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Gary Gang Tian

Flinders University, gtian@uow.edu.au

Jordan Shan

Victoria University of Technology

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Abstract

This study contributes to the recent debate on immigration and unemployment in Australia by investigating the causal linkage between immigration and unemployment. The question of whether 'immigrants rob jobs' is examined by identifying the sources of unemployment through causal linkages between unemployment and other key variables such as immigration. The research finds no Granger causality between immigration and unemployment, but does run from industrial structural change to the high unemployment rate in Australia. This research also finds that both GDP growth and immigration inflow reinforce each other in the course of economic development in Australia.

Keywords

do, evidence, jobs, rob, migrants, australia

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DO MIGRANTS ROB JOBS? NEW EVIDENCE FROM AUSTRALIA

Gary Gang Tian*

School of Economics

The Flinders University of South Australia

Jordan Shan

Department of Applied Economics

Victoria University of Technology

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DO MIGRANTS ROB JOBS? THE EMPIRICAL EVIDENCE FROM AUSTRALIA

ABSTRACT

Using a new Granger no-causality testing procedure, developed by Toda and Yamamoto (1995), this study contributes to recent debate on immigration and unemployment in Australia by investigating the causal linkage between immigration and unemployment in a six-variable vector autoregression (VAR) model. The VAR model in the paper is built upon a general unemployment equation developed by Pope and Withers (1993), using quarterly time series data covering the 1983:3 to 1995:4 period. The question that whether “immigrants rob jobs” is examined by identifying the sources of unemployment through causal linkages between unemployment and other key variables such as immigration. The research finds no Granger causality between immigration and unemployment. Instead, there is evidence of Granger causality running from structural change, as measured by the Stoikov Index, to unemployment and from other key variables to unemployment.

1. INTRODUCTION

The linkage between immigration and unemployment remains a subject of continuing debate and a matter of public concern in Australia since mid-1980s. However, a consensus conclusion based upon robust empirical evidence is yet to emerge. Recently, the remark on Australia's immigration policy made by the MP for Oxley has renewed interests in the migration-unemployment research and revived the debate on the Australian immigration policy. New developments in econometric theory, such as time series concepts of cointegration and causality testing, have further expanded the debate on the migration-unemployment relationship.

This paper takes these developments as the motivations for investigating the causal linkage between immigration and unemployment in Australia using a new Granger no-causality testing procedure, developed by Toda and Yamamoto (1995). This study contributes to recent debate on immigration and unemployment in Australia by building a six-variable vector autoregression (VAR) model following the general unemployment equation developed by Pope and Withers (1993), using quarterly time series data covering the 1983:3 to 1995:4 period. The literature on Australian migration-unemployment nexus is limited. The noteworthy works are that by Withers and Pope (1985), Lee (1992) and Junankar, *et al* (1996). The study is a first attempt using Granger no-causality procedure in a VAR model, and further, the use of the Toda and Yamamoto (1995) is expected to improve the standard F-statistics in the causality test process. The rest of paper progresses as follows: Section 2 provides the reader with a brief review of the empirical literature, followed by a discussion of the model employed in the paper, Section 3 demonstrates empirical results, and finally, Section 4 concludes.

2. THE REVIEW AND MODEL

A. Review:

Broadly speaking, the empirical studies on the migration-unemployment relationship can be categorised into two groups: (i) those who applies cross-country (or regional) data¹, and (ii) those who uses time series data. In recent years an increasing number of studies in other areas have relied on time series data, as opposed to the cross section data analysis. Among time series data analysis, few researchers have directed the migration-unemployment studies towards the use of the Granger no-causality testing² procedure. Withers and Pope (1985) did a pioneering work, followed by Lee (1992) and Junankar *et al* (1996). Their conclusions are mixed: while xxx (19xx) finds evidence that immigration contributes to high unemployment rate in Australia, xxx (19xx) reject the immigration-cause unemployment hypothesis.

However, these studies suffer from all or some of the following problems: first is their arbitrary choice of the lag length (eg., xxx, xx); Second, some scholars have applied F-test statistics for the causality test. It is now well established in the literature of econometrics that the F-test statistic is not valid if times series are integrated (e.g., if they are $I(1)$ variables) as argued by Toda and Yamamoto (1995), Zapata and Rambaldi (1997) and Gujarati (1995); Third, these studies have used a simple two-variable relationship in the model specification (eg., xxx,xxx). It is established in the econometrics literature that causality tests are sensitive to model selection and functional form (Gujarati, 1995 and Xu, 1996). Fourth is the endogenous nature of a unemployment function. The determinants of the equation are quite possible to have feedback effects in the system, the modelling should therefore considers this problem to avoid a simultaneity bias. A VAR model, as argued by Zapata and Rambaldi (1997) and Gujarati (1995), have proved to generate more reliable estimates in an endogenous context.

¹ See, eg., Winegarden & Khor (1991) and Simon, et al (1993).

² Granger (1988a and 1988b) has discussed the concept of causality in the framework of bivariate VAR, defining Y is said to be Granger-caused by X if the information in past and present X helps to improve the forecasts of the Y variable.

B. The Data and model

The VAR model is estimated using quarterly times series data covering 1983:3 to 1995:4 period. This VAR system is constructed upon the so-called “general disequilibrium model for unemployment”, developed by Pope and Withers(1993). Therefore, it consists the following six variables³:

$$U_t = f(MR_t, W_t, CAP_t, BR_t, STO_t) \quad \dots \dots \dots \quad (1)$$

where U_t is unemployment rate; MR_t is net immigration per 1,000 of Australia’s population; W_t is real Wages; CAP is the capacity utilisation rate (actual relative to trend real GDP); BR is unemployment benefits per unemployment worker⁴; STO is the change in industrial structure of employment measured by the Stoikov index.

There is methodological question whether structural analysis based on formal modeling from theory is an adequate guide to interdependence. In recent years an alternative theoretical approach to statistical testing of relationships has been advocated for testing “causality” assertions. Few study have been done in this areas by conducting “Granger-causality” analysis on the migration-unemployment relationship to see if it confirms structural findings. However, these two variable Granger-causality approach faced the statistics problem. Based upon the review in the previous section and incorporating the factors that affect unemployment, a six-variable VAR model is built based upon the following function. This new approach incorporate the structural analysis and so permits richer interpretation than the two-variable Granger-causality analysis.

This disequilibrium model embodies elements of search and classical and Keynesian explanations of unemployment. (Pope & Withers, 1993) Following P. Trivedi and G. Baker,

³ The Poe and Withers (1993) model originally consists the 7th variable, migrant quality, as measured by human capital, savings, and spending potential. Since reliable data on these are yet available, it is therefore left out in or model.

⁴ It is approximated by the change of the number of the people receiving unemployment benefits due to unavailable data.

the basic formulation seeks to incorporate variables reflecting frictional-structural unemployment, such as unemployment benefits and industry structure changes, and variables reflecting cyclical unemployment, such as real wages (classical) and job availability (Keynesian). Capacity utilisation, measured as the ratio of actual to trend real gross domestic product, signals changes in job availability through changes in labour demand. Industrial structure is measured by a Stoikov index applied to employment dispersion as follows:

$$\text{Stoikov index} = \sum |L_{it} - L_t| (L_{it} / L_t)$$

where:

C. The Granger causality procedures:

The Granger no-causality test methodology applied in the paper is developed by Toda and Yamamoto (1995) and is extended and interpreted by Zapata and Rambaldi (1997) and Rambaldi and Doran (1996). Because the traditional F-Test in a regression context for determining whether some parameters of the model are jointly zero (in a stable VAR model) is not valid when the variables are integrated, the test statistic does not have a standard distribution. Hence several alternative procedures have been developed in an attempt to improve the size and power of the Granger no-causality test (see, e.g., Toda and Phillips, 1993; Johansen and Juselius, 1990). Unfortunately, these tests are cumbersome and "the simplicity and ease of application have been largely lost" (Rambaldi and Doran, 1996, p.1)⁵.

A different procedure, developed by Toda and Yamamoto (1995), utilises a modified Wald test for restrictions on the parameters of a VAR(k), MWALD (where k is the lag length in the system). This test has an asymptotic χ^2 distribution when a VAR(k + d_{max}) is estimated (where d_{max} is the maximal order of integration suspected to occur in the system). A Monte Carlo experiment, presented in Zapata and Rambaldi (1997), provides evidence that the MWALD test has a comparable performance in size and power to the LR and WALD tests.

⁵ There is growing concern among applied researchers that the cointegration likelihood ratio (LR) tests of Johansen and Juselius (1990) have often not provided the degree of empirical support that might reasonably have been expected and it is not practically simple in the case of more than two cointegrating vectors (see, e.g., Toda, 1994).

The advantage of this procedure, as argued by Zapata and Rambaldi (1997), is that it does not require the knowledge of cointegration properties of the system and the test can be applied even if there is no cointegration and/or the stability and rank conditions are not satisfied, “so long as the order of integration of the process does not exceed the true lag length of the model” (Toda and Yamamoto, 1995, p. 225). Rambaldi and Doran (1996) have proved that this method can be computed by using a seemingly unrelated regression (SUR) form. We therefore, build the following VAR model:

[fix the following stuff late]

$$\begin{array}{c} \text{UR}_t \\ \text{Imm}_t \\ \text{GDP}_t \\ \text{Exp}_t \\ \text{Lab}_t \\ \text{Imp}_t \\ \text{Inv}_t \\ \text{FDI}_t \end{array} = A_0 + A_1 \begin{array}{c} \text{UR}_{t-1} \\ \text{GDP}_{t-1} \\ \text{Exp}_{t-1} \\ \text{Lab}_{t-1} \\ \text{Imp}_{t-1} \\ \text{Inv}_{t-1} \\ \text{FDI}_{t-1} \end{array} + A_2 \begin{array}{c} \text{UR}_{t-2} \\ \text{GDP}_{t-2} \\ \text{Exp}_{t-2} \\ \text{Lab}_{t-2} \\ \text{Imp}_{t-2} \\ \text{Inv}_{t-2} \\ \text{FDI}_{t-2} \end{array} + A_3 \begin{array}{c} \text{UR}_{t-3} \\ \text{GDP}_{t-3} \\ \text{Exp}_{t-3} \\ \text{Lab}_{t-3} \\ \text{Imp}_{t-3} \\ \text{Inv}_{t-3} \\ \text{FDI}_{t-3} \end{array} \\
 + A_4 \begin{array}{c} \text{UR}_{t-4} \\ \text{GDP}_{t-4} \\ \text{Exp}_{t-4} \\ \text{Lab}_{t-4} \\ \text{Imp}_{t-4} \\ \text{Inv}_{t-4} \\ \text{FDI}_{t-4} \end{array} + A_5 \begin{array}{c} \text{GDP}_{t-5} \\ \text{Exp}_{t-5} \\ \text{Lab}_{t-5} \\ \text{Imp}_{t-5} \\ \text{Inv}_{t-5} \\ \text{FDI}_{t-5} \end{array} + A_6 \begin{array}{c} \text{GDP}_{t-6} \\ \text{Exp}_{t-6} \\ \text{Lab}_{t-6} \\ \text{Imp}_{t-6} \\ \text{Inv}_{t-6} \\ \text{FDI}_{t-6} \end{array} + \begin{array}{c} \varepsilon_{\text{GDP}} \\ \varepsilon_{\text{Exp}} \\ \varepsilon_{\text{Lab}} \\ \varepsilon_{\text{Imp}} \\ \varepsilon_{\text{Inv}} \\ \varepsilon_{\text{FDI}} \end{array} \dots \dots (2)$$

Where: A_1 - A_6 are six by six matrices of coefficients with A_0 as an identity matrix.

To test the hypothesis that “no Granger causality from immigration to unemployment”, we test $H_0: \alpha_1^{(12)} = \alpha_2^{(12)}, \dots, \alpha_5^{(12)} = 0$, where $\alpha_i^{(12)}$ are the coefficients of $\text{MR}_{t-1}, \text{MR}_{t-2}, \dots, \text{MR}_{t-4}$ respectively in the first equation of system (2) where the system is being estimated as a VAR(5).

The existence of a causality from immigration to unemployment can be established through rejecting the above null hypothesis which requires finding the significance of the MWALD statistic for the *group* of the lagged independent variables identified above. A similar testing procedure can be applied to the alternative hypothesis that “no Granger causality from unemployment to immigration”, i.e., to test $H_0: \alpha_1^{(21)} = \alpha_2^{(21)}, \dots, \alpha_5^{(21)} = 0$, where $\alpha_i^{(21)}$ are the coefficients of $U_{t-1}, U_{t-2}, \dots, U_{t-4}$ respectively in the second equation of system (2) where the system is being estimated as a VAR(5).

III. EMPIRICAL RESULTS

Prior to testing for non-causality, it is necessary to establish the order of integration present. To this end, an Augmented Dickey-Fuller (ADF) test was carried out on the time series in levels and differenced forms⁶. We carry out the tests on time series of each variable for Australia for the period 1983:3-1995:4. If the null hypothesis that a time series is non-stationary (has at least one unit root) can be accepted, the test procedures is then reapplied after transforming the series into first differenced form. If the null hypothesis of non-stationarity (when the time series is expressed in first differenced form) can be rejected, we then may establish that the time series is integrated of order one, $I(1)$. The number of the lags included was determined using Akaike Information Criteria (AIC) and Schwartz Criteria (SC)⁷. After the ADF test, we proceeded to the Granger no-causality test. The results derived from these methods are presented in Table 1.

[Tables 1]

The results in Table 1 suggest, in the case of Australia, that both the null hypothesis of “Grange no-causality from immigration to unemployment” and the null hypothesis that “Granger no-causality from unemployment to immigration” cannot be rejected at the 5%

⁶ The ADF regression equation is: $\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 t + \sum \gamma_j \Delta Y_{t-j} + \varepsilon_t$, where: ε_t for $t=1, \dots, N$ is assumed to be Gaussian white noise. This equation is with constant and trend denoted by α_0 and α_2 . The lag length, p , is chosen to ensure an approximate white noise and it was determined by AIC and SC. The results are not reported in this paper.

⁷ Results are not reported in the paper.

significance level. The research finds no Granger causality running between migration and unemployment. The myth that immigration take jobs is therefore not supported by the empirical evidence from Australia during post-1980s period.

The results in Table 1 also suggest in fact that both the null hypothesis of “Grange no-causality from Cap. rate to immigration inflows” and the null hypothesis of “Grange no-causality from immigration to Cap. rate” can be rejected at the 1% significance level. There is evidence of a two way causality running through GDP growth and immigration. The above results demonstrate that both GDP growth and immigration inflow reinforce each other in the course of economic development.

More importantly, the causality between the Stoikov Index and unemployment in Australia is very informative: there is a strong causality between the Index and unemployment (at the 1% significance level, Table 2) which suggests that the structural change in the composition of demand for labour is one important source of unemployment in Australia. Further, a graphic plot of the Stoikov Index, despite its volatility in the time span, suggest it follows the pattern of unemployment (Figure 1). the causalities for other pairs find the b-directional casualties between unemployment and other variables such as between unemployment benefits and the unemployment rate (Table 2).

Even though we have used AIC and SC to aid in the choice of lag length, we have estimated the model using several different lag structures to ensure that results are not sensitive to the choice of the lag length. It is pointed out that “it is best to run the test for a few different lag structures and make sure that the results are not sensitive to the choice of m (lag length)” (Pindyck and Rubinfeld, 1991, p. 217). The results set out in Table 1 are robust to different lag structures, so we can conclude that our results are robust or sturdy.

4. CONCLUDING REMARKS.

The paper has used the methodology of Granger no-causality test developed by Toda and Yamamoto (1995) to examine the causality linkage between immigration and unemployment as well as between immigration and other variables, to determine the sources of unemployment in Australia. The test was based upon annual time series data, in a six-variable VAR model, for the period of 1960-1996. The results indicate no causality running between immigration and unemployment, while there is two way causality running between immigration and GDP growth for Australia. The results reported here cannot offer a support for the argument (or fear) that migrants take jobs away from Australia. The paper found that there is two way causality running between GDP and immigration. In other words, the economic growth in Australia during the post war was (partly) propelled by immigration expansion, along with a set of other domestic factors, while the economic growth further attracted more migration come to Australia. The implication of this founding between immigration, GDP growth and unemployment is that the host region such as Australia may adopt a policy combing attracting more skilled and high savers with capital to promote economic growth, and at the same time, mobilising domestic resources and promoting further GDP growth by a continued commitment to an economic reform policy) to attract new inflow of skilled immigration. In other words, the efforts of promoting further economic growth using a set of well-designed domestic policies is no less important as replying on immigration inflows. It is economic growth that help to reduce the unemployment rate but not by reducing immigration intakes.

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Table 1. Results of Granger Causality Test

H0: Lag structure (VAR order)	U_t . does not cause Mr_t	Mr_t Does not cause U_t
2(3) 3(4) 4(5)* 5(6) 6(7) 7(8) 8(9)	0.1106	0.1012

NOTE: GDP = GDP in real terms; Exp. = Export in real terms; * VAR(6) is the optimal lag length which is determined by AIC and SC. VAR order = $k + d_{\max}$, where k is the lag length used in the system and $d_{\max}$ is the maximum order of integration in the system, which in our system is $I(1)$.

Table 2. Results of Granger Causality Test: Comparison of each causality pair

Ho:	P-values for MWALD (optimal VAR order)
STO_t does not cause U_t	0.00007 (one-way)
Cap_t and U_t	0.0002 VS. 0.00006 (two-way)
Br_t and U_t	0.0003 VS. 0.0001 (two-way)
W_t and U_t	0.00014 VS. 0.0004 (two-way)

NOTE: Variable definitions are the same as in Table 1.

Figure 2. Stoikov Index and Unemployment in Australia:1983-95