The Cyclical Behaviour of Shadow and Regular Employment

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Errors using inadequate data are much
less than those using no data at all.
Charles Babbage

Abstract

Using the Hodrick-Prescott filter, this paper examines the cyclical properties of the Italian labour market. Its main contribution is the empirical analysis of three different labour inputs - regular employees, regular self-employed and underground workers. Results from VAR models support the widespread view that the shadow employment functions as an improper tool for increasing the flexibility of the labour market. While the contemporaneous correlation between shadow labour and output is significant, as time passes their association looses momentum. The opposite is found for regular employees, which show significant positive correlations only with lagged output gaps. Somewhat puzzling, self-employment seems to be the less sensitive to the course of business cycles. The skewness of input distributions suggests that hiring employees is easier than firing them, while this can not be said for the other two labour gaps. Disaggregate data tell different stories. For instance, in the manufacturing sector the hidden employment is not correlated with the output, while in the trade sector the acyclical input turns out to be the recorded employees. In the transport industry, where no labour input follow the cycle, regular employees are more fired than hired.

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1. Introduction

There are several reasons for why one might be interested in the cyclical nature of the shadow (hidden, irregular, underground, black, etc.) employment. The cyclical swings of the Government revenues may depend on the short term movements of irregular workers (Ihrig and Moe, 2004). Then, to the extent that black workers productivity is lower than that of the corresponding regular ones (Isae, 2002; Boeri and Garibaldi, 2002; Busato and Chiarini, 2004), different cyclical responses of labour inputs can have an impact on the overall productivity dynamics. In addition, the relative responsiveness of the different labour inputs may have implications for the costs of downturns, and how aggregate shocks are propagated across firms/time (Choi and Tum, 2002). Finally, shadow employment may also serve as a macroeconomic buffer for regular sector employment over the course of business cycles. Several authors (Ihrig and Moe, 2001; Conesa *et al.*, 2001; Busato and Chiarini, 2004; Carillo and Pugno, 2004) suggest that underground employment functions as an improper tool for increasing the flexibility of the labour market. In fact, given a sufficiently low expected penalty and a rigid regular market, the irregular labour input may afford to increase all kinds of flexibility - occupational (hiring-firing), contractual (part-time, fixed-term, etc...) and wage. The logic is straightforward. By occupying black workers firms may reduce their wage bill (paying less taxes and bearing less costs due to labour regulations) and may easily, costless and immediately, fire them to overcome adverse economic evolutions. On the other hand, if the shadow employment actually works as a pad, during booms firms should increase it to "refill the black pool". Altogether it means that black jobs should be more business cycle sensitive than the regular ones and, in turn, it should induce a positive correlation between the detrended series of output and hidden employment. Due to selective labour/fiscal policies, to the structural diversity of sectors, and to the heterogeneity of underground workers, the expected penalty and the degree of regular market flexibility could be different across industries. Consider, for instance, tax amnesties and/or an employment protection legislation applied only to some industries and/or up to some threshold size values[1]. Then, unregistered immigrants and native multiple-income hidden workers (such as retirees, civil servants, etc.), have different productivity, contractual power, etc., so they may have potentially different cyclical behaviours. Moreover, they are differently spread among sectors which, in addition, have not the same share of small business units. To the extent these considerations are true, it makes more difficult to have *a priori* expectations on the cyclical behaviour of regular (employees and self-employed) labour inputs, on the one side, and makes more interesting and useful the empirical analysis of the overall and of the sectoral labour markets, on the other side. This analysis is the aim and the contribution of the present paper.

Needless to say, the first and the most important issue to be addressed, especially within a measurement-without-theory approach dealing with the underground sector, is to gather reliable data. The occasion to provide brand-new empirical evidence on the cyclical behaviour of labour inputs is given by the recent release published by the Italian national institute of statistics (Istat). Istat has made available national accounts consistent annual data for the three above mentioned labour inputs throughout the period 1980-2002, even at a sectoral level (Istat, 2004).

From the methodological point of view, the empirical analysis is based on the examination of the high frequency (transitory) components of four time series. In particular, the Hodrick-Prescott filter is applied to output and to three labour inputs series and, making use of the derived gaps, several bivariate "input-output" VAR models are estimated. VAR innovations are then used to compute impulse response functions, while block exogeneity and instantaneous linear dependence tests are performed to assess causality issues. Altogether they should give an impression of how, and how much, shocks propagate across output/inputs and the timing of their impact. Finally, I address the following question: Is the firms' hiring/firing activity (a)symmetric? To this end I compare the third moment of the distribution of the variables. The idea is that asymmetric labour gap distributions may indicate a dissimilar firms' ability/willingness in hiring and firing.

Results show that shadow employment functions as a buffer over the course of business cycles, expanding during upturns and contracting during downturns. While the contemporaneous correlation between shadow labour and output is significant, as time passes their association looses momentum. The opposite is found for regular employees, which show significant correlations only with lagged output gaps. Somewhat puzzling,

[1] *E.g.*, the Italian law on unfair firing (art. 18 of Statuto dei Lavoratori) discriminates according to whether the firm is below or above the threshold of 15 employees.

but possibly as a consequence of the black-buffer presence, self-employment seems to be the less responsive to the cycle. The skewness of input gap distributions suggests that hiring employees is easier than firing them, while this can not be said for the other two labour inputs. Disaggregate data tell different stories. For instance, in the manufacturing sector the hidden employment is not correlated with the output, while in the trade sector the acyclical input turns out to be the employees. In the transport industry, where no labour input follows the cycle, regular employees are more fired than hired.

The paper is organised as follow. Section 2 describes the Istat methodology for estimating the shadow employment. Section 3 deals with the time series decomposition. Sections 4 and 5 report, respectively, the statistical analysis and the results.

2. The Estimation Method of the Shadow Employment.

According to the internationally accepted definition (U.N. *et al.*, 1993) described in the System of National Accounts (SNA93), the non (directly) observed economy includes the illegal, the informal, and the underground sector. The former consists in production of goods and services whose sale, distribution or mere possession is forbidden by law (*i.e.* production and distribution of illegal drugs); (b) production activities which are usually legal but which become illegal when carried out by unauthorised producers (*i.e.* unlicensed practising of a profession). To define the second, the SNA93 (IV – Annex) refers to institutional production units characterised by: (a) a low level of organisation; (b) little or no division between labour and capital; (c) labour relations based mainly on occasional employment, kinship or personal and social relations, as opposed to formal contracts. There is no need to underline that informal activities are not necessarily carried out in order to evade taxes or other controls related to social security contributions. On the basis of the laws in force in each country, for example, this sector may be identified by referring to the “size” of the production unit or to the characteristics of the legislation (no obligation whatsoever to register with public authorities). The “third” sector represents the area of (legal) production activities that are not directly observed due to reasons of economic nature (deliberate desire to avoid taxes and/or to avoid observing the law provisions concerning the labour market) and/or statistical nature (*e.g.* due to the failure to fill out the administrative forms or statistics questionnaires). The definition of “economic” underground makes clear that it is different from tax evasion. In fact, it there could be underground activity even with no taxation, if firms do not observe the employment protection legislation, and tax evasion with no underground, if tax evasion deals with, *e.g.*, financial and/or real estate markets.

Istat claims that non-observed does not means non-measured (Calzaroni, 2000; Baldassarini and Pascarella, 2003), and its estimation approach to measure the underground sector is known as the labour input method (OECD, 2002). Briefly, it consists in i) the use of sources and survey techniques that make possible to measure the weight of unregistered work (this is achieved primarily by using labour status particulars declared by respondents in the household surveys: it is assumed that individuals have less reasons than enterprises to conceal the nature of their work[2]); ii) the correction of the under-reporting of income by the enterprises through adjustments of the per capita production and value added values declared by the small production units (fewer than 20 employees) and iii) the checks for the consistency of the economic aggregates through the balancing of the resources and uses made at the level of each industry. In particular, Istat considers irregular employment the positive[3] difference between the number of persons recorded by supply-side (household) surveys and the number of jobs emerging from the business-side surveys. As a result, Istat publishes annual estimates of the irregular input of labour in Full-Time-Equivalent units (FTE) and of the irregular value added. The main focus of this paper is the labour market, therefore I deal with labour input (full time equivalent units) data. On the other hand, this is the only time series available for the whole (1980-2002) sample, and it accounts for the 70% of the irregular GDP (this is why, as mentioned, the method is called the “labour input method”).

[2] The existence of such a situation is not a mere hypothesis but rather a reality that has been repeatedly verified by Istat.
[3] In the case of negative value Istat defines those workers as regular with multiple jobs. If there is no gap, then Istat speaks about regular single jobs.

While it is simple to describe, and it is internationally recognised to be a very good one such as to be recommended as the most appropriate to estimate the input of labour (OECD, 2002), the practical application of the Istat method is more difficult (OECD, 2004):

- labour force surveys provide estimates of the (supply-side) numbers of workers, while data from enterprise surveys usually refer to the (demand-side) number of jobs. The two sets of data must therefore be standardised by converting them to comparable units such as hours worked or full-time equivalents.

- the comparison between the two independent sets of data needs to be made at as detailed a level as possible. Ideally this should be by size-classes as well as by detailed kinds of activities.

- the method depends crucially on the availability of comprehensive estimates of labour inputs.

As mentioned, Istat works out FTE units. Referring to the other two points, Istat uses microdata (five-digit industry level), and considers that the results of the household labour force survey, supplemented by demographic data, provide exhaustive estimates. The Italian survey collects information on the kind of activity, hours worked, and the approximate number of employees in the enterprises where the respondents work. The survey also collects information on secondary jobs, which are relatively common in Italy for persons whose main job is with the government. In addition Istat, via *ad hoc* analyses, tries to take into account non-resident undocumented foreigner workers, which can not be directly observed by the usual sources used to uncover other kinds of black economy. Finally, even if Istat knows (and surveys) only regular firms, from households' answers it can detect irregular workers engaged both for regular and for irregular firms.

The literature has raised concerns over the ability to uncover the real status of workers via surveys. Even if it is reasonable to assume that individuals have less reasons than enterprises to conceal the nature of their work, Boeri and Garibaldi (2002) point out that if employees cooperate in shadow activities they may decide not to declare to be working. As reported in their paper, a joint Istat-Fondazione Curella survey reports that about 25% of the black economy is wrongly assigned to the inactive status by the labour force survey. Also, some individuals who indicate to their interviewer that they are self-employed may actually be labouring in the underground economy. A study of the US Internal Revenue Service[4] found that 47% of the workers who were classified as independent contractors did not report any taxable income. In general, the respondent may want to avoid telling anyone the truth about sources of income, and so will have concocted a convenient story intended to arouse the least suspicion. A non-specific but legitimate sounding job would appear the easiest way out for those individuals. Thus, supply-side sources can capture illegal workers which, instead, should be considered outside the underground sector. Then, one can speculate that unemployment could be overstated in the surveys because respondents who should have been classified "out of the labour force" are fearful that they would lose benefits unless they indicated they were looking for work (Gutmann, 1979). Finally, as Tanzi suggests (Tanzi, 1981), the first issue for the irregular sector worker when approached by the interviewer, is whether to become a respondent and not what to answer. It seems reasonable to assume that he is more likely to be a non-respondent than he would be if he were not in the irregular sector. In the Istat approach, non-respondent are included in the "statistical underground", which is allocated to the observed economy. In 1998 the percentage of non response was 3% of total GDP (Istat, 1998).

Evidence reported in Di Nardo *et al.*, (2000) may give an idea of the potential bias. In that paper is described a survey carried out in San Giuseppe Vesuviano, a town near Naples known for its widespread black employment. The standard method was that of the census survey, but conducted three times for the same universe in a period of a few months. Once by an interviewer not known to the local area; once by an interviewer who was known, using the indirect method of contacting 'key observers'; and once by a known interviewer using the direct, door-to-door survey method, but establishing trust with the respondents and exploiting (fortuitously) her particular personal situation - she had to finish her thesis and she was pregnant. Where the standard method produced a result of 31.1% and that of the "informed persons" one of 35.8%, the

[4] Budget of the United States Government, 1984, p. 5–120.

third approach got 43.7%. While this kind of research may suggest that the bias could be significant, its scientific content and replicability is questionable. Just to mention, what about other "particular" personal situations? Then, those share are directly indicated by (more or less) informed persons, so the amount is "subjective" as, in fact, shown by their threefold evidence. As should be clear, the Istat method is different because it estimates the hidden workers indirectly. Finally, it is really hard to imagine how this method could be structurally implemented in the system of national accounts.

3. The Cyclical Decomposition

Growth-rate correlations are subject to some bias due to first-differencing. The transfer function of the first-difference filter, which shows the proportion of variation in the underlying series that is "transferred" to the first differenced series, can be expressed as $2\times[1-\cos(\omega)]$, which is greater than one for frequencies higher than the business cycle frequency band. That is, first-differencing boosts the relative importance of high-frequency components of time series. An alternative approach of estimating trend and cyclical (high frequency) components of time series is the use of statistical filters, in either their univariate or multivariate form. One of the most common statistical filters is the Hodrick and Prescott (1997), developed as a mechanical and statistical procedure to extract very low and very high frequencies, fewer than two years and more than eight years approximately, from time series. Although this data window seems arbitrary, it comes from the seminal study by Burns and Mitchell (1944), carried out at the National Bureau of Economic Research, which concluded that the US economy presents very clear business cycles lasting up to eight years. In fact, economists generally agree on that (Christiano and Fitzgerald, 2003).

Basically, the Hodrick-Prescott (HP) filter decomposes a time series (y_t) into a trend/smoothed component (S_t) and cyclical component (C_t). Technically, the HP filter is a two-sided linear filter that computes the smoothed series S_t of y_t by minimizing the variance of y_t around S_t, subject to a penalty that constrains the second difference of S_t. That is, the HP filter chooses S_t to minimize:

$$\sum_{t=1}^{T}(y_t - S_t)^2 + \lambda\sum_{t=2}^{T-1}[(S_{t+1} - S_t) - (S_t - S_{t-1})]^2$$

where λ denotes the smoothness parameter. Once the smoothed series has been obtained from the problem, the cyclical component (C_t) is obtained from $C_t = y_t - S_t$. Parameter $\lambda>0$ is the penalty on variation, where variation is measured by the average squared second difference. A larger value of λ makes the resulting $\{S_t\}$ series smoother; less high-frequency noise. For $\lambda \to \infty$, the trend series becomes linear.

Following a different but related approach, other studies (Baxter and King, 1995, 1999; Christiano and Fitzgerald, 1999) designed and implemented specific band-pass filters. These filters are used to isolate the cyclical component of a time series by specifying a range for its duration. Roughly speaking, the band-pass filter is a linear filter that takes a two-sided weighted moving average of the data where cycles in a "band", given by a specified lower and upper bound, are "passed" through, or extracted, and the remaining cycles are "filtered" out. The various band-pass filters differ in the way that they compute the moving average. Even in this case the band pass filters are designed to isolate fluctuations in the data that persist for periods of 1.5 or 2 through 8 years. The authors claim that this kind of filter can improve two practical problems encountered when using the Hodrick-Prescott filter: unusual behaviour of cyclical components at the sample's beginning and end, and the choice of a smoothing parameter for non-quarterly data. In turn, the main practical problem with this sort of filter is that the ideal filter requires an infinite amount of data. Moreover, the fixed length symmetric filters employ a fixed lead/lag length, thus the resulting filtered series will lose observations from both the beginning and end of the original sample. This is particularly disturbingly in the present case. On the other hand, there exist asymmetric filtered series which do not have this requirement, but asymmetric filters induce phase shift, which could distort correlations between filtered series, the main statistical object of this paper. Turning the attention to the λ-problem for annual data, suggestions about the smoothness parameter range from a low of 10 to a high of 400 (Baxter and King, 1999). However, I set λ=10 since Baxter and King (1999) show that such a value performs quite well in removing frequencies larger than thirty-two quarters. Also, in a previous work those authors (Baxter and King, 1995) show that setting the smoothing parameter to about 10 produces a Hodrick-Prescott filter that is very similar to their band-pass for annual data. Thus, one can be sufficiently confident that the results of this paper are robust to the Baxter and King filtering procedure, as well. In addition, setting the smoothing parameter to 10 in the present case is consistent even with the recent Ravn-Uhlig procedure (2002) to improve the HP filter[5]. Finally, the HP-detrended series will not lose any observations. Data are transformed as the difference between the log of variables and the Hodrick-Prescott trend of the log of variables. So, the time series I use in the following section represent short-term fluctuations around the trend.

4. The Statistical Analysis.

One common way to properly analyse the empirical relationships between time series is the vector autoregression approach. The VAR approach (Sims, 1980) sidesteps the need for structural modelling by treating every endogenous variables in the system as a function of the lagged values of all the endogenous variables in the system. Consider the VAR(p) model

$$\Phi(L)\boldsymbol{y}_t = \varepsilon_t$$

where $\Phi(L) = \boldsymbol{I} - \Phi_1 L - \Phi_2 L^2 - \dots - \Phi_p L^p$.

Provided that the stationary conditions hold (*i.e.* that roots of $| \boldsymbol{I} - \Phi_1 z - \Phi_2 z^2 - \dots - \Phi_p z^p | = 0$ lie outside the unit circle) we have the vector moving average representation of $\boldsymbol{y}_t$ as

$$\boldsymbol{y}_t = \Phi^{-1}(L)\varepsilon_t = \varepsilon_t + \sum_{i=1}^{\infty} \psi_i \, \varepsilon_{t-i}$$

where ψ_i is an m×m coefficient matrix. The ε_t's represent shocks in the system. Suppose we have a unit change in ε_t then its effect in $\boldsymbol{y}$ s periods ahead is $\frac{\delta y_{t+s}}{\delta \varepsilon_t} = \psi_s$.

Accordingly the interpretation of the ψ matrices is that they represent marginal effects, or dynamic multipliers, or the model's response to a unit shock (or innovation) at time point t in each of the variables. The response of y_i to a unit shock in y_j is given by the sequence, known as the impulse response function (IRF),

$$\psi_{ij,1}, \psi_{ij,2}, \psi_{ij,3}, \dots,$$

where $\psi_{ij,k}$ is the ij^th^ element of the matrix ψ_k (i, j = 1, . . . , m). Generally speaking an IRF traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. However, unless the error covariance matrix $E(\varepsilon_t \varepsilon_t')$ is a diagonal matrix, the shocks will not occur independent from each other. The conventional practice in the VAR literature is to single out the individual effects by first orthogonalise the error covariance matrix, *e.g.* by Cholesky decomposition, such that the new

[5] In the frequency power rule of Ravn and Uhlig (2002), the smoothing parameter is equal to the number of periods per year divided by 4, raised to a power (Ravan and Uhlig recommend using a power value of 4), and multiplied by 1600. In the present case the value is (1/4)^4*1600=λ=6.25, which generates cyclical series observationally equivalent to the case with λ=10.

residuals become contemporaneously uncorrelated with unit variances. Unfortunately orthogonalization is not unique in the sense that changing the order of variables in $\boldsymbol{y}$ changes the results. The economic theory may be used to solve the ordering issue, but in the present case there are not commonly accepted theoretical indications, especially about dynamics. In addition, the nature of this paper is eminently empirical. So, my solution is to follow the "agnostic" approach of Pesaran and Shin (1998). These authors construct an orthogonal set of innovations that does not depend on the VAR ordering. The generalized impulse responses from an innovation to the j^{th} variable are derived by applying a variable specific Cholesky factor computed with the j^{th} variable at the top of the Cholesky ordering. The exercise can be thought of as tracing out how the observation of a forecast error in one equation of the system would lead to revisions in the forecast path of all model variables. To analyse the propagation mechanisms of macroeconomic shocks between output and labour inputs, I perform three bivariate VAR models which include the output gap and, alternatively, each of the three labour gaps. The pure shape of impulse functions is not fully informative of whether a detected reaction path is also meaningful in a statistical sense. Thus, I also display the upper and lower limits of a 95% Monte Carlo band. Clearly, if these bands contain the zero line one can conclude that there is evidence of no reaction.

It should be noticed that the generalised response profiles derived in this way are not conveying information about economic causation among the variables. To this end, I perform block/exogeneity Granger causality tests (Granger, 1963, 1969). As known, the logic of the Granger causality is based on the concept that an effect can not precede its cause[6]. In the present bivariate VAR the Granger approach amounts to test the information content of the past values of output (input) in improving (linear) predictions of the present value of input (output). Thus, I compute the Wald statistic for the joint exclusion of the lagged term(s) of output in the input equation and *vice versa*. VAR innovations are both serially uncorrelated and uncorrelated with the lagged terms of the variables but, as already noticed, they can be contemporaneously correlated. So, side-by-side with the Granger causality, it may be interesting to analyse the instantaneous causality (or instantaneous linear feedback). Geweke (1982) proposes to perform the following two regressions[7]:

$$x_t = \sum_{i=1}^{r} \beta_i x_{t-i} + \sum_{j=1}^{s} \lambda_j y_{t-j} + \varepsilon_{1t} \qquad (1)$$

$$x_t = \sum_{i=1}^{r} \beta_i x_{t-i} + \sum_{j=0}^{s} \lambda_j y_{t-j} + \varepsilon_{2t} \qquad (2)$$

The existence of instantaneous causality amounts to a non-zero partial correlation between the two variables conditional on their history. Asymptotically, and under the null of no instantaneous causality, Geweke's test is

$$\ln[\mathrm{Var}(\varepsilon_{1t})/\mathrm{Var}(\varepsilon_{2t})]^*n \sim \chi_1^2 .$$

If we further assume that the errors are independent and identically normally distributed, we have an exact, finite sample F-statistic which, in the present experiments seems to be preferable. Actually, I perform an omitted variable test by comparing the residual sum of squares computed with and without the zero-restriction imposed on the current term of equation 2. Results of instantaneous causality are reported in Appendix 1, together with the main VAR diagnostics and outcomes (see also Appendix 3).

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[6] Should be clear that when I speak about "input-output" relationships I do not necessarily expect that inputs must "precede" the output. In fact, it may well happen that inputs demand is based on lagged output. Otherwise stated, I just have no *a priori* about the kind of relationship linking the gaps.

[7] In the absence of contemporaneous exogenous variables the disturbance variance–covariance matrix contains all the information about contemporaneous correlations among the variables. Thus, a similar exercise in the present bivariate VAR can be performed by regressing one VAR residual on the other to see if the parameter is significant by a t-test. In fact, it amounts to perform the regression (2) after having multiplied the two variables by the relative VAR residual covariances in order to make y and ε_{2t} uncorrelated. Here not reported, they substantially confirm the Geweke procedure findings.

Once addressed covariances, another potentially useful set of experiments may be based on higher moments, in particular the skewness. The question I want to address is the following: is the firms' hiring/firing activity symmetric? As known, the third moment for a normal distribution is zero, and any symmetric data should have a skewness near zero. In the present setting, negative (positive) values for the third moment indicate that the number of cases showing a negative labour gap is greater (lower) than the number of cases with a positive labour gap. It turns out that if data are skewed left there is an indication that firms can/want fire more than can/want hire. The opposite holds, *mutatis mutandis*, if data are skewed right. In Appendices 2 and 4, I report the skewness values for the inputs together with the asymmetry presents in the output gap distribution. This should help to detect the behaviour of the firms' hiring/firing activity over the course of business cycles. Due to data scarcity issues, I use a small sample robust test of skewness. The third moment (Sk) and its standard error (Ss) are computed as follows (Sheskin, 2004):

$$Sk = \frac{n^2 m_3}{(n-1)(n-2)s^3} \qquad \text{Ss} = \sqrt{\frac{6n(n-1)}{(n-2)(n+1)(n+3)}}$$

where:

$$\bar{x} = \text{mean; n = \# of obs.;} \quad m_j = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^j \; ; \qquad s = \sqrt{\frac{1}{(n-1)}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

Under the null hypothesis of Sk=0:

$$\frac{Sk}{Ss} \sim \text{N}(0,1).$$

5. Results

The picture emerging from the VARs, which give a reasonable statistical description of data, highlights some interesting stylized facts (Appendices 1 and 3). As for aggregate data, the instantaneous linear feedback between output gap (Y) and black employment gap (B) confirms the expected procyclical nature of the latter. As a matter of fact, as suggested by the absence of significant lagged correlations, shadow employment just works as a "flash" buffer. In contrast, HP-detrended regular employees (E) and Y are significantly correlated only with some lag, with information flows running from output to input. Thus, findings support the view that in the last two decades also E were fired/hired according to the cycle, although with a delay of more than a year. Possibly, this for two main reasons. First, despite the often claimed labour market rigidity, firms have had "regular" devices to fire regular employees. Tools such as the Cassa Integrazione Guadagni (CIG, wages guarantee fund), and the widespread use of early retirements have been largely used as shock absorbers in the last decades (Bertola and Garibaldi, 2003; Bovi, 2005). Second, it should be remembered that the hidden sector's absorptive capacity is limited and can become saturated during profound recessions, as happened during the 1993 crisis. Somewhat puzzling, the regular self-employed gap (S) seems to be always orthogonal to the business cycle, that is S shows neither Geweke, nor Granger, nor Pesaran-Shin links with Y. Possibly it may be rationalized by the exchange of the buffer role between S and B.

Due to *ad hoc* tax amnesties and/or selective policies, industries may have a different degree of labour market rigidity and/or a different expected penalty. Therefore, aggregate outcomes are not necessarily mimicked at the sectoral level. In fact, the industry-level VAR experiments detect different cyclical behaviours (Appendix 4). Taking as a cut-off rate the 95% significance level, it seems that value added gap and regular employees gap share a contemporaneous feedback just in the manufacturing and in the trade sectors. This outcome is particularly interesting because those sectors are among the few one, beyond construction and putting aside the small media sector, that can use the CIG to "regularly" increase their flexibility. In the construction industry only Y and S comove at the zero lag which, perhaps, my help in explaining the absence of contemporaneous feedback between the other two inputs and Y. In the personal services sector (where there are no self-employed) the flash-buffer role is played by hidden employees. Maintaining the 95% rule and turning the attention to the Granger causality, it results that lagged values of Y help in predicting E in the agriculture, manufacturing, and construction sectors. The causality runs instead from output to underground workers in the construction, trade, and personal services sectors. The former sector is the only one to show a "complete" Granger causality - all labour inputs are unidirectionally caused by the value added. A similar outcome holds for the other industrial sector, where only B is not Granger caused by Y. The Pesaran-Shin propagation mechanism of shocks shows that in these two industrial sectors there are significant input-output feedbacks. In the manufacturing sector the reaction is two-way. The output response to a surprise in the employees gap may be tentatively rationalized thinking about a productivity shock[8]. The effect of the value added shock on E is more lengthy (four vs two years). In the construction sector all inputs reply to Y, but an unexpected rise in output affect no input. The different starting points and the durations of the feedback may be due to the nature of the input, in the sense that the response of B and S is smaller, quicker and shorter than the "more structured" E input. The only other non-zero reactions are found in the personal services sector. They are both two-way (in this sector there are only two inputs, E and B), with B and Y linked for few years. The feedbacks between E and Y last relatively more years and are stronger. In this sector the comovements should be seen in the light of the equivalence of labour costs and value added. In addition, it is strongly affected by the (frequently reiterated) legalizations of unregistered immigrants, which imply a one-shot *ex lege* change of status from B to E[9]. Finally, the inputs in the transport and in the hotel and restaurant services sectors seem to be linearly independent from their value added gaps in each and every trial.

The economy-wide experiments dealing with the skewness (Appendix 2), show that the regular employees gap distribution is the only one to be significantly skewed. I interpret this as an indication that, for firms, hiring is cheaper/easier/more-wanted than firing. Despite the measurement-without-theory nature of the proposed framework, other considerations can be tentatively made. First, this E-hoarding result is robust to recursive computations. Second, it is achieved together with a symmetric output gap, so it may help in explaining the reversion of the jobless recovery started in the 80s (Bertola and Garibaldi, 2003). Recall that, *ceteris paribus*, replacing regular with shadow employment implies a decrease in the value added due to the reduced gross wages. Third, the other two inputs are not participating in that labour hoarding and reversion. As for disaggregate data, in the most part of experiments the null of symmetric behaviour can not be rejected. The only sector confirming the system-wide E-hoarding is the agriculture one, while in the hotel-restaurants and in the transportation sectors the skewness show significant negative values. It should be noted that some outcomes are fragile, because they hold just when computed for the whole period. A notable exemption is the positive asymmetry detected in the construction sector for self-employment. Possibly, this result is coherent with the flash buffer role of S in this sector, where the share of S on total is increasing and much higher than in the other sectors (35% vs 25%).

To conclude, some *caveat*. I can not exclude that the outcomes are biased because of measurement errors, such as those stemming from black workers with wrongly assigned labour status, or from non-exhaustive surveys. In addition, the sample is small and the data are annual. This may affect the results when analysing cyclical behaviours (Hamermesh, 1993). So the results are fragile and should be seen as *prima facie* evidence. Then, I focus on full time equivalent units. While they measure the amount of labour input used in producing GDP, they do not allow to study the impact of policies on the number of jobs/persons. On the positive side, the data are National Account consistent, are "official", and are the most reliable we can have.

[8] By definition, the labour productivity involves both input and output.

[9] In the last decade there were four legalizations: 1990, 1995, 1998, 2002. In this latter legalization, 274,000 B units became regular employees (Istat, 2004).

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APPENDIX 1. Bivariate VAR Analysis (Output vs Labour Input). Sample 1980-2002.

In each IRF graph, the ± 2 S.E bands are drawn from 1000 Monte Carlo replications.

Table 1a. Input: Black Employment. One lag. Instantaneous Causality: [0.04;]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 4.92 [0.77][a]	Normality J-B = 1.76 [0.78]	Hetero X^2 No Cross Terms = 7.98 [0.79]	Hetero X^2 Cross Terms = 10.0 [0.82]

All variables are in logs and HP detrended. [a]=adjusted version. P-values in squared brackets. For instantaneous causality (Ho: no causality) the p-value refers to an F-test of omitting the contemporaneous gap from the other gap VAR equation (based on the Newey-West HAC Standard Errors & Covariance).

Table 1b. Input: Regular Employees. Two lags. Instantaneous Causality: [0.15]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 8.57 [0.07][a]	Normality J-B = 5.89 [0.20]	Hetero X^2 No Cross Terms = 24.8[0.42]	Hetero X^2 Cross Terms = 34.7 [0.78]

See table 1a.

Table 1c. Input: Regular Self-Employed. One lag. Instantaneous Causality: [0.07]

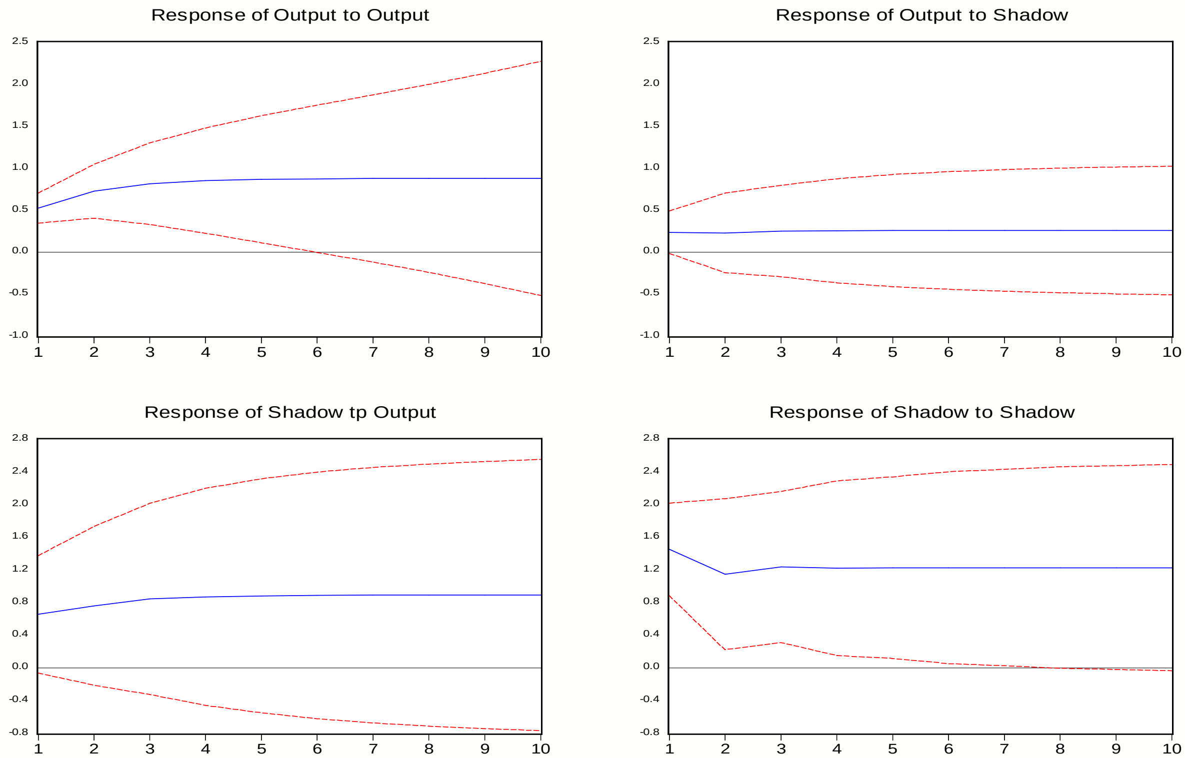
Multivariate tests			
Portmanteau Q-Stat 3 lags = 12.7 [0.12][a]	Normality J-B = 1.50 [0.83]	Hetero X^2 No Cross Terms = 17.1[0.15]	Hetero X^2 Cross Terms = 18.6 [0.23]

See table 1a.

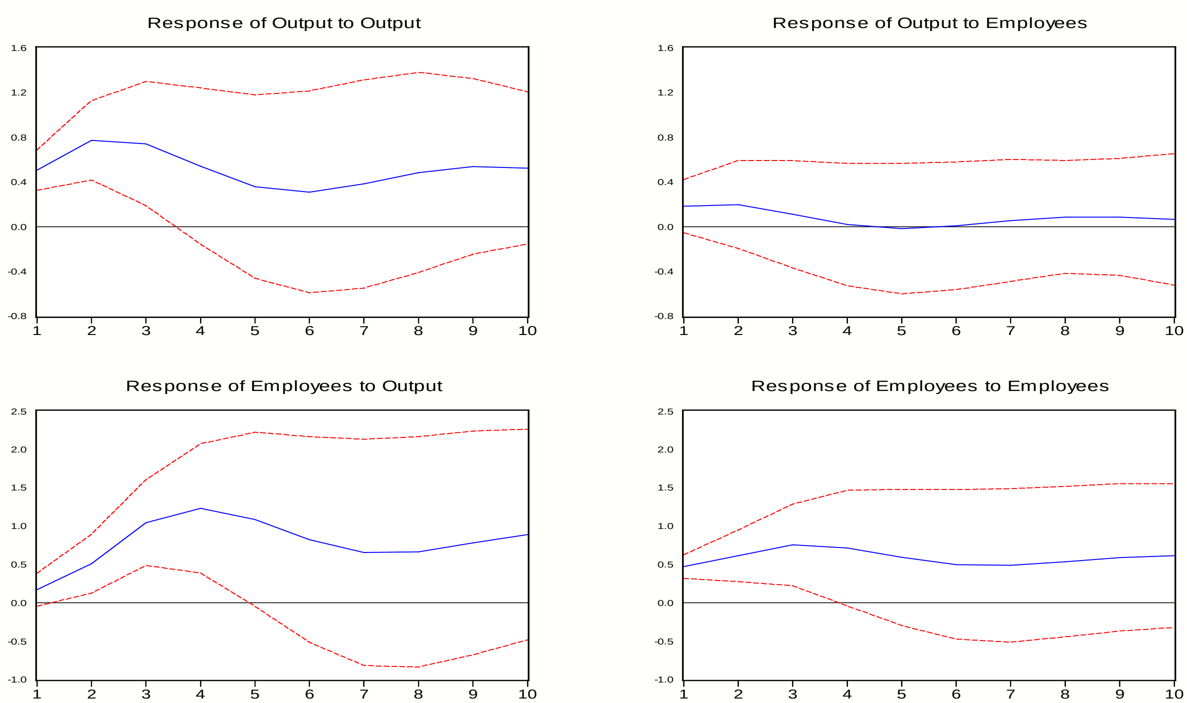
Table 1d. VAR Granger Causality/Block Exogeneity Wald Tests.

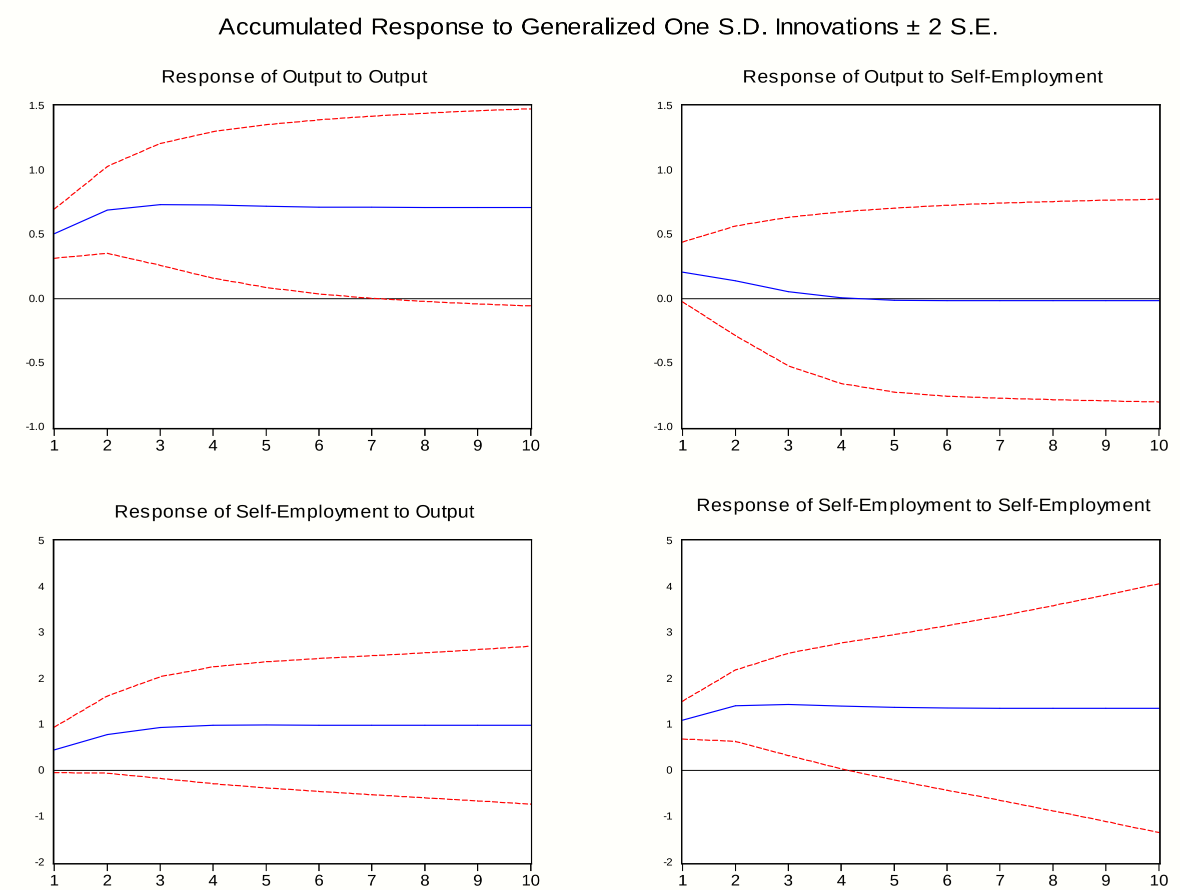
X^2 [P-value]	X^2 [P-value]	X^2 [P-value]
Output => Black 0.83 [0.41]	Output => Employees 21.0 [0.00]	Output => Self-Employed 1.19 [0.27]
Black => Output 0.66 [0.36]	Employees => Output 1.36 [0.51]	Self-Employed => Output 2.24 [0.13]

Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.



Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.




Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Response of Output to Output
Response of Output to Self-Employment
Response of Self-Employment to Output
Response of Self-Employment to Self-Employment

APPENDIX 2. Recursive Asymmetries. Aggregate Data.

Table 2. Skewness in input-output gaps. Values and test

Sample	**Y**		**B**		**E**		**S**	
	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.
80-02	-0.029700	0.944200	-0.219400	0.645600	**0.879900**	**0.067200**	-0.032100	0.944200
80-01	0.336800	0.496400	0.031800	0.944200	**1.087000**	**0.030000**	-0.094400	0.849200
80-00	0.401200	0.441200	0.029300	0.952200	**1.318500**	**0.011800**	-0.131400	0.794800
80-99	0.377000	0.490200	0.249300	0.645600	**0.924300**	**0.091000**	-0.052800	0.920400
80-98	0.389500	0.496400	0.225200	0.696600	0.636800	0.271400	0.095600	0.865000
80-97	0.418100	0.496400	0.310700	0.610000	0.433000	0.477600	0.143500	0.810400
80-96	0.302200	0.645600	0.367700	0.575400	-0.101600	0.872800	0.119800	0.849200
80-95	0.147800	0.833600	1.105600	0.121200	-0.212400	0.764200	0.203800	0.771800
80-94	0.134500	0.865000	0.196900	0.802600	0.018100	0.976000	0.224100	0.771800

APPENDIX 3. Bivariate VAR Sectoral Analysis (Output vs Labour Input). Sample 1980-2002.

In each IRF graph, the ± 2 S.E bands are drawn from 1000 Monte Carlo replications.

Agriculture, forestry and fishering

Table 3aa. Input: Black Employment. One lag. Instantaneous Causality: [0.14]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 6.79 [0.56][a]	Normality J-B = 1.56 [0.82]	Hetero X^2 No Cross Terms = 7.60 [0.82]	Hetero X^2 Cross Terms = 7.81 [0.93]

See table 1a.

Table 3ba. Input: Regular Employees. Two lags. Instantaneous Causality: [0.75]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 6.18 [0.19][a]	Normality J-B = 5.38 [0.25]	Hetero X^2 No Cross Terms = 24.1[0.46]	Hetero X^2 Cross Terms = 39.8 [0.57]

See table 1a.

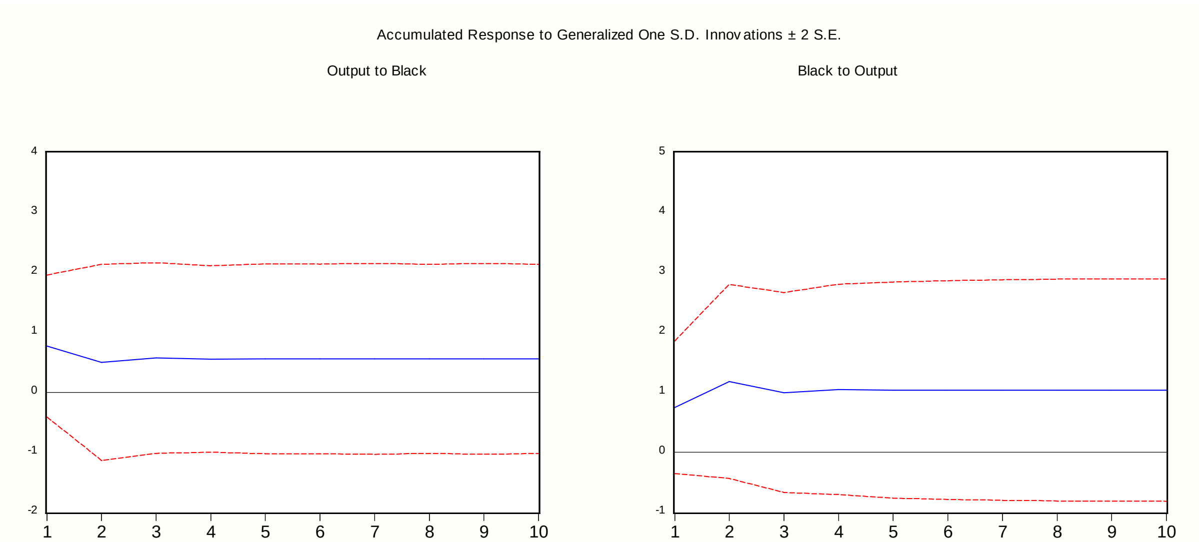
Table 3ca. Input: Regular Self-Employed. Two lags. Instantaneous Causality: [0.14]

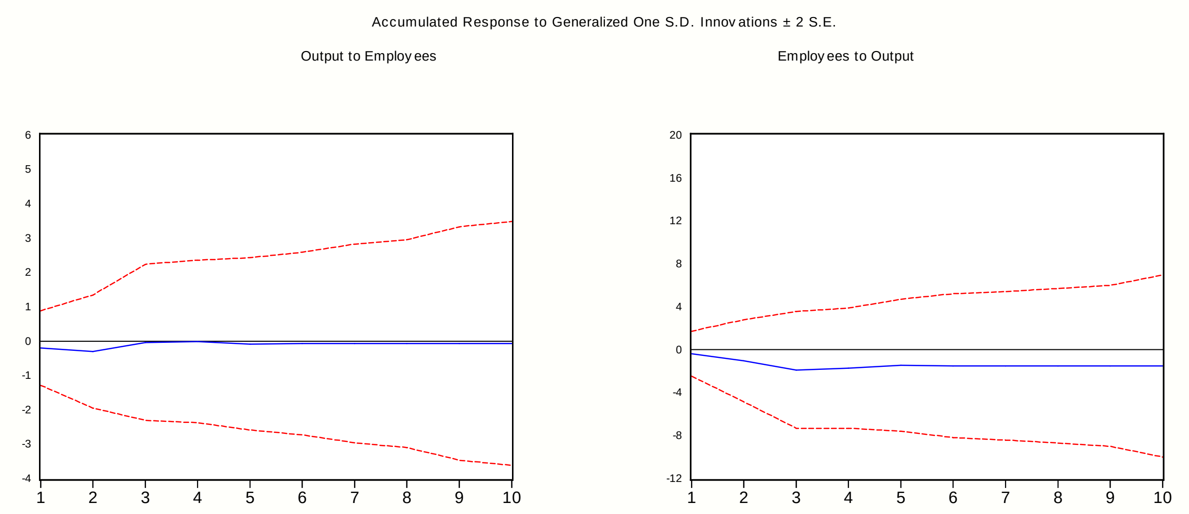
Multivariate tests			
Portmanteau Q-Stat 3 lags = 6.26 [0.18][a]	Normality J-B = 4.14 [0.39]	Hetero X^2 No Cross Terms = 17.2 [0.84]	Hetero X^2 Cross Terms = 34.4 [0.79]

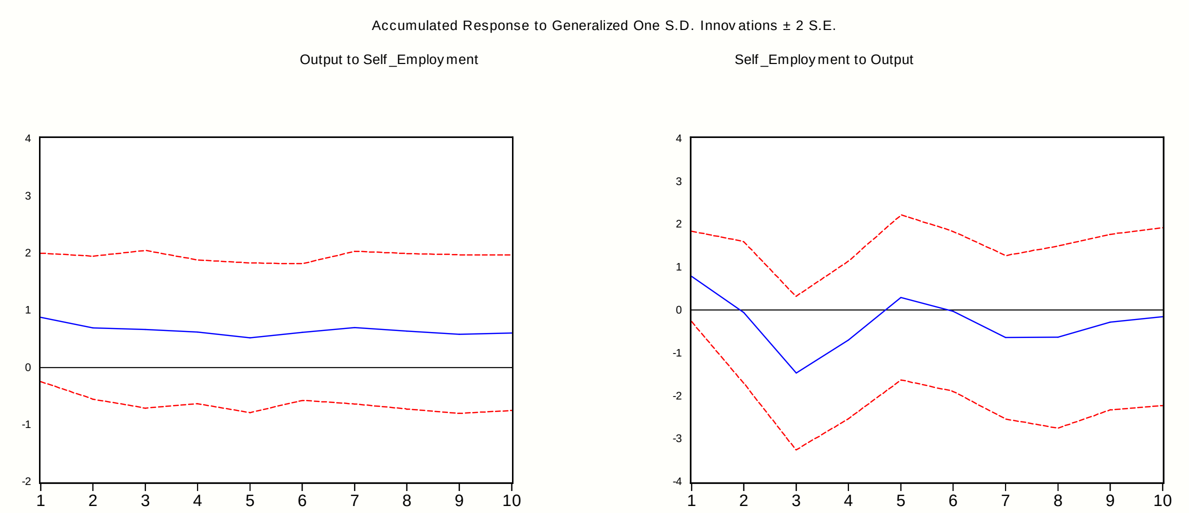
See table 1a.

Table 3da. VAR Granger Causality/Block Exogeneity Wald Tests.

X^2 [P-value]	X^2 [P-value]	X^2 [P-value]
Output => Black 0.92 [0.34]	Output => Employees 0.66 [0.72]	Output => Self-Employed 5.81 [0.05]
Black => Output 0.02 [0.90]	Employees => Output 0.20 [0.91]	Self-Employed => Output 0.36 [0.83]




Accumulated Response to Generalized One S.D. Innov ations ± 2 S.E.
Output to Employ ees
Employ ees to Output


Accumulated Response to Generalized One S.D. Innov ations ± 2 S.E.
Output to Self_Employ ment
Self_Employ ment to Output

Manufacturing

Table 3ab. Input: Black Employment. One lag. Instantaneous Causality: [0.09]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 14.6 [0.07][a]	Normality J-B = 3.20 [0.52]	Hetero X^2 No Cross Terms = 10.4 [0.58]	Hetero X^2 Cross Terms = 11.9 [0.68]

See table 1a.

Table 3bb. Input: Regular Employees. Two lags. Instantaneous Causality: [0.00]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 8.42 [0.11][a]	Normality J-B = 4.29 [0.34]	Hetero X^2 No Cross Terms = 22.4 [0.55]	Hetero X^2 Cross Terms = 42.8 [0.44]

See table 1a.

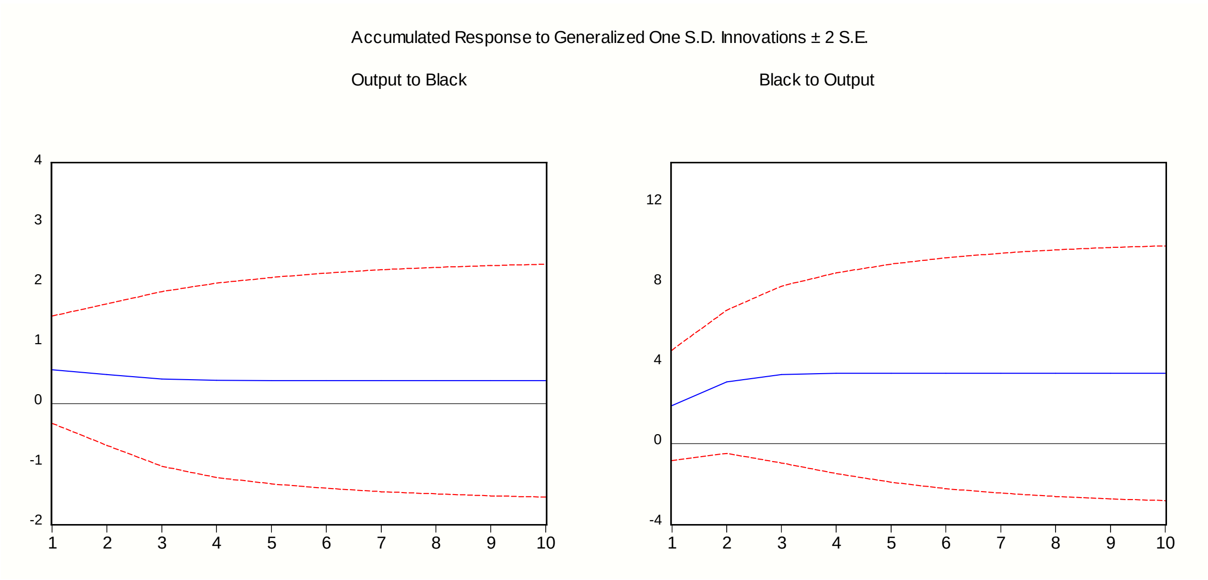
Table 3cb. Input: Regular Self-Employed. One lag. Instantaneous Causality: [0.33] OK: flex via cig

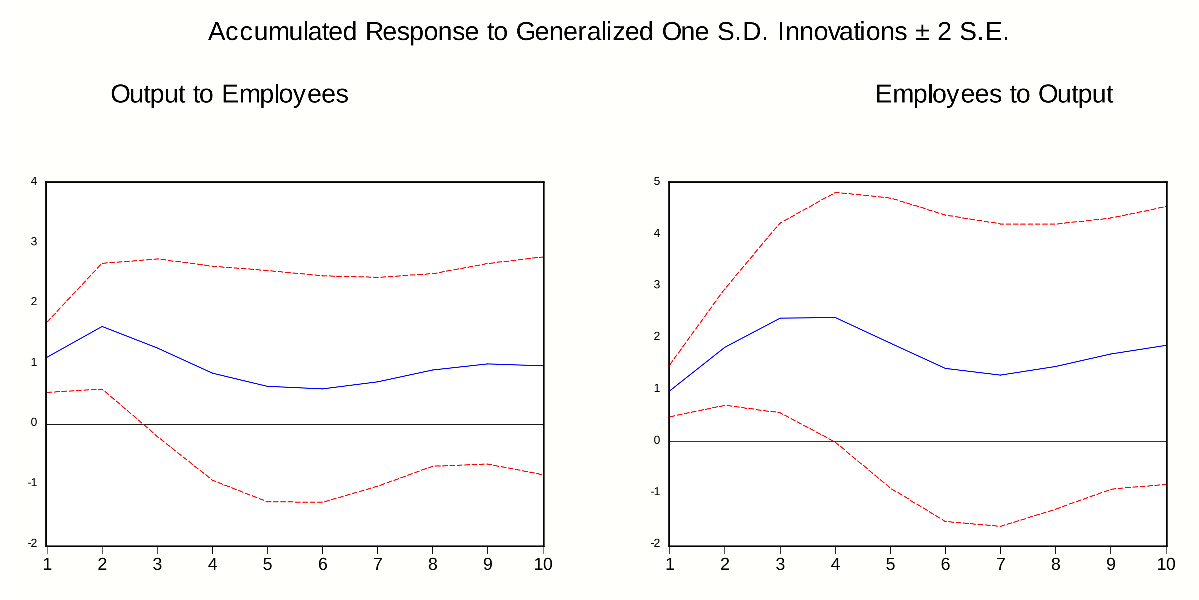
Multivariate tests			
Portmanteau Q-Stat 3 lags = 6.35 [0.61][a]	Normality J-B = 2.64 [0.62]	Hetero X^2 No Cross Terms = 5.49 [0.94]	Hetero X^2 Cross Terms = 5.99 [0.98]

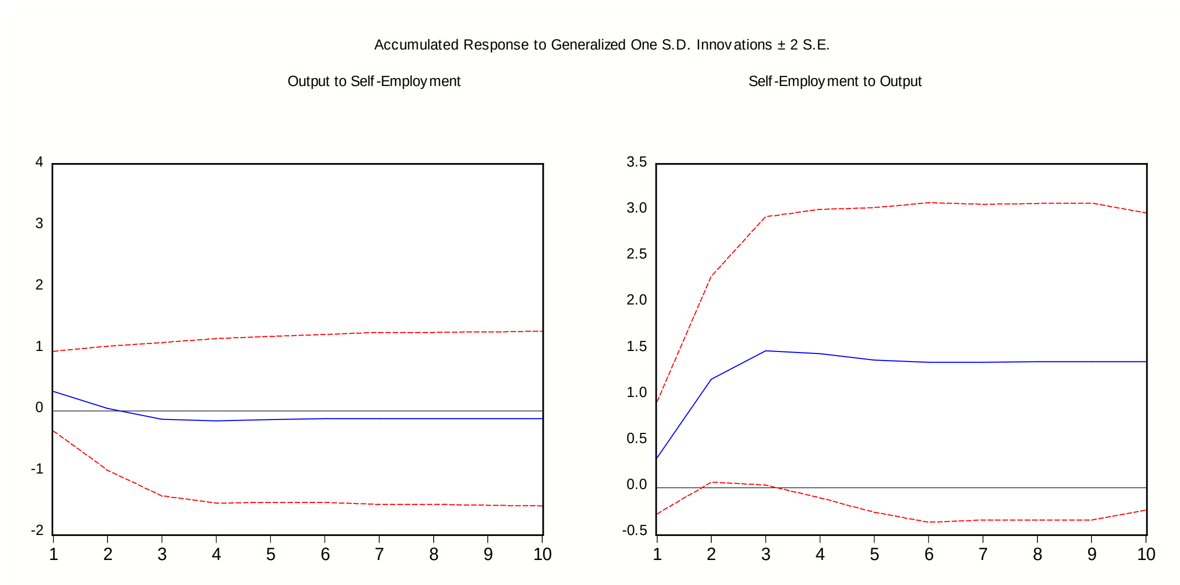
See table 1a.

Table 3db. VAR Granger Causality/Block Exogeneity Wald Tests.

X^2 [P-value]	X^2 [P-value]	X^2 [P-value]
Output => Black 0.88 [0.35]	Output => Employees 2.58 [0.27]	Output => Self-Employed 7.90 [0.00]
Black => Output 0.56 [0.45]	Employees => Output 2.01 [0.37]	Self-Employed => Output 1.96 [0.16]




Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Output to Employees
Employees to Output


Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Output to Self-Employment
Self-Employment to Output

Construction

Table 3ac. Input: Black Employment. One lag. Instantaneous Causality: [0.25]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 13.0 [0.11][a]	Normality J-B = 4.47 [0.35]	Hetero X^2 No Cross Terms = 11.6 [0.71]	Hetero X^2 Cross Terms = 13.4 [0.77]

See table 1a. Point dummy in 1989.

Table 3bc. Input: Regular Employees. Two lags. Instantaneous Causality: [0.11]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 4.49 [0.34][a]	Normality J-B = 2.91 [0.57]	Hetero X^2 No Cross Terms = 29.2[0.21]	Hetero X^2 Cross Terms = 51.9 [0.14]

See table 1a.

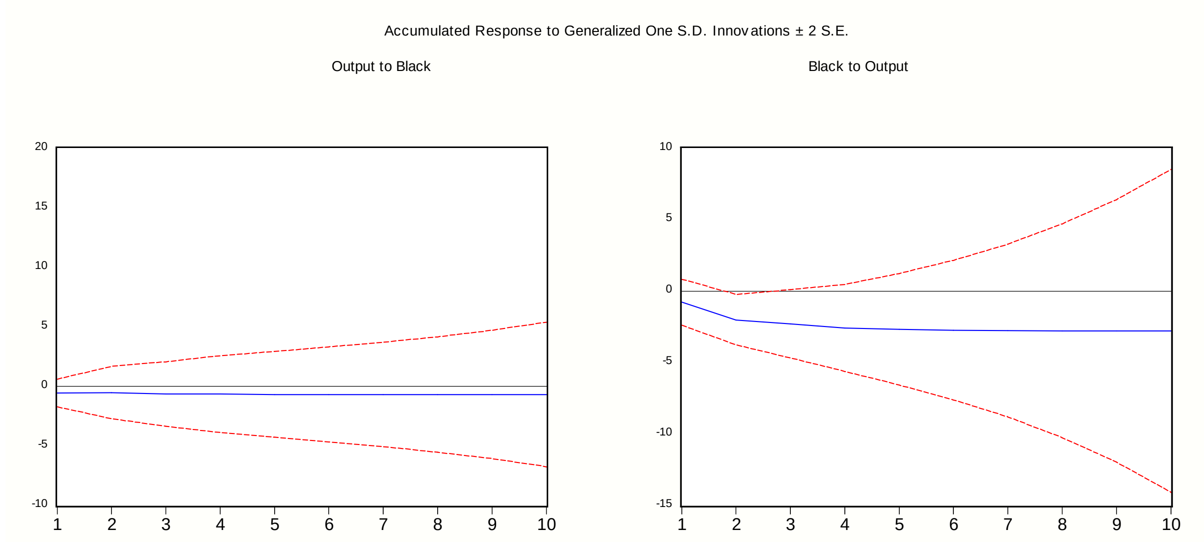
Table 3cc. Input: Regular Self-Employed. Three lags. Instantaneous Causality: [0.04]

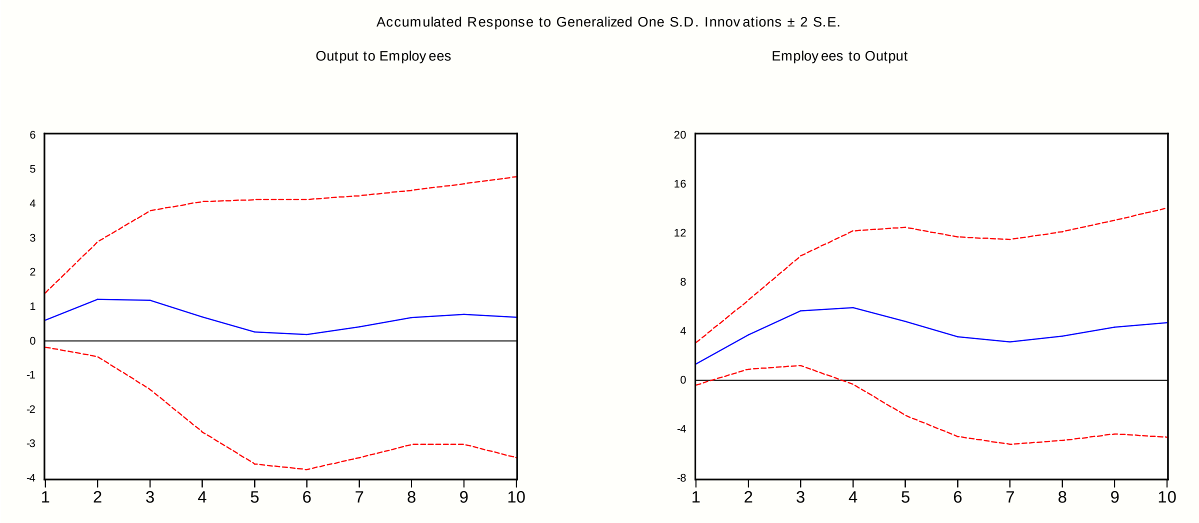
Multivariate tests			
Portmanteau Q-Stat 4 lags = 8.45 [0.08][a]	Normality J-B = 7.21 [0.12]	Hetero X^2 No Cross Terms = 32.0[0.66]	Hetero X^2 Cross Terms = NA

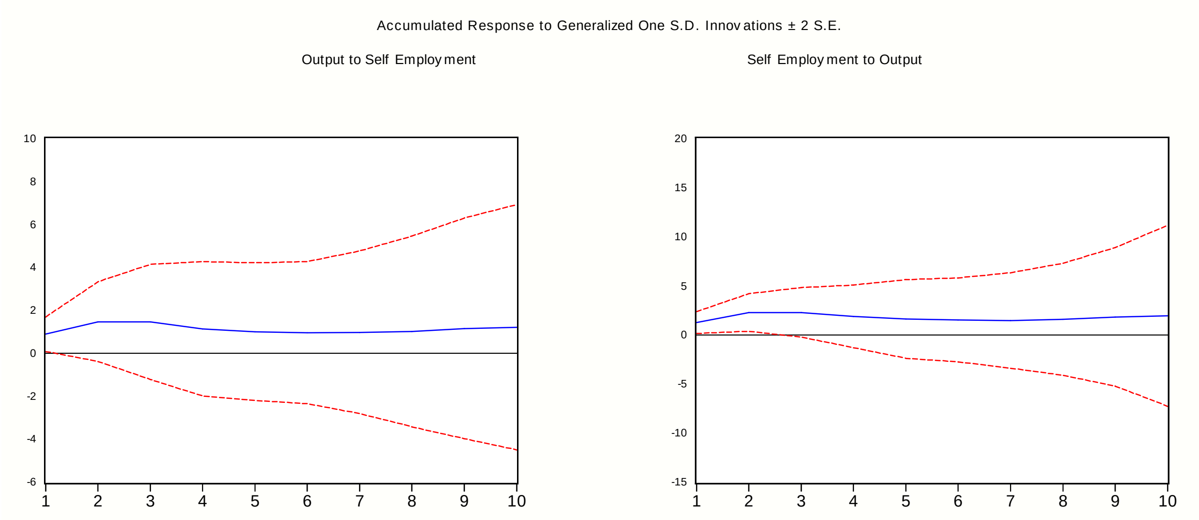
See table 1a.

Table 3dc. VAR Granger Causality/Block Exogeneity Wald Tests.

X^2 [P-value]	X^2 [P-value]	X^2 [P-value]
Output => Black 7.07 [0.01]	Output => Employees 7.05 [0.03]	Output => Self-Employed 8.73 [0.03]
Black => Output 0.73 [0.39]	Employees => Output 0.32 [0.85]	Self-Employed => Output 0.83 [0.84]




Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Output to Employees
Employees to Output


Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Output to Self Employment
Self Employment to Output

Transport and Communications

Table 3ad. Input: Black Employment. One lag. Instantaneous Causality: [0.72]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 6.98 [0.54][a]	Normality J-B = 3.05 [0.55]	Hetero X^2 No Cross Terms = 9.52 [0.85]	Hetero X^2 Cross Terms = 14.5 [0.70]

See table 1a. Point dummy in 1983.

Table 3bd. Input: Regular Employees. One lag. Instantaneous Causality: [0.84]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 9.42 [0.31][a]	Normality J-B = 3.84 [0.43]	Hetero X^2 No Cross Terms = 12.9[0.38]	Hetero X^2 Cross Terms = 18.7 [0.23]

See table 1a.

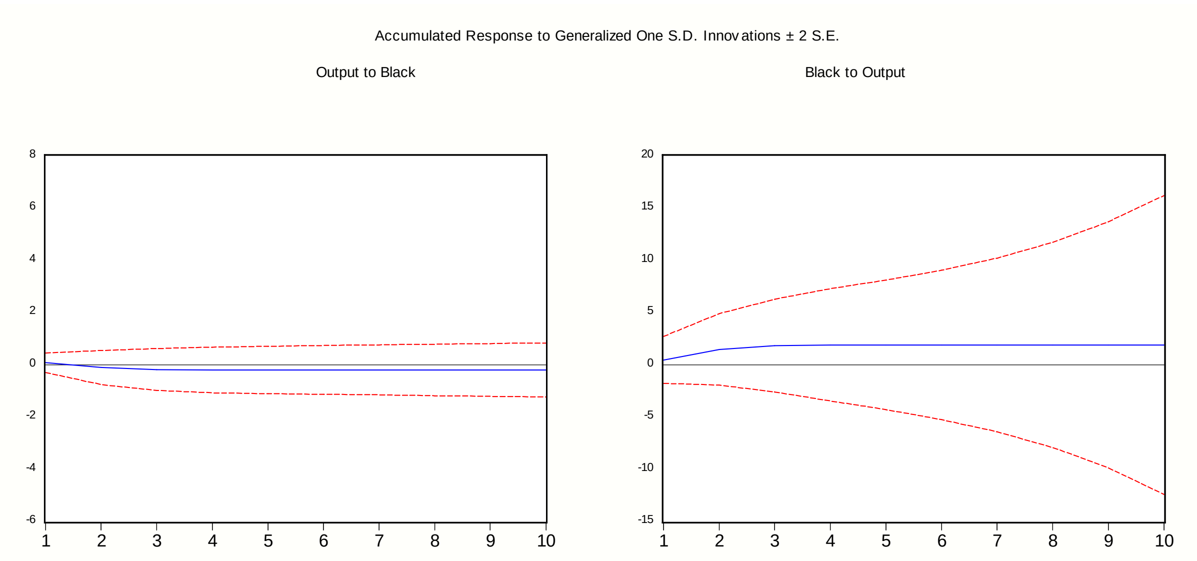
Table 3cd. Input: Regular Self-Employed. One lag. Instantaneous Causality: [0.49]

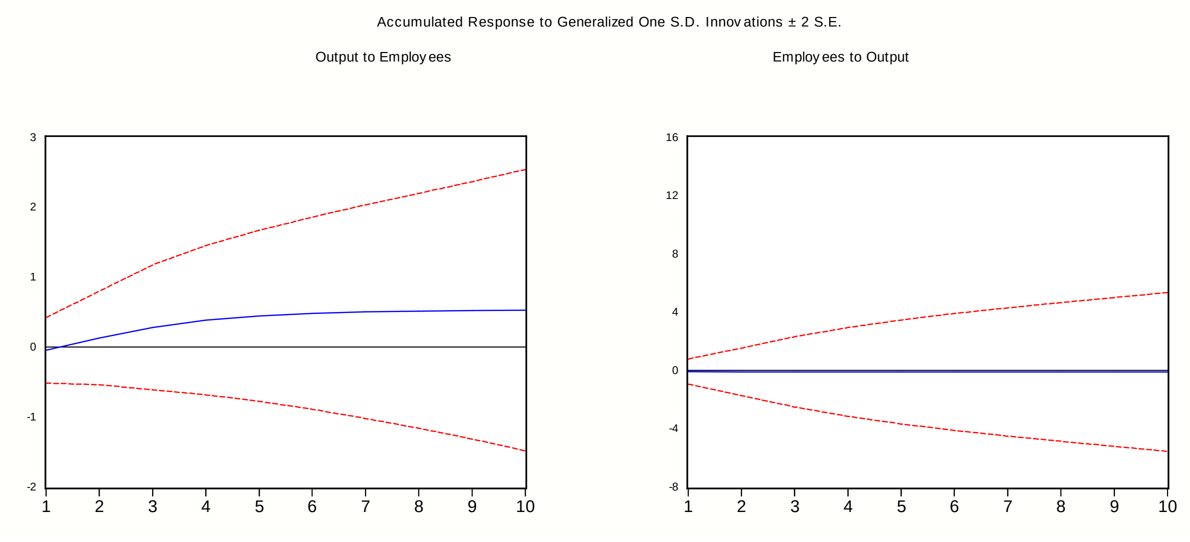
Multivariate tests			
Portmanteau Q-Stat 3 lags = 4.94 [0.76][a]	Normality J-B = 2.48 [0.65]	Hetero X^2 No Cross Terms = 9.26[0.68]	Hetero X^2 Cross Terms = 10.7[0.77]

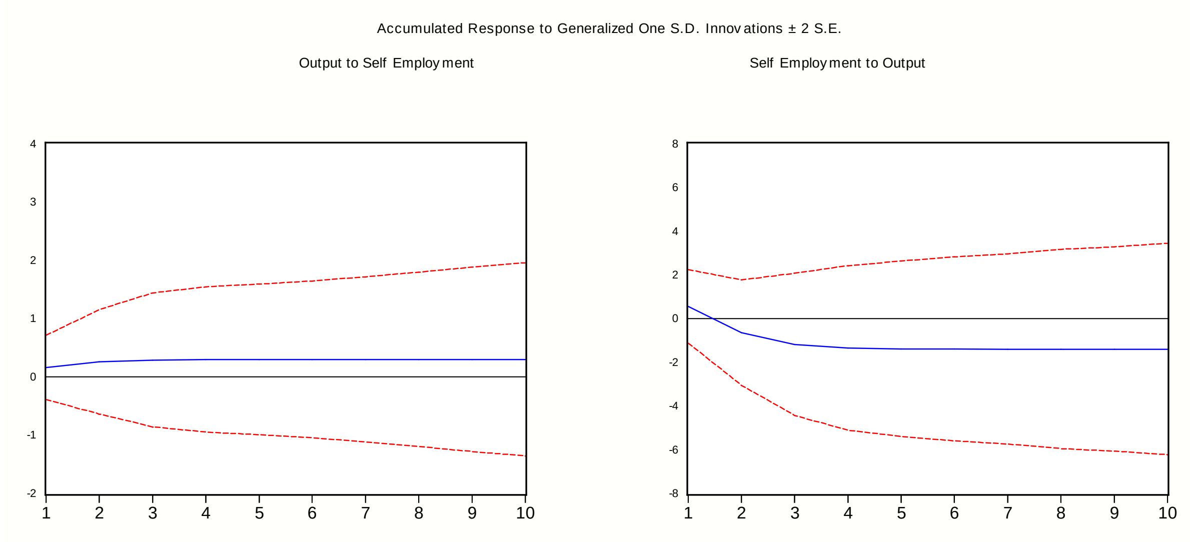
See table 1a.

Table 3dd. VAR Granger Causality/Block Exogeneity Wald Tests.

X^2 [P-value]	X^2 [P-value]	X^2 [P-value]
Output => Black 1.00 [0.32]	Output => Employees 0.00 [0.96]	Output => Self-Employed 3.06 [0.08]
Black => Output 1.57 [0.21]	Employees => Output 1.04 [0.31]	Self-Employed => Output 0.05 [0.82]




Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Output to Employees
Employees to Output
3
2
1
0
-1
-2
16
12
8
4
0
-4
-8
1 2 3 4 5 6 7 8 9 10


Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Output to Self Employment
Self Employment to Output
4
3
2
1
0
-1
-2
8
6
4
2
0
-2
-4
-6
-8
1 2 3 4 5 6 7 8 9 10

Hotels and Restaurants

Table 3ae. Input: Black Employment. One lag. Instantaneous Causality: [0.07; 0.05]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 8.27 [0.41][a]	Normality J-B = 1.91 [0.75]	Hetero X^2 No Cross Terms = 5.93 [0.92]	Hetero X^2 Cross Terms = 6.59 [0.97]

See table 1a.

Table 3be. Input: Regular Employees. One lag. Instantaneous Causality: [0.72]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 10.3 [0.24][a]	Normality J-B = 5.44 [0.24]	Hetero X^2 No Cross Terms = 3.84[0.99]	Hetero X^2 Cross Terms = 10.2 [0.80]

See table 1a.

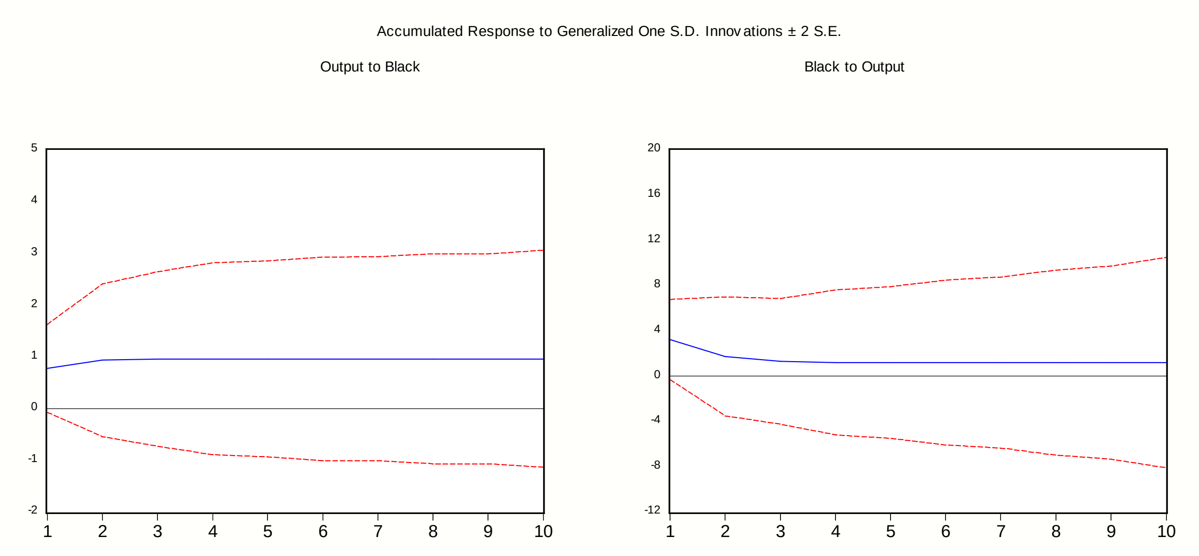
Table 3ce. Input: Regular Self-Employed. One lag. Instantaneous Causality: [0.33]

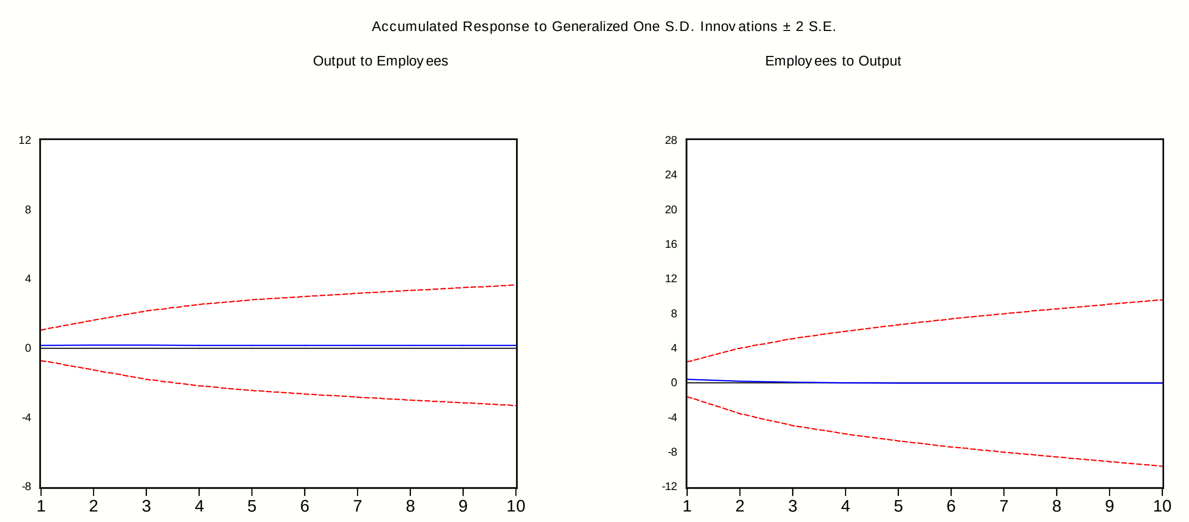
Multivariate tests			
Portmanteau Q-Stat 3 lags = 7.89 [0.44][a]	Normality J-B = 3.50 [0.48]	Hetero X^2 No Cross Terms = 12.2[0.43]	Hetero X^2 Cross Terms = 14.8[0.46]

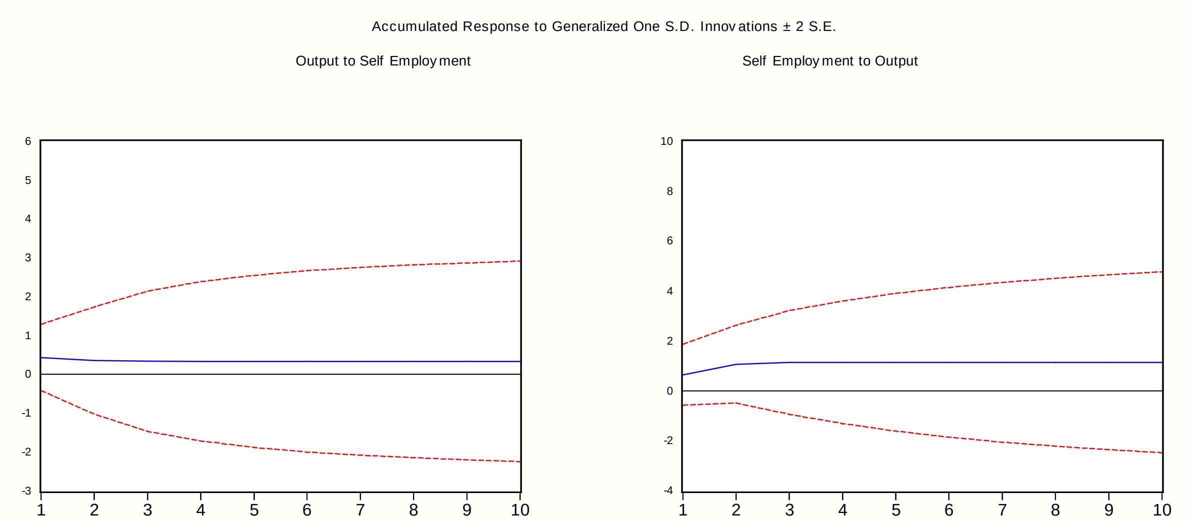
See table 1a.

Table 3de. VAR Granger Causality/Block Exogeneity Wald Tests

X^2 [P-value]	X^2 [P-value]	X^2 [P-value]
Output => Black 0.98 [0.32]	Output => Employees 0.11 [0.74]	Output => Self-Employed 0.39 [0.53]
Black => Output 0.01 [0.93]	Employees => Output 0.00 [0.97]	Self-Employed => Output 0.12 [0.73]




Accumulated Response to Generalized One S.D. Innov ations ± 2 S.E.
Output to Employ ees
Employ ees to Output
12 8 4 0 -4 -8
28 24 20 16 12 8 4 0 -4 -8 -12
1 2 3 4 5 6 7 8 9 10


Accumulated Response to Generalized One S.D. Innov ations ± 2 S.E.
Output to Self Employ ment
Self Employ ment to Output
6 5 4 3 2 1 0 -1 -2 -3
10 8 6 4 2 0 -2 -4
1 2 3 4 5 6 7 8 9 10

Trade

Table 3af. Input: Black Employment. Two lags. Instantaneous Causality: [0.58]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 2.52 [0.64][a]	Normality J-B = 6.01 [0.20]	Hetero X^2 No Cross Terms = 21.6 [0.60]	Hetero X^2 Cross Terms = 35.3 [0.76]

See table 1a.

Table 3bf. Input: Regular Employees. One lag. Instantaneous Causality: [0.04; 0.02]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 10.2 [0.25][a]	Normality J-B = 2.95 [0.57]	Hetero X^2 No Cross Terms = 7.81[0.80]	Hetero X^2 Cross Terms = 7.97 [0.92]

See table 1a.

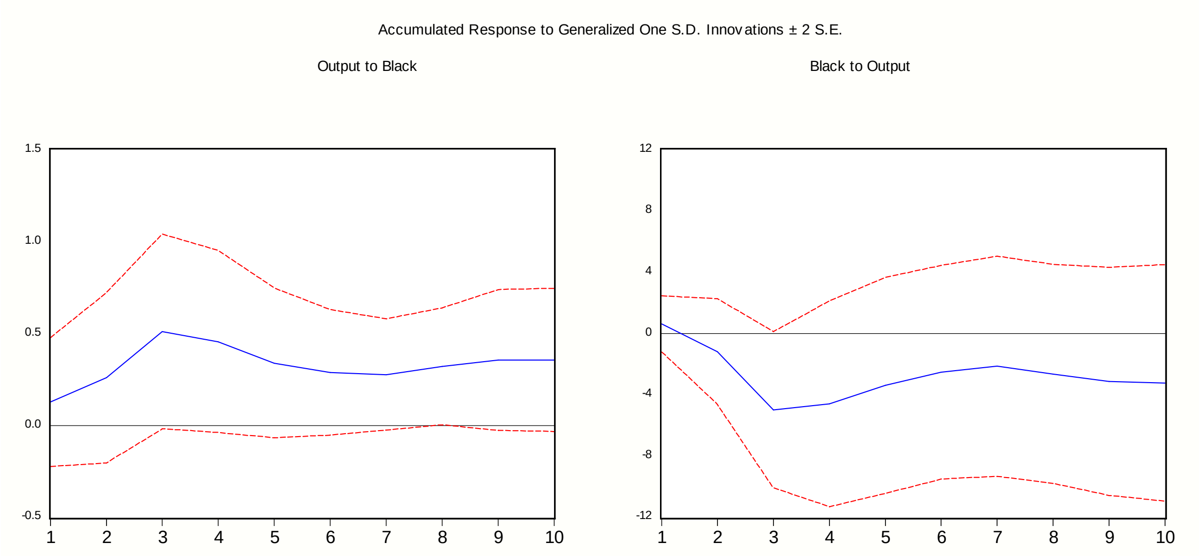
Table 3cf. Input: Regular Self-Employed. One lag. Instantaneous Causality: [0.11; 0.07]

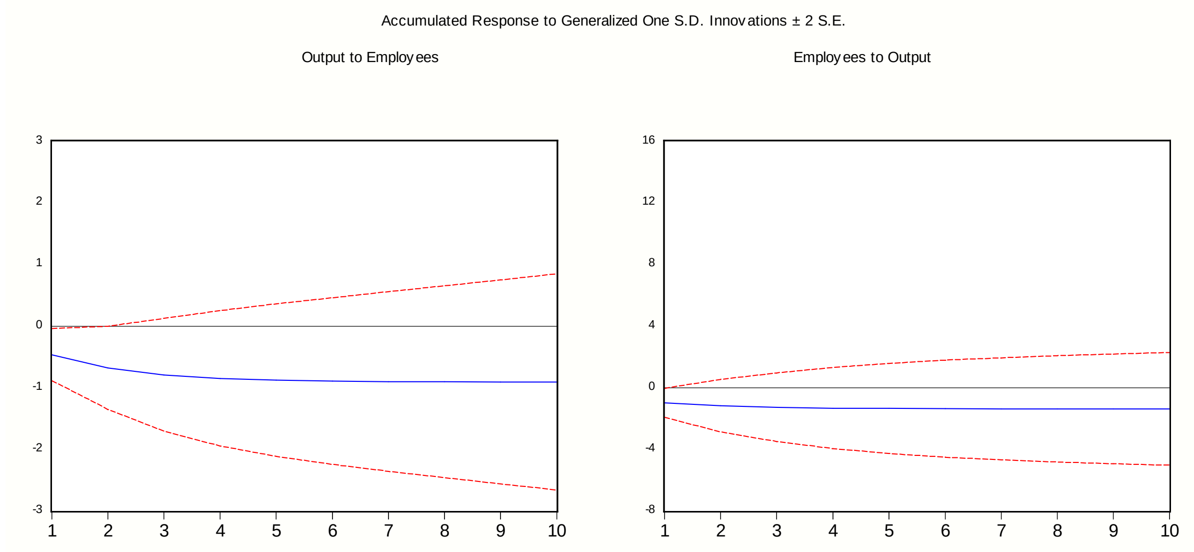
Multivariate tests			
Portmanteau Q-Stat 3 lags = 10.2 [0.25][a]	Normality J-B = 5.32 [0.26]	Hetero X^2 No Cross Terms = 7.28 [0.84]	Hetero X^2 Cross Terms = 7.66[0.94]

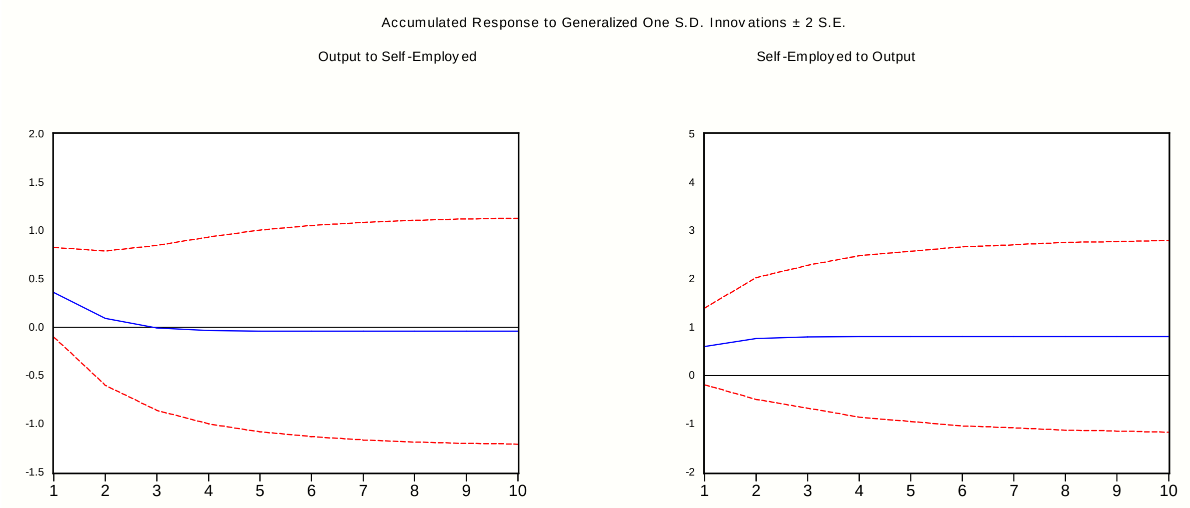
See table 1a.

Table 3df. VAR Granger Causality/Block Exogeneity Wald Tests

X^2 [P-value]	X^2 [P-value]	X^2 [P-value]
Output => Black 18.4 [0.00]	Output => Employees 0.54 [0.47]	Output => Self-Employed 0.01 [0.95]
Black => Output 5.50 [0.07]	Employees => Output 1.22 [0.27]	Self-Employed => Output 1.99 [0.16]




Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Output to Employees
Employees to Output


Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Output to Self-Employed
Self-Employed to Output

Personal Services

Table 3ag. Input: Black Employment. One lag. Instantaneous Causality: [0.00]

Multivariate tests			
Portmanteau Q-Stat 3 lags = 6.66 [0.57][a]	Normality J-B = 1.94 [0.75]	Hetero X^2 No Cross Terms = 12.1 [0.44]	Hetero X^2 Cross Terms = 17.5 [0.29]

See table 1a.

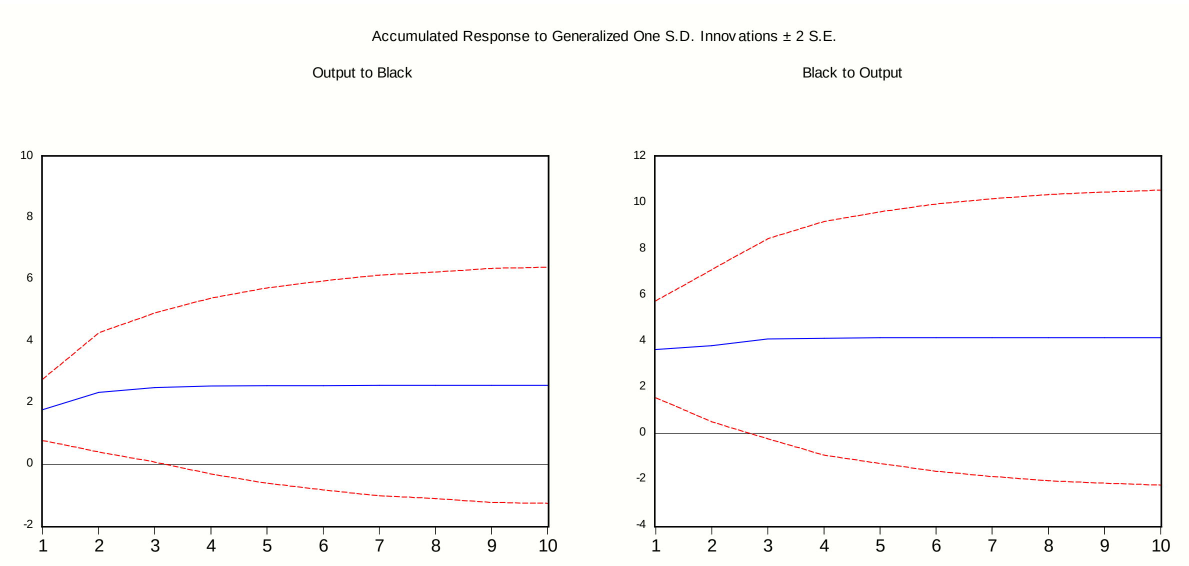
Table 3bg. Input: Regular Employees. One lag. Instantaneous Causality: [0.42]

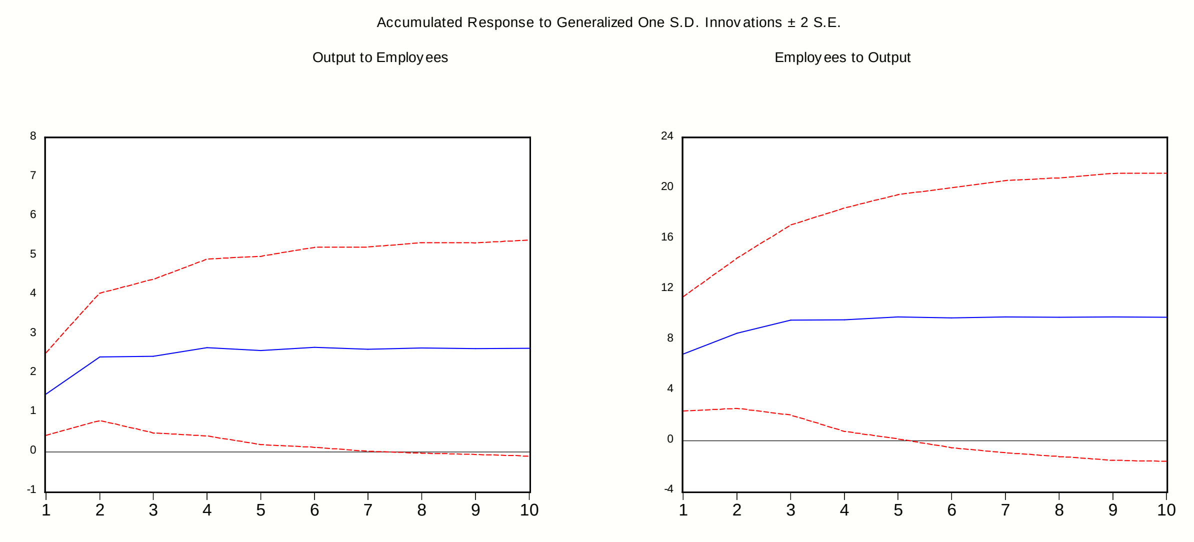
Multivariate tests			
Portmanteau Q-Stat 3 lags = 15.0 [0.06][a]	Normality J-B = 3.68 [0.45]	Hetero X^2 No Cross Terms = 20.2[0.16]	Hetero X^2 Cross Terms = 23.9 [0.16]

See table 1a. Point dummy in 2001 (legalization).

Table 3dg. VAR Granger Causality/Block Exogeneity Wald Tests.

X^2 [P-value]	X^2 [P-value]
Output => Black 0.44 [0.51] Black => Output 0.00 [0.96]	Output => Employees 4.04 [0.04] Employees => Output 1.28 [0.26]




Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.
Output to Employees
Employees to Output
8
7
6
5
4
3
2
1
0
-1
24
20
16
12
8
4
0
-4
1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

APPENDIX 4. Recursive Asymmetries. Disaggregate Analysis.

Table 4a. Skewness in input-output gaps. Values and test. Agriculture, forestry and fishering

Sample	Y		B		E		S	
	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.
80-02	-0.052100	0.912400	-0.060500	0.896600	**1.865100**	**0.000200**	-0.538700	0.262800
80-01	0.383500	0.441200	-0.138500	0.779400	0.316400	0.522200	-0.264700	0.596200
80-00	0.541700	0.298400	-0.102100	0.841400	-0.015700	0.976000	-0.252300	0.624200
80-99	0.730900	0.183600	-0.044300	0.928200	0.227900	0.674400	-0.088200	0.865000
80-98	0.695200	0.230200	-0.100800	0.857200	0.200300	0.726400	-0.255200	0.660000
80-97	0.216200	0.718800	-0.189300	0.756600	0.178800	0.764200	-0.487500	0.423800
80-96	0.558700	0.395400	-0.352800	0.589200	0.217300	0.741400	-0.393700	0.548400
80-95	0.407900	0.568600	-0.450100	0.528600	0.246100	0.726400	-0.508600	0.477600
80-94	-0.127600	0.865000	-0.508200	0.515600	0.498200	0.528600	-0.727900	0.357600

Table 4b. Skewness in input-output gaps. Values and test. Manufacturing

Sample	Y		B		E		S	
	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.
80-02	-0.425100	0.373400	-0.058800	0.896600	0.010100	0.976000	-0.346400	0.471600
80-01	0.546900	0.271400	-0.015000	0.976000	0.034100	0.944200	-0.376700	0.447200
80-00	0.726500	0.164600	-0.056100	0.912400	0.045300	0.928200	-0.442400	0.395400
80-99	**1.117000**	**0.041400**	-0.144600	0.787200	-0.190900	0.726400	-0.359000	0.509200
80-98	**1.162800**	**0.044400**	-0.203600	0.718800	-0.595100	0.303000	-0.436700	0.447200
80-97	0.953000	0.121200	-0.203100	0.741400	-0.472100	0.441200	-0.702200	0.254200
80-96	0.182800	0.779400	-0.201600	0.756600	0.465300	0.477600	-0.903100	0.170600
80-95	0.099800	0.888600	-0.164900	0.818000	0.423600	0.548400	-0.989200	0.167600
80-94	0.598800	0.447200	-0.198400	0.802600	0.255500	0.741400	-0.955700	0.226200

Table 4c. Skewness in input-output gaps. Values and test. Construction

Sample	Y		B		E		S	
	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.
80-02	0.169900	0.718800	0.127900	0.787200	0.767400	0.109600	**0.903300**	**0.060200**
80-01	0.420800	0.400800	0.083000	0.865000	0.621700	0.211200	0.761800	0.126000
80-00	0.080700	0.872800	-0.124100	0.810400	0.574100	0.271400	0.828800	0.111800
80-99	0.060100	0.912400	-0.397600	0.465400	0.578600	0.289200	**0.997000**	**0.068800**
80-98	0.101300	0.857200	-0.556100	0.337000	0.680200	0.238000	**0.964200**	**0.095000**
80-97	0.049800	0.928200	-0.701700	0.254200	0.712800	0.246000	0.893200	0.147000
80-96	-0.295700	0.652800	-0.874100	0.183600	0.120300	0.849200	0.767500	0.242000
80-95	-0.412000	0.562000	-0.508500	0.477600	0.218400	0.756600	0.314800	0.660000
80-94	-0.649400	0.412200	0.126200	0.872800	0.117800	0.880800	0.264900	0.733800

Table 4d. Skewness in input-output gaps. Values and test. Transport and Communications

Sample	Y		B		E		S	
	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.
80-02	-0.006100	0.984000	0.357000	0.453200	**-1.442500**	**0.002600**	**0.996200**	**0.038400**
80-01	-0.262600	0.596200	0.353200	0.477600	-0.689500	0.167600	0.709200	0.155600
80-00	-0.466400	0.368200	0.503500	0.332000	-0.788200	0.131000	0.188600	0.711400
80-99	-0.450700	0.412200	-0.077600	0.880800	-0.767300	0.161600	0.075500	0.888600
80-98	-0.225500	0.696600	-0.154100	0.787200	-0.426700	0.459200	-0.028400	0.960200
80-97	-0.085200	0.888600	0.107200	0.857200	-0.489800	0.423800	-0.511000	0.406600
80-96	-0.038700	0.952200	0.289200	0.660000	0.132000	0.841400	-0.356000	0.589200
80-95	-0.088000	0.896600	0.351300	0.624200	1.050800	0.141600	-0.630200	0.378800
80-94	-0.015700	0.984000	0.164800	0.833600	0.773500	0.327000	-0.986900	0.211200

Table 4e. Skewness in input-output gaps. Values and test. Hotels and Restaurants

Sample	Y		B		E		S	
	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.
80-02	0.532100	0.267000	-0.248500	0.603000	**-0.832700**	**0.081800**	0.583500	0.222400
80-01	0.030200	0.944200	-0.218200	0.660000	-0.293200	0.555200	-0.381700	0.441200
80-00	-0.036700	0.936200	0.111200	0.825800	-0.085300	0.865000	-0.378600	0.465400
80-99	-0.168300	0.756600	0.167100	0.756600	-0.102400	0.849200	-0.335600	0.535200
80-98	-0.294200	0.610000	0.225300	0.696600	-0.143500	0.802600	-0.349700	0.541800
80-97	-0.464500	0.447200	0.267600	0.660000	-0.198100	0.741400	-0.497500	0.418000
80-96	-0.769000	0.242000	0.273500	0.674400	-0.275700	0.674400	-0.712900	0.280200
80-95	-0.742900	0.298400	-0.140000	0.841400	-0.138600	0.841400	-1.015500	0.155600
80-94	-1.066100	0.177000	0.591300	0.453200	-0.325700	0.674400	-1.330400	0.093000

Table 4f. Skewness in input-output gaps. Values and test. Trade.

Sample	Y		B		E		S	
	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.
80-02	-0.424300	0.373400	-0.493600	0.303000	0.284200	0.548400	0.018100	0.968000
80-01	-0.358000	0.471600	-0.587400	0.238000	0.210900	0.667200	0.144400	0.771800
80-00	-0.343400	0.509200	-0.537500	0.303000	-0.182100	0.726400	0.236200	0.645600
80-99	-0.267900	0.624200	-0.533600	0.327000	-0.245600	0.652800	0.194400	0.718800
80-98	-0.195700	0.733800	-0.350700	0.541800	-0.284300	0.617000	0.358900	0.535200
80-97	-0.104200	0.865000	-0.255500	0.674400	-0.255600	0.674400	0.419700	0.490200
80-96	0.060600	0.920400	-0.067900	0.912400	-0.113900	0.857200	0.557600	0.395400
80-95	0.491400	0.490200	-0.335300	0.638400	-0.205300	0.771800	0.543600	0.447200
80-94	1.117000	0.158600	-0.495700	0.528600	-0.418200	0.596200	0.900900	0.254200

Table 4g. Skewness in input-output gaps. Values and test. Personal Services.

Sample	Y		B		E	
	Value	Prob.	Value	Prob.	Value	Prob.
80-02	0.464000	0.332000	0.002700	0.992000	0.483600	0.312400
80-01	0.522700	0.293800	0.053200	0.912400	0.125000	0.802600
80-00	0.701000	0.180200	-0.228700	0.660000	-0.015100	0.976000
80-99	0.736500	0.180200	-0.199600	0.711400	-0.008000	0.984000
80-98	0.673700	0.242000	-0.119000	0.833600	-0.008500	0.984000
80-97	0.578500	0.347200	-0.115600	0.849200	0.000500	0.992000
80-96	0.471500	0.471600	-0.021900	0.968000	-0.003700	0.992000
80-95	0.122700	0.857200	-0.084900	0.904400	-0.013500	0.984000
80-94	0.624100	0.429600	-0.174300	0.825800	0.083100	0.912400