. The advantages of the more decentralised approach are lower influence of the executive level and the close-knit relationship that allows the body to cater for the needs of the department. However, given the number of users of statistics nowadays, the latter argument loses its relevance. Malkiel in his recommendation also indicated the need to create advisory committees, which were introduced in 2008⁸, 2010⁹ and 2011¹⁰. Consolidation however has not been achieved so far: 13 bodies remain as primary producers of statistics with further 70 engaged in some statistical research (GAO 2012).

In 2012 an inquest by the Congress Oversight Committee attempted to investigate the politicisation of the BLS data and the dissemination process. The accusations were in regard to requirements to “draft news articles on government-owned and government-operated computers” by news agencies using BLS data and the methods of accounting for “green jobs” (US Congress 2012). Also, the analysis of the implications of the changes to indexation of social security from CPI to other indices was proposed by the government, motivated by the political need to research possible federal spending savings, .

E. Country review: Greece

Hellenic Statistical Authority (ELSTAT) was created in 2010 in the wake of accounting scandals that surfaced after the Greek government debt crisis. In 2002 Eurostat expressed its reservations on the quality of Greek statistics and forced reclassifications in debt accounting area. In 2004 Eurostat rejected the corrections made by the National Statistical Service of Greece, the predecessor office of ELSTAT belonging to the Ministry of National Economy (Eurostat 2004). The NSSG was also under IMF’s review, who found methodologies of national accounts “obsolete” and that the NSSG had no plans to introduce quality adjustment and sample adjustment methods as of 2005 (IMF 2005).

As an independent body ELSTAT is supervised by the parliament and its role is to approve (certification body) and supervise work of ELSS agencies (Hellenic Statistical System). It was also explicitly designated to introduce the statistical principles from the Regulation (EC) No 223/2009 to harmonise the system with European Standards.

In 2011 Andreas Georgiou, the head of ELSTAT, was put under investigation over felony charges (FT 2011). Upon his chairmanship, ELSTAT revised the 2009 budget deficit figure from 13.4 to 15.8 percent of GDP, the figure that was crucial to the decision of the ECB on delivering tranches of the bailout fund to the government. Georgiou was cleared of the charges, however upon the change of government to austerity-challenging coalition, the charges were investigated again and the case failed in July 2015, followed by Mr Georgiou’s resignation in August (Reuters 2015). The 2015 ESGAB report (ESGAB 2015) notes the “absence of a “wider cultural acceptance and understanding amongst politicians, administrators, the media and indeed the public at large of what

⁸ BEA Advisory Committee

⁹ Federal Economic Statistics Advisory Committee

¹⁰ BLS Advisory Committee

professional statistical independence actually entails in practice”, which may impair the process of creating the credibility of Greek statistics.

IV. Conclusions

The discussed issues that surround production and use of national statistics are yet to be resolved. Despite the technological progress, statisticians are unable to collect large parts of data to compile the statistics. Methodological changes compensating for known inaccuracies have changed the original meaning of the figures for both price indices and the national income and production accounts.

In the area of price indices measurement this is evident in the move away from the Cost of Goods Index to the Cost of Living Index as a primary indicator of inflation for policymaking purposes. Methodology evolved to compensate for estimated biases that arose due to the technological progress: multiple outlets, availability of substitutes and quality improvements. While these corrections have strong foundations in economic theory, the real world intricacies have not been resolved. Differences in the level of satellite services remain largely invisible to statisticians. Demand switching from traditional outlets to the growing discounting outlets likely reverses the true direction of adjustment due to the negative outlet bias. The quality change bias adjustments have been focused on CPI categories where the bias was apparently positive, such as consumer durables or medical care. Hulten-Bruegel paradox implies lack, or existence of a negative bias at some point in history, in categories where it was assumed to be negligible, as confirmed by independent studies. Such asymmetry in looking for positive quality bias, and overstating it, can be explained by the political pressure to lower the reported inflation.

The level of complexity of statistical computations has increased due to introduction of quality matching methods, making inflation figures nearly impossible to audit externally. Statistical bodies, acting on their own initiative or being required by the governing body, should make the methodology, raw data and the interim calculations publicly available. Price index changes were insufficiently explained to the users and were not a subject of debate regarding their wider implications in areas of monetary policy, fiscal policy and social transfers. Greater transparency will uncover the political implications of changes, improving the perceived credibility of inflation figures. It is also required to enable debates on the direction on the future of the Cost of Living Index as the primary indicator of inflation.

In the field of NIPA the adjustments accounting for the size of informal and illegal economies increase the coverage of the statistics and the completeness of the flows. However, decoupling the headline GDP figure from the formal, taxed economy impairs its usability in the fields of national borrowing, fiscal restrictions and public finance. Informal and illegal economies do not form the tax base for the state, and the size of such adjustment varies from 2.5% to over 30% of the economy size for surveyed developed countries. Relying on such figures to compose fiscal ratio statistics will mislead domestic policy makers, the investors and international bodies. The initial premise on GDP figures regarding the positive welfare and taxability of the activity are invalidated, as statistical bodies are attempting to internalise informal and illegal economies.

Capitalisation of R&D expenditure in national production accounts is a step forward in truly reflecting the economic nature of R&D investment. These changes require the statistical bodies to use imputations around the depreciation rate and the required rate of return. Given that the confidence of these estimates is no greater than for other sectors of unobserved economy, there is scope to call for “all or nothing” treatment of the nonmarket activity. This would also entail

including natural resources, environmental assets and household services, an adjustment which will reduce the true growth rate of national income in the past decades. The current approach and the political pressure tend to be skewed towards accounting for more outputs and not recognising inputs, increasing GDP figure and its growth.

The solution proposed in this study is to continue publishing the familiar GDP figure using the existing methodology. Maintaining separate experimental accounts for nonmarket sectors will enable research and political discussions on their inclusion in the new, exhaustive measure of economy. This should be published concurrently to the formal economy GDP and used when more suitable, facilitating tasks such as cross country comparisons and measuring policy outcomes. In the future, following political decisions, the universal economic activity measure could form the skeleton of the welfare accounting framework.

The task of preparing national statistics is susceptible to politicization, which can have serious consequences for fiscal and monetary policymaking. Conflicts of interest arise along the lines of government – public, government – independent monetary institution and government-supranational organisations. The ability to audit the statistical work is impaired because the tasks of the agency cannot be conducted outside the agency due to their complexity (Lewis 2008). Recognising the issues and responding to the user needs statistical frameworks were re-designed in the USA, the UK and Greece.

Current institutional arrangements explicitly focus on building credibility and independence of statistical bodies. The division of roles and supervision were designed to establish responsibilities, facilitate cooperation and enable audit of the figures. Institutional approach in the reviewed countries acknowledges the need to separate the production and dissemination of statistics from policymaking. In the UK and Greece, which re-designed their systems in the past decade, the statistical agency takes the leading role, while in the US the work is more decentralised. As presented in Table 2. solutions in place for national statistics borrow from the experience on establishing the independence of central banks: independent committees, transparency of appointments and availability of information to the public.

Nevertheless, establishing credibility and maintaining professional independence require further commitment. National parliaments are best suited to perform the governance and oversight role over statistical bodies. Basic definitions of headline indices should be included in the mandate delegating work to the statistical bodies, which could be subject to parliamentary vote. At the same time, publicising interim data and methodology will allow for a form of public audit of the clearly defined task.

V. References

- Abraham, K.G., Mackie, C.D., 2005 “Beyond the market: Designing nonmarket accounts for the United States” National Academy Press
- Abramsky, J., Drew, S., 2014 “Changes to National Accounts: Inclusion of Illegal Drugs and Prostitution in the UK National Accounts” ONS, May 2014
- Ahnert, H., Kenny, G. 2004 "Quality adjustment of European price statistics and the role for hedonics" Occasional Paper Series 15, European Central Bank.
- Armknrecht, P., 1984 “Quality Adjustment in the CPI and Methods to Improve It” *Proceedings of the Business and Economics Statistics Sections*, American Statistical Association 1984 pp. 57-63
- Armknrecht, P., Weyback, D. 1989 “Adjustments for quality change in the U.S. Consumer Price Index” *Journal of Official Statistics*, 5, pp. 107-123.
- Barro, R., Gordon, D., 1983b “Rules, Discretion and Reputation in a Model of Monetary Policy,” *Journal of Monetary Economics* 12, pp. 101-121
- Bascher, J., Lacroix, T. 1998 “On the use of hedonic methods in the CPI: an application to consumer durables and apparel” French National Institute of Statistics and Economic Studies, April 1998
- BEA, 1994 “A Satellite Account for Research and Development” *Survey of Current Business*, November 1994
- BEA, 2013 “Preview of the 2013 Comprehensive Revision of the National Income and Product Accounts” Bureau of Economic Analysis, March 2013 Available online at: http://www.bea.gov/scb/pdf/2013/03%20March/0313_nipa_comprehensive_revision_preview.pdf [Available: 24/01/2016]
- Billion Prices Project, 2016 Available online at: <http://bpp.mit.edu> [Available: 03/03/2016]
- BLS, 1997 “Measurement Issues in the Consumer Price Index” Bureau of Labor Statistics U.S. Department of Labor Available online “<http://www.bls.gov/cpi/cpig697.htm>”
- Boarini, R., Johansson, Å. Mira d’Ercole, M., 2006 “Alternative Measures of Well-being” *OECD Statistics Brief*, May 2006, no.11 OECD
- Bos, F., 2007 “Use, misuse and proper use of national accounts statistics” *National accounts occasional paper* Nr. NA-096, Statistics Netherlands
- Cavallo, A., 2013 “Online and official price indexes: Measuring Argentina’s inflation” *Journal of Monetary Economics* Volume 60, Issue 2, March 2013, pp. 152–165
- Cavallo, A., Neiman, B., Rigobon, R., 2014 “Inflation Expectations, Learning and Supermarket Prices” *NBER Working Papers 20576*, National Bureau of Economic Research, Inc.
- Daniels, M., 2007 “Capitalising R&D” *Yearbook on Productivity 2007*, Statistics Sweden pp.63-74
- Dziobek, C., Tanase, F., 2008 “Institutional arrangements for producing macroeconomic statistics in countries subscribing to the Special Data Dissemination Standard (SDDS)” *IFC Bulletin* No 28 pp.323-328

ECB 2014 “Introductory statement to the press conference (with Q&A)” 9 January 2014, Available online at: <https://www.ecb.europa.eu/press/pressconf/2014/html/is140109.en.html> [Available 15/01/16]

Edworthy, E., Wallis, G., 2009 "Research and Development as a Value Creating Asset" in OECD and FSO, Productivity Measurement and Analysis, OECD Publishing, Paris

Eife, T.A., Coombs, W.T., 2006 “Coping with People’s Inflation Perceptions During a Currency Changeover” *Working Papers 0458*, University of Heidelberg, Department of Economics, revised November 2007

Elgin, C. , 2012 “Cyclicality of Shadow Economy” *Journal of Applied Economics and Policy*, December 2012 pp.478–490

ESGAB, 2015 “Opinion of the European Statistical Governance Advisory Board (ESGAB), urging full implementation of the Hellenic Statistical Law (3832/2010) and Greece’s commitment on confidence in statistics” European Statistical Governance Advisory Board, 24 March 2015 Available online at:

http://ec.europa.eu/eurostat/documents/34693/344453/2015_271_opinion+on+Greek+developments_15+03+24_final/c8cab733-3351-41c1-b990-0171e07cc4c0 [Available: 25/02/2016]

Eurostat 2007 “HICP Methodology”, Available online at: http://ec.europa.eu/eurostat/statistics-explained/index.php/HICP_methodology [Available 14/01/16]

Eurostat, 2004 “Report by Eurostat on the Revision of the Greek Government Deficit and Debt Figures” Eurostat, 22 of November 2004 Available online at:

<http://ec.europa.eu/eurostat/documents/4187653/5765001/GREECE-EN.PDF/2da4e4f6-f9f2-4848-b1a9-cb229fcabae3?version=1.0> [Available: 25/02/2016]

FAO, 2015 “Food Price Index” Available online:

http://www.fao.org/fileadmin/templates/worldfood/Reports_and_docs/food_price_index_nominal_real.xls [Avaliable: 04/01/2016]

Federal Register, 2010 “Establishment of the Federal Economic Statistics Advisory Committee and Intention To Recruit New Members” A Notice by the Economics and Statistics Administration, 15/09/2010 Available online at:

<https://www.federalregister.gov/articles/2010/09/15/2010-22985/establishment-of-the-federal-economic-statistics-advisory-committee-and-intention-to-recruit-new> [Available: 21/02/2016]

Federal Reserve Board (2004), “Economic outlook and current fiscal issues” testimony of Chairman Alan Greenspan before the Committee on the Budget, U.S. House of Representatives, February 25. Available at:

www.federalreserve.gov/boarddocs/testimony/2004/20040225/default.htm. [Avaliable: 03/01/2016]

Fraumeni, B.M., Okubo, S., 2005 “R&D in the National Income and Product Accounts: A First Look at Its Effect on GDP” *Measuring Capital in the New Economy*, University of Chicago Press August 2005

FT, 2011 “Greece’s statistics chief faces criminal probe” Financial Times, 27th of November 2011, Athens. Available online at: <http://www.ft.com/cms/s/0/82b15932-18fe-11e1-92d8-00144feabdc0.html#axzz41HuIJQI5> [Available: 25/02/2016]

- GAO, 1995 “Statistical Agencies: Adherence to Guidelines and Coordination of Budgets” *Chapter Report*, 08/09/95, GAO/GGD-95-65 Government Accountability Office, Available online at: <https://www.gpo.gov/fdsys/pkg/GAOREPORTS-GGD-95-65/html/GAOREPORTS-GGD-95-65.htm> [Available: 25/02/2016]
- GAO, 2012 “Federal Statistical System: Agencies Can Make Greater Use of Existing Data, but Continued Progress Is Needed on Access and Quality Issues” Report to the Chairman, Subcommittee on Federal Financial Management, Government Information, Federal Services, and International Security, Committee on Homeland Security and Governmental Affairs, U.S. Senate, February 2012
- Gordon, R.J. 1990 “The Measurement of Durable Goods Prices” University of Chicago Press
- Gordon, R.J. 1996 "The Sears Catalog Revisited: Apparel and Durable Goods." Northwestern University, April 1996.
- Gordon, R.J. 2006 “The Boskin Commission Report: A Retrospective One Decade Later” *National Bureau of Statistical Research Working Paper*, June 2006
- Gordon, R.J. 2009 “Price Index Concepts and Measurement” Chapter in NBER book, W. Erwin Diewert, John S. Greenlees and Charles R. Hulten, editors, University of Chicago Press pp. 85 - 128
- Gordon, R.J., VanGoethem, T. 2005 “A Century of Housing Shelter Prices: Is There a Downward Bias in CPI?” *National Bureau of Statistical Research Working Paper* 11776, November 2005
- Greenlees, J.S. 2010 “Improving the Preliminary Values of the Chained CPI-U” American Statistical Association, Joint Statistical Meetings October 2010
- Greenlees, J.S., McClelland, R. 2008 “New Evidence on Outlet Substitution Effects in Consumer Price Index Data” *BLS Working Papers* U.S. Department of Labor Working Paper 421 November 2008
- Greenspan, A. 1997 “Testimony of Chairman Alan Greenspan: Bias in the consumer price index” The Committee on the Budget, U.S. House of Representatives, Available online at <https://www.federalreserve.gov/boarddocs/testimony/1997/19970304.htm> [Available: 07/02/2016]
- Grilli, V., Masciandaro, D., Tabellini, G., Malinvaud, E., Pagano, M. “Political and Monetary Institutions and Public Financial Policies in the Industrial Countries” *Economic Policy* Vol 6, No. 13. October 1991 pp. 341-391
- Hall, B., 2007 “Measuring the Returns to R&D: The Depreciation Problem” *National Bureau of Economic Research Working Paper* 13473, October 2007.
- Haltiwanger, J. C., 1997 “Measuring and Analyzing Aggregate Fluctuations: The Importance of Building from Microeconomic Evidence,” Review (May/June 1997), pp. 55-75. Federal Reserve Bank of St. Louis
- Hartwig, J. 2005 “On Misusing National Accounts Data for Governance Purposes” *KOF Working papers* 05-101, KOF Swiss Economic Institute, ETH Zurich.
- HM Government, 2007 “Statistics and Registration Service Act 2007”

- Hulten, C. 2004 "The Political Economy of Price Measurement: At What Price and Beyond," paper presented at Price Index Concepts and Measurement, Conference on Research in Income and Wealth, Vancouver, B.C., June 28-29, 2004
- Ihrig, J., Moe, K.S., 2004. "Lurking in the shadows: the informal sector and government policy," *Journal of Development Economics*, Elsevier, vol. 73(2), pages 541-557, April.
- IMF, 2005 "Greece: Report on the Observance of Standards and Codes—Data Module—Update" *IMF Country Report* No. 05/45, February 2005
- IMF, 2006 "Japan: Report on Observance of Standards and Codes: Data Module, Response by the Authorities, and Detailed Assessments Using the Data Quality Assessment Framework" *IMF Country report* No. 06/115
- Ker, D., 2014 "Changes to National Accounts: Measuring and Capitalising Research and Development" *Measuring and Capitalising R&D*, Office for National Statistics, June 2014
- Koch-Weser, I.N., 2013 "The reliability of China's economic data: an analysis of national output" U.S.-China Economic and Security Review Commission Staff Research Project Report
- Landefeld, J.S., Fraumeni, B.M., Vojtech, C.M., 2009 "Accounting for Household Production: A Prototype Satellite Account Using the American Time Use Survey" *Review of Income and Wealth* Series 55, Number 2, June 2009
- Laux, R., Alldritt, R., Dunnell, K. 2007 "Evolution of National Statistical Systems" *Statistical Journal of the IAOS* vol. 24, no. 1,2, pp. 47-59
- Lebow, D.E., Roberts, J.M., Stockton, D.J. 1994 "Monetary Policy and the Price Level" Board of the Governors of the Federal Reserve System, Washington D.C.
- Lewis, D.E., 2008 "The Politics of Presidential Appointments: Political Control and Bureaucratic Performance" Princeton University Press
- Li, W.C.Y., 2012 "Depreciation of Business R&D Capital" *Bureau of Economic Analysis/National Science Foundation R&D Satellite Account Paper*, October 2012
- Malkiel, B.G., 1978 "Problems with the Federal Economic Statistical System and Some Alternatives for Improvement" *The American Statistician*, Vol. 32, No. 3 (Aug., 1978), pp. 81-88
- Mayerhauser, N., Reinsdorf, M., 2007 "Housing Services in the National Economic Accounts" Bureau of Economic Analysis, September 2007 Available online at <http://www.bea.gov/papers/pdf/RIPfactsheet.pdf> [Available: 04/02/2016]
- Mehrhoff, J., 2014 "Will the real inflation rate please stand up – overlooked "quirks" of a favoured chain-linking technique" Deutsche Bundesbank, Statistics Department Meeting of the Group of Experts on Consumer Price Indices Geneva, 26-28 May 2014
- Moulton, B.R., Moses, K.E., 1997 "Addressing the Quality Change Issue in the Consumer Price Index" *Brookings Papers on Economic Activity*, 1:1997

NatCen 2010 “Public Confidence in Official Statistics 2009 Report” NatCen Social Research March 2010 Available online <http://www.natcen.ac.uk/media/25384/public-confidence-official-statistics-2009.pdf> [Available: 18/02/2016]

NatCen, 2015 “Public Confidence in Official Statistics” NatCen Social Research February 2015 Available online at http://www.natcen.ac.uk/media/833802/public-confidence-in-official-statistics_-final.pdf [Available: 18/02/2016]

Nordhaus, W. D., 1998 “Quality changes in price indexes” *Journal of Economic Perspectives*, Winter, pp.59–68.

Novak, G. J., 1975 “Reliability Criteria for National Accounts” *Review of Income and Wealth*, 21 pp.323–344.

ONS, 2008 “Proposals for Satellite Accounts” ONS May 2008. Available online at: <http://www.ons.gov.uk/ons/guide-method/ukcemga/publications-home/publications/archive/proposals-for-satellite-accounts.pdf> [Available: 04/02/2016]

ONS, 2014 “About the National Minimum Wage” Low Pay Commission, available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414323/facts.pdf

ONS, 2014 “National Accounts Articles - Impact of ESA10 changes on current price GDP estimates” Office for National Statistics 10 June 2014 Available online at: <http://www.ons.gov.uk/ons/rel/naa1-rd/national-accounts-articles/impact-of-esa10-changes-on-current-price-gdp-estimates/index.html> [Available: 24/01/2016]

Pakes, A. 2005 “Hedonics and the Consumer Price Index” *Annales d'Economie et de Statistique* 2005; 79-80 pp.729-749.

Reinsdorf, M.B., Moulton, B.R., 1996 “The Construction of Basic Components of Cost-of-Living Indexes” *The Economics of New Goods*, January 1996

Reuters, 2015 “Greek judges drop felony charge against stats chief – source” Athens, July 19 Available online at:<http://www.reuters.com/article/eurozone-greece-statisticsidUSL5N0ZZ0C420150719>

Ritter, J.A.. 2000 “Feeding the National Accounts” *Federal Reserve Bank of St. Louis Review* 82, (2), pp.11-20

Rodriguez-Palenzuela, D. Wynne, M.A., 2004 "Measurement Bias in the HICP: What do we know and What do we need to know?" *Journal of Economic Surveys*, Wiley Blackwell, vol. 18(1), pages 79-112, 02.

Rogoff, K., 1985 “The Optimal Degree of Commitment to an Intermediate Monetary Target” *Quarterly Journal of Economics* 100, pp.1169-1190

Ruggles, R. 1994 “Issues Relating to UN System of National Accounts and Developing Countries” *Journal of Development Economics* 38

Sargent, T. J., and Wallace, N., 1981 “Some Unpleasant Monetarist Arithmetic” *Federal Reserve Bank of Minneapolis Quarterly Review* 5, pp. 1-17.

Schneider, F., Williams, C.C., 2013 “The Shadow Economy” The Institute of Economic Affairs 2013 Available online at:

- <http://www.iea.org.uk/sites/default/files/publications/files/IEA%20Shadow%20Economy%20web%20rev%207.6.13.pdf> [Available: 25/01/2016]
- Schutze, C., Mackie, C. 2002 “At What Price?: Conceptualizing and Measuring Cost-of-Living and Price Indexes”. *Panel on Conceptual, Measurement, and Other Statistical Issues in Developing Cost-of-Living Indexes*. Committee on National Statistics, National Research Council
- Seskin, E.P., Smith, S., 2009 “Preview of the 2009 Comprehensive Revision of the NIPAs: Changes in Definitions and Presentations” *BEA Working Paper* March 2009. Available online at: http://www.bea.gov/scb/pdf/2009/03%20March/0309_nipa_preview.pdf [Available: 15/02/2016]
- Shadowstats, 2016 “Shadow Government Statistics: Analysis Behind and Beyond Government Economic Reporting” Available online at: <http://www.shadowstats.com> [Available: 25/01/2016]
- Shapiro, M.D. Wilcox, D.W. 1996 “Mismeasurement in the Consumer Price Index: An Evaluation” *NBER Macroeconomics Annual* 1996, Volume 11, MIT Press January 1996 (p. 93 - 154)
- Silver, M. 2007 “Core Inflation: Measurement and Statistical Issues in Choosing Among Alternative Measures” *IMF Staff Papers* Vol. 54, No. 1 (2007), pp. 163-190 Palgrave Macmillan Journals
- Statistics Authority 2009 “Code of Practice for Official Statistics“ UK Statistics Authority January 2009. Available online at: https://www.statisticsauthority.gov.uk/wp-content/uploads/2015/12/images-codeofpracticeforofficialstatisticsjanuary2009_tcm97-25306.pdf [Available: 18/02/2016]
- Stix, H., 2006 “Perceived Inflation and the Euro: Why High? Why Persistent?” *Proceedings of OeNB Workshops*, Oesterreichische Nationalbank , 15th of December 2005
- Triplett, J. 2004 “Handbook on Hedonic Indexes and Quality Adjustments in Price Indexes: Special Application to Information Technology Products”, *OECD Science, Technology and Industry Working Papers*, 2004/09, OECD Publishing.
- US Congress, 2012 “Oversight Committee Examines Politicization of Job and Economic Data at Labor Department” Press release 30th of May 2012 Available online at: <https://oversight.house.gov/release/oversight-committee-examines-politicization-of-job-and-economic-data-at-labor-department/> [Available: 12/03/2016]
- Wenzel, L., Khalid Nadeem Khan, M., Evans, P., 2009 “Capitalising research and development towards the new System of National Accounts” *Economic & Labour Market Review* Vol.3 No 9 September 2009
- Wynne, M. A. 1999 "Core Inflation: A Review of Some Conceptual Issues," *ECB Working Paper* No. 5 (Frankfurt, European Central Bank)