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MILAN EXPO 2015: THE BEST IS YET TO COME

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Abstract

The 2015 Milan Universal Exposition (Expo), as a major international event, represents an opportunity for the hosting country to trigger the economic growth because of the huge investments and public/private expenditure involved with the event. The economic benefits deriving from the event are expected in its preparatory phase, during the main exposition and after its conclusion. In this perspective, this paper develops a CGE model to assess the overall direct and indirect impact of Milan Expo 2015 on Italian economy, given the complex interrelationships among operators described by the SAM. The analysis considers the shocks on demand occurred during the preparatory phase of the Exposition, from 2011 to 2014 to determine the impact on the economic system of the event itself. Then, after the conclusion of the event, we analysed the potential impacts on the economic system of a set of demand shocks related to the renovation of the Expo infrastructures and expected tourist flows.

JEL Classification: C51, C52, C68, E60.

Keywords: Expo; CGE model; Economic Policy.

1. Introduction

An international big event such as Milan Universal Exposition - Expo 2015 - represents a huge opportunity for Italian economy to activate new production processes and stimulate the economic growth. Similarly, to the Olympic Games, World Expositions are identified in the literature as *mega events* (Guala, 2002; Roche, 2000) and involve the realization of many projects of constructions, communication, advertising and ICT infrastructure (Locatelli and Mancini, 2014). Therefore, they seem to be able to produce several socio-economic benefits for the hosting country, because of the expansion in event-related demand for commodities that they are supposed to generate (Dwyer et al., 2006). We are referring to the increase in tourism expenditure (final consumption), investment in event venue and related infrastructures and exports and foreign investment heritage after the event finishes (Li et al., 2013). This also helps understanding the reason for which in recent years Governments are increasingly willing to host these special events.

The Milan Expo 2015 in particular, explored the core theme "Feeding the Planet, Energy for Life" and involved 145 countries, 3 international organizations, several civil society organizations, corporations and non-governmental organizations. Around 5000 events were organised and more than 20 million people visited the exposition². As expected, this made Italy at the centre of the world attention for almost a year engendering benefits in terms of investment, tourist flows and consumption not only in the area where the event was held (Milan - Lombardy Region), but in all the country.

² <http://www.expo2015.org/>

The efficacy and the overall impact of a mega event like Expo should be assessed with a methodology able to take into account the economy-wide interactive effects of the increase in final demand (Dwyer et al., 2000). Input-Output model represented one of the most commonly used approach dealing with event impact analysis (Humphreys and Plummer, 1995), but because of the limitations of its assumptions, Computable General Equilibrium (CGE) models have recently received a stronger attention (Blake, 2005; Bohlmann and Van Heerden, 2005; Giesecke and Madden, 2007; Li et al., 2011; Madden, 2002, 2006; New South Wales Treasury, 1997). More precisely, CGE models are considered as best practice in exploring the economic impacts of tourism and hosting major events because they are able to detect the complex interrelationships among the operators within the economy and then simultaneously track direct and indirect impacts of policy measures (Dwyer et al., 2005). However, their application on major events impacts are still limited.

This study aims to quantify the economic impact of Milan Expo 2015 in Italy through the analysis of the changes in main macroeconomic aggregates (GDP, Consumption, Investment, Inflation etc.) in two different phases of the event. Indeed, economic and social benefits from Expo start occurring before the event itself, during its preparatory phase when planning the organization of the exposition area, constructing the infrastructures to allow the access to the site, building the pavilions and the Expo site itself. Then, during the exposition, economic and social benefits arise from tourist flows (domestic and foreign) that boost the consumption expenditure for goods and services. Finally, after the conclusion of the event, economic and social benefits can occur from the use of the event heritage represented by infrastructures tourism attractiveness,

especially from abroad (Antonioli Corigliano, 2010)³. In this respect, the Italian Government planned the progressive reuse of the Expo spaces for different purposes. The area set up for the event will be immediately destined to the host of national and international events. Successively, the spaces of the exposition will host the development of an Excellence Research Centre. The total amount of resources assigned to this project account for 1.5 billion euros in 10 years: the Government has already spent 80 million of euros.

In this perspective, the quantification of Milan Expo 2015 economic impact requires a separate definition of the shocks on investments, exports and final consumption occurring in each phase. For this purpose, we firstly determine the exogenous shock on domestic final consumption, investments and exports directly related to Milan Expo 2015 according to some studies commissioned by Expo Spa to some research centres (Chamber of Commerce of Milan, CEReT Bocconi University Research Center, Bocconi SDA researchers). These researches provide an estimation of the amount of additional investments, production, value added and employment directly connected with the Expo from 2011 to 2020 (Dell'Acqua et al., 2013). Then, we developed a multi-sector, multi-input and multi-output CGE model calibrated on the SAM for Italian economy, to carry out the impact analysis of the Expo's final demand shocks distributed in two scenarios. The first scenario, *pre-Expo*, evaluates the impact of the increase on investments related to the construction the event venue, accommodations and other urban and technological infrastructures. The second scenario, *post-Expo*, assesses the impacts of the increase on: i) domestic and foreign consumption expenditures during the execution and

³ In this phase, the transitory effects are assumed to be permanent.

expected after the conclusion of the event; ii) investments related to the reconversion of the infrastructures and the realisation of post-Expo initiatives.

Given the limited applications of SAM based CGE models to the study of mega events social and economic impact (Li et al., 2013), in this study we made an effort to provide a contribution on both methodology and outcomes. As for the first aspect, we developed a disaggregate model in which we consider a different behaviour of the Government that acts under the hypothesis of fixed and flexible expenditure for consumption. These conditions affect the government deficit determination and thus the results of the analysis, but are fundamental if we consider the constraints that the Italian Government has to fulfil. As regard to the outcomes, by splitting the analysis in two separate scenarios, we want to show the direct and indirect impacts of Expo 2015 in different moments of its realisation and highlight the different transmission mechanisms leading to the macroeconomic variables performances.

The article is organised in three main parts: the first part (paragraph 2) deals with the description of the methodologies used to carry out the analysis: CGE and SAM. The second (paragraph 3) describes the assumptions on demand shocks related to EXPO 2015 and provides the preliminary results of the analysis.

2. Models for economic policy impact analysis: the CGE and the SAM

Assessing the disaggregate effects of Expo 2015 within the economic system requires a set of instruments able to draw and quantify the relations among all the agents involved in production process, generation, primary and secondary distribution of income (Ciaschini et al., 2013). The CGE and the SAM represents the proper instruments to deal with this aim (Dwyer et al., 2000).

In particular, CGE model formalises the complex interactions among the operators which can be summarized in the relations between productive activities (products and activities), primary factors (labour and capital) and Institutional Sectors (Households, Firms, Government and Rest of World) (Ciaschini et al., 2012). Indeed, even if it does not have the ambition to draw the strict macroeconomic picture (Grassini, 2009) a CGE model provides a reliable and well-detailed interpretation of the economic system behaviour, given its basic assumption (Bacharach, 1989; Hicks, 1986).

Starting from the original concept of general equilibrium, dated back to Walras (Walras, 1874), the application of general equilibrium analysis to real economies received a strong impulse in the following years (Arrow and Debreu, 1954). It was furtherly expanded to the study of selected issue such as economic development (Chenery and Uzawa, 1958), economic growth (Joansen 1960) and the incidence of taxation on income and on production (Harberger, 1962; Showen and Walley, 1972, 1974). In recent times, general equilibrium models moved to a less Walrasian framework by introducing assumptions on price rigidities, unbalanced government budgets, fixed and flexible nominal exchange rates, unemployment and so on (Willenbockel, 1994). This “Less-orthodox CGEs approach” can include also the “macro-structuralists” (Taylor, 1990) contributions, which focus on the theories of Keynes, Kalecki and Kaldor. According to these viewpoints, the transmission mechanisms of the effects within the CGE depend more on the conditions regulating the macro-economic balances than the choices of the functional forms.

On the other side, the SAM provides the economic flows among operators representing the initial balance of the entire economic system (Socci, 2004). Therefore, it represents the fundamental database for the calibration of model parameters such as technical coefficients of

production, tax rates, consumption shares etc. The structure of the SAM is highly flexible in terms of disaggregation and the classification of operators can meet the specific requests of the research as regard to the structure of production, broken down by product or activity, and the composition of Institutional Sectors (Ciaschini et al., 2007).

In this study, we used the SAM for Italy characterised by a disaggregation in 63 Commodities, 2 Primary factors (Labour and Capital), a set of taxes on activities, taxes on income, 3 Institutional Sectors (Households, Firms, Government), Capital formation and flows related to transactions with Rest of the World (Ciaschini et al., 2013). Using this dataset, the CGE model is derived as a set of behavioural equation, equilibrium conditions and budget constraints going through the whole process of generation and distribution of income as summarised in table 1. The model assumes perfect competitiveness in commodity and primary factors markets. That is to say, the commodity supply derives from the solution of the profit maximisation problem conditioned to the resources' endowments and the demand derives from the maximisation of Institutional Sectors' utility subject to budget constraints (Ciaschini et al., 2012).

The output by commodity $X_i(p_i)$ is obtained through a nested constant-elasticity-of-substitution (CES) production function. The first production nest combines the demand for two bundles, the domestic output by commodity $D_i(x_i, p_{Di})$ and the imports by commodity $M_i(x_i, p_{Mi})$:

$$X_i(p_i) = \left(D_i(x_i, p_{Di})^{\frac{\sigma_i-1}{\sigma_i}} + M_i(x_i, p_{Mi})^{\frac{\sigma_i-1}{\sigma_i}} \right)^{\frac{\sigma_i}{\sigma_i-1}} \quad [1]$$

where σ_i is the elasticity of substitution between domestic output and imports⁴ by commodity, p_{Di} is the domestic price of each commodity, p_{Mi} is the foreign price and X_i is the total output by commodity.

The subsequent nest decomposes the domestic output bundle into aggregate intermediate demand $B_i(x_i, p_i)$ and aggregate Value Added by commodity as follow:

$$D_i(x_i, p_{Di}) = \left(B_i(x_i, p_i)^{\frac{\sigma_D-1}{\sigma_D}} + VA_i(x_i, p_{VA_i})^{\frac{\sigma_D-1}{\sigma_D}} \right)^{\frac{\sigma_D}{\sigma_D-1}} \quad [2]$$

where σ_D is the elasticity of substitution between the aggregates and it is set equal to zero (Leontief production function) and p_{VA} is the price of Value Added that can be interpreted as the average cost of primary factors. The intermediate goods bundle is obtained as:

$$B_i(x_i, p_i) = \left(\sum_j X_j(p_j)^{\frac{\sigma_B-1}{\sigma_B}} \right)^{\frac{\sigma_B}{\sigma_B-1}} \quad [3]$$

where σ_B is the elasticity of substitution between the intermediate demand of each commodity and is set equal to zero (Leontief production function). The aggregate Value Added is obtained by combining primary factors: labour $L_i(x_i, p_L)$ and capital $K_i(x_i, p_K)$:

$$VA_i(x_i, p_{VA_i}) = \left(L_i(x_i, p_L)^{\frac{\sigma-1}{\sigma}} + K_i(x_i, p_K)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \quad [4]$$

where σ is the elasticity of substitution between labour and capital and is set equal to 0.582 (Van der Werf E., 2007). p_L is the salary paid to each unit of labour and p_K is the price of capital.

Both prices correspond to the marginal cost and the marginal productivity of primary factors.

⁴ According to the Armington assumption (Armington, 1969), the imported and domestically produced goods are not perfect substitutes. This implies that national and foreign goods show elements of differentiation that can be perceived by consumers and therefore does not make them interchangeable. The elasticity of substitution between imported and national goods and is assumed to be 0.3 (Pretaroli and Severini, 2009).

The aggregate investment $I(x_i, r)$ is obtained combining the demand of each commodity for investment as follow:

$$I(x_i, r) = \sum_j I_i(p_i) \quad [5]$$

where r is the price of investment, or in other words, the rental of capital.

Households maximize their utility (Cobb-Douglas function) subject to the budget constraint represented by the disposable income Y_d . The utility depends on the consumption of goods and services $C(Y_d, p_i)$ and savings $S(Y_d, r)$. Disposable income depends on incomes from primary factors $R(VA)$, transfers from other institutional sectors $Tr_h(Y_{dk})$, net of taxes $T(Y_d, t)$ and transfers to other institutional sectors. The problem can be summarised as follow:

$$\max U_h(C_h, S_h) = \left(\left(\sum_i c_i(Y_{dh}, p_i) \right)^{\frac{\sigma_U - 1}{\sigma_U}} + S(Y_{dh}, r)^{\frac{\sigma_U - 1}{\sigma_U}} \right)^{\frac{\sigma_U}{\sigma_U - 1}} \quad [6]$$

s.t.

$$Y_{dh} = [\alpha_h \cdot L(x_i, p_L) \cdot p_L + \beta_h \cdot K(x_i, p_K) \cdot p_K + Tr_h(Y_{dk})] - T(Y_{dh}, t) - Tr_k(Y_{dh}) \quad [7]$$

where U_h is the utility of consumer h , σ_U is the elasticity of substitution between the aggregate consumption and savings (that is set equal to 1 according to CD assumption), α_h and β_h are the share of primary factors income going to institutional sector h , t is the income tax rate.

Firms do not demand goods and services for final consumption and their disposable income is completely destined to savings and thus to investments. Firms' disposable income depends on incomes from capital, transfers from other institutional sectors, net of taxes and transfers to other institutional sectors.

Government maximises its utility function that depends on collective consumption of goods and services $CG(Y_{dG}, p_i)$ subject to the constraint on total expenditure. This latter is calculated as the sum of tax revenues $T(Y_{dk}, t)$, incomes from capital, net transfers to other institutional sectors $[Tr_h(Y_{dk}) - Tr_k(Y_{dh})]$ and initial savings $SG(Y_d, r)$ or Government deficit. In policy scenarios we consider different cases of consumption expenditure and deficit restrictions (see paragraph 3.1).

The Rest of the World is assumed to behave as a private consumer (Households). It demands goods and services (exports) $E(Y_{dRdM}, p_i)$ subject to the budget constraint represented by its disposable income. This latter is computed as the sum of incomes from primary factors $R(VA)$ and net transfers from institutional sectors $[Tr_{RdM}(Y_{dh}) - Tr_h(Y_{dRdM})]$. Savings of Rest of World and nominal exchange rate are fixed.

The commodity market is in equilibrium when the excess of demand is zero, that is to say, the total demand equals the total supply of each commodity. This condition is fulfilled when the total output by commodity $X_i(p_i)$ is equal to: intermediate consumption $Bi(x_i, p_i)$, Households demand for consumption $C(Y_d, p_i)$, Government consumption expenditure $CG(Y_{dG}, p_i)$, Investments $I(x_i, r)$ and demand for exports $E(Y_{dRdM}, p)$. Similarly, the equilibrium condition on primary factors market imposes that the total demand equals the total supply (endowments). The total demand of primary factors derives from the production processes according to the principle of cost minimisation; total endowments are exogenous.

The model closes with the standard condition on Investment-Savings balance. We consider a neoclassical closure rule, so that the total amount of investments are savings-driven. Any changes in Households/Firms/Government savings will influence the amount of Investment.

3. *The shock on final demand related to Milan Expo 2015*

The existing studies on Expo 2015 mainly focus on local effects of demand shocks in the area of Milan and Lombardy Region (Antonioli Corigliano, 2010; Dell'Acqua et al., 2013; Locatelli et al., 2014). For this reason, we developed a macroeconomic analysis of economic and social impacts generated by Milan Expo 2015 on the Italian economy.

However, we considered the quantitative definition of the exogenous final demand shocks on Households consumption expenditures, private and public Investments and Exports based on the abovementioned studies' estimations. In some cases, we revised the original estimation to extend the exogenous shock at national level. In particular, we revised the amount of the shock on final demand for tourism, catering and hotels commodity that was only assumed for the Lombardy Region. Then, we developed two different scenarios that split the final demand shocks according to the phase of the Expo realisation as summarised in table 2.

The first scenario, *pre-Expo*, simulates the increase on Investment in major infrastructures, accommodations, urban and technological infrastructures occurring from 2011 to 2015, before the universal exposition. The total amount of resources involved are 3,400 million euros.

The second scenario, *post-Expo*, analyses the increase in: i) consumption expenditure deriving from domestic and inbound tourism flows during the exposition and expected after the event conclusion; iii) private and public investments related to the reconversion of the infrastructures, ordinary and extraordinary maintenance, creation of a Research Centre of excellence, similar to a university campus (one of the Government project). The financial

commitment planned over the *post-Expo* scenario predicts an increase in investments of 750 million euros (for 5 years only).

3.1 The economic impact of Expo 2015 through the CGE model

Given the estimation of the shocks on final demand related to the Expo 2015, we developed a CGE model to emphasise the direct and indirect economic impact of the event in terms of generation, distribution and use of income (Pretaroli and Severini, 2009). We considered the above mentioned two scenarios and simulated the demand shocks sequentially, so that each simulation is computed on the equilibrium reached in the previous scenario.

Therefore, the economic performance of the first scenario is described in terms of variables' percentage change from the benchmark (SAM for Italy). The economic performance of the second scenario is expressed in terms of deviation from the outcomes of the previous scenario. The shocks are assumed not permanent in all simulations.

Taking advantage of the model flexibility, we also tested two alternative hypotheses concerning the Government real consumption expenditure: we assume it is fixed in the first hypothesis and flexible (endogenous) in the second one.

i. Hypothesis 1: Fixed Government real consumption expenditure

The imposition of a constraint on Government real consumption expenditure reduces the multiplicative effect on macroeconomic aggregates of the exogenous shock on final demand. In the CGE model, this assumption is modelled by imposing that any increase in Government real disposable income must be allocated to real saving, not to Government real consumption.

In *pre-Expo* scenario, we considered a shock on Investments of 3.4 billion Euros related to the construction of infrastructures directly and indirectly connected with the event. The overall (direct, indirect, induced) impact on real GDP is around 0.19%, as showed in table 2, and it is mostly related to the increase on Investment (+1.49%), consumption(+0.08%) and exports (+0.07%). Higher investments and consumption stimulate imports (+0.21%) of goods and services that reduce the potential positive effect on GDP.

In *post-Expo* scenario, we considered the shocks on final demand (consumption, export and investment) related to the execution of the event and estimated after the event conclusion. The impacts are expressed in terms of percentage changes from the output in the previous scenario and reported in table 3, column 2.

The total amount of the shock on final demand is 6.793 billion Euros broken down into: increase in exports for 3.421 billion Euros, increase in consumption related to tourism flows for 1.422 billion Euros, increase in investment for renovation of infrastructures and the construction of the Research Centre after the conclusion of the event for about 1.950 billion Euros.

The impact on real GDP is 0.72% and is greater than the previous scenario for two main reasons: the amount of the exogenous shock is higher and the shock is modelled on private consumption and exports. These variables indeed, register the most relevant impact that is 0.93% and 2.36% respectively⁵.

ii. *Hypothesis 2: Flexible Government real consumption expenditure*

⁵ The overall impact on GDP, compared to the estimated provisional data from ISTAT, turns out to be relevant. To judge the contribution of Expo 2015 to the GDP growth in 2015, it is advisable to wait the revisions to this aggregate in the next three years. In the past, the ISTAT revisions on GDP growth have not always been marginal.

In this second hypothesis, the overall impact on macroeconomic variables of the Expo event is higher than in previous one because we removed the constraint on Government real consumption expenditure.

In particular, in *pre-Expo* scenario (table 4), the shock on investment generates a change in GDP of 0.31% that is higher than in previous hypothesis because of a greater value of the income multiplier. The drivers of this performance are Investments (+1.40%) and Exports (+0.11%). Domestic consumption is almost stable, likewise imports.

In *post-Expo* scenario (table 4), the shock on final consumption, exports and Investments generates a positive impact on GDP by 1.26%. Domestic consumption in particular, shows the highest change compared to the other variables (+1.94%), including exports (+0.98%), because of the positive direct and indirect effect of letting the Government real consumption expenditure fluctuate. Therefore, the analysis confirms the capacity of Government expenditure to amplify the economic impact of an exogenous shock on final demand through the income distribution channel. The increase in total output indeed, positively affects tax revenues and Government disposable income that can be allocated to consumption, promoting the generation of income in a virtuous income circular flow.

4. Conclusion

The economic impact of an international event like Milan Expo 2015 can be quantified through an accurate analysis and a suitable set of instruments able to ascertain two main aspects. The first concerns the estimation of the shocks on final demand related to the preparation, realisation and conclusion of the event and how they are transmitted to the socio-economic system. The second

aspect, connected to the previous one, concerns the quantification of the direct, indirect effects of the estimated shocks in the economic system, being particularly attentive to the induced impacts that are usually omitted in existing analysis. Indeed, the transmission channels of the exogenous shocks, from production processes to allocation and distribution of income, cannot be considered neutral in terms of impact on the economic system. Therefore, even though aggregate models allows evaluating the economic performance through the variations of main macroeconomic aggregates both in a static and dynamic context, but they present some weaknesses. First, the characteristics of the shock and the specific distressed variable: the shock on final demand certainly leads to different results depending on the affected operator (consumption, investment, government spending and exports). Second, the overall assessment of an event occurring in the economic system requires the use of a comprehensive approach that combine the general equilibrium analysis with the multi-sector characteristic. Production processes interact in a different way with other activities and institutional sectors, and therefore are able to greatly influence both the aggregate and disaggregate performance. The CGE models based on the SAM database are considered the most appropriate instruments for the analysis of international events in the literature.

In this study, we analysed the impact of Expo event during its organization, realisation and after its conclusion assuming exogenous shocks on investment, final consumption and exports. We assessed the overall impact on the main macroeconomic aggregates at national level, given the magnitude of the event and its potential impact in terms of tourism attraction and investment. We confirm the positive impact of this International event in stimulating the economic growth especially when the Government responds to the final demand shocks with a

flexible real consumption expenditure. In general, the results of this study are higher than alternatives studies on Milan Expo 2015, which are carried out with partial analysis, suggesting the relevance of indirect and induced effects in the generation of the final impacts. The impact of *post-Expo* scenario in particular, represents an original aspect of the analysis and provides a quantification of the benefits related to the potential tourism flows and investments on infrastructures after the conclusion of the event. Undoubtedly, the prospected reuse and redevelopment of the area and Expo infrastructures through new investment, represents a further chance to stimulate the economic growth.

References

- Antonioli Corigliano M. (2010). Analisi dei flussi turistici connessi ad Expo Milano 2015 - Aggiornamento di verifica a gennaio 2010, Università Bocconi, Milano.
- Armington P. (1969). A Theory of Demand for Products Distinguished by Place of Production. *International Monetary Fund Staff Papers*, vol. XVI (1969), pp. 159-178.
- Arrow K. and Debreu G. (1954). Existence of a Competitive Equilibrium for a Competitive Economy. *Econometrica*, vol. 22 (3), pp. 256-290.
- Bacharach M. (1989). The role of verstehen in economic theory. *Ricerche Economiche*, vol. 43 (1-2), pp. 129-150.
- Blake, A. (2005). The economic impact of the London 2012 Olympics. *TTRI Discussion Paper*, No. 2005/5. University of Nottingham.
- Bohlmann, H.R. and Van Heerden, J.C. (2005). The impact of hosting a major sport event on the South African economy. *Journal of Tourism*, vol. 26, pp. 594–603.
- Ciaschini M., Pretaroli R., Severini F. and Socci C. (2013). Environmental Tax and Consumption Expenditure by Regional Government in the Fiscal Federalism. *Economics and Policy of Energy and the Environment*, n.2, pp. 129-152.
- Ciaschini M., Pretaroli R., Severini F. and Socci C. (2012). Regional Double Dividend: evidence from environmental tax reform. *Research in Economics*, vol. 66, pp. 273–283.
- Ciaschini M. and Socci C. (2007). Bi-regional SAM linkages: a modified backward and forward dispersion approach. *Reviews of Urban and Regional Development Studies*, vol. 19(3), pp. 233-254.

- Dell'Acqua A., Morri G. and Quaini E. (2013). L'indotto di Expo 2015: un'analisi di impatto economico. *Camera di commercio di Milano*, Expo 2015 SpA. Available at: [http://www.confindustria.it/Aree/AltriDocumentiEXPO.nsf/B76A02BEC9A6C6BDC1257864005A0E49/\\$File/Impatto%20sull'Economia%20italiana.pdf](http://www.confindustria.it/Aree/AltriDocumentiEXPO.nsf/B76A02BEC9A6C6BDC1257864005A0E49/$File/Impatto%20sull'Economia%20italiana.pdf)
- Dwyer, L., Forsyth, P. and Spurr, R. (2005). Estimating the impacts of special events on an economy. *Journal of Travel Research*, vol. 43(4), pp. 351-359.
- Dwyer, L., Forsyth, P. and Spurr, R. (2006). Economic evaluation of special events. In: Dwyer, L., Forsyth, P. (eds). *International Handbook on the Economics of Tourism*. Edward Elgar, Cheltenham, pp. 316-355.
- Dwyer, L., Mellor, R., Mistilis, N. and Mules, T. (2000). A framework for assessing “tangible” and “intangible” impacts of events and conventions. *Event management*, vol. 6(3), pp. 175-189.
- Giesecke, J. and Madden, J. (2007). The Sydney Olympics, seven years on: an ex-post dynamic CGE assessment. *CoPS General Paper No. G-168*. Centre of Policy Studies, Monash University, Melbourne.
- Grassini, M. (2009). Rowling along the computable general equilibrium modelling mainstream. *Studies on Russian Economic Development*, March 2009, vol. 20(2), pp. 134-146.
- Guala, C. (2002). Per una tipologia di mega eventi. *Bollettino Società Geografica Italiana*, vol.VII(4).
- Harberger, A. (1962). The incidence of corporate income tax. *Journal of political economy*, vol.70, pp. 215-240.

- Hicks, J. (1986). Rational behaviour: Observation or assumption? *New York University Press*, pp. 102-110.
- Humphreys, J.M. and Plummer, M.K. (1995). The Economic Impact of Hosting the 1996 Summer Olympics. *The University of Georgia and IRE Advisors*, Georgia.
- Li, S.N. and Blake, A. (2009). Estimating Olympic related investment and expenditure. *International Journal of Tourism Research*, vol. 11, pp. 337–356.
- Li, S.N., Blake, A. and Cooper, C. (2011). Modelling the economic impact of international tourism on the Chinese economy: a CGE analysis of the Beijing 2008 Olympics. *Tourism Economics*, vol. 17(2), pp.279–303.
- Li, S. N., Blake, A. and Thomas, R. (2013). Modelling the economic impact of sports events: the case of the Beijing Olympics. *Economic Modelling*, vol. 30, pp. 235-244.
- Locatelli, G. and Mancini, M. (2014). Controlling the delivering of projects in mega-events: an application on EXPO 2015. *Event Management*, vol. 18, pp. 285–301.
- Madden, A.R. (2002). The economic consequences of the Sydney Olympics: the CREA/Arthur Andersen study. *Current Issues in Tourism*, n.5, pp. 7–21.
- Madden, A.R. (2006). Economic and fiscal impacts of mega sports events: a general equilibrium assessment. *Public Finance and Management*, vol.6, pp. 346–394.
- Pretaroli R. and Severini F. (2009). Assessing the effects of a value added tax policy on the wine sectors. *Enometrica*, vol. 2(2), pp. 41-51.
- Roche, M. (2000). *Mega-event and modernity*. London: Routledge.

- Showen J.B. and Walley, J. (1972). A general equilibrium calculation of the effects of differential taxation on income from capital. *Journal of public economics*, vol. 1, pp. 281-322.
- Showen J.B. and Walley, J. (1974). A proof of the existence of a general equilibrium with ad valorem commodity taxes. *Journal of economic theory*, vol. 8, pp. 1-25.
- Socci C. (2004). Distribuzione del reddito e analisi delle politiche economiche per la regione Marche. Giuffré editore, Milano.
- Taylor, L. (1990). Structuralist CGE models, in Taylor L. (ed): *Socially relevant Policy Analysis: Structural computable general equilibrium models for developing world*. Cambridge (MA), MIT press, pp. 1-70.
- Van der Werf, E. (2007). Production Functions for Climate Policy Modeling: An Empirical Analysis. Nota di Lavoro, Fondazione Eni Enrico Mattei, No. 47.
- Walras, L. (1874). *Éléments d'économie politique pure, ou théorie de la richesse sociale* (Elements of pure economics, or theory of social wealth). Lausanne, L. Borbax ed.
- Willenbockel, D. (1994). Applied general equilibrium modelling: imperfect competition and European integration. Wiley.

Tables

Table 1

Fundamental Relationships in CGE model

	Commodities (1, ..., n)	Primary Factors (Labour, Capital)	Private Institutional Sectors (Households, Firms)	Government	Investment	Rest of the World
Commodities (1, ..., n)	$\mathbf{B}(x,p)$		$\mathbf{C}(Y_{d,p})$	$\mathbf{C}_G(Y_{d,p})$	$\mathbf{I}(x,r)$	$\mathbf{E}(Y_{d,p})$
Primary Factors (Labour, Capital)	$VA(x,p_{VA})$					
Private Institutional Sectors (Households, Firms)		$\mathbf{R}(VA)$	$\mathbf{Tr}(Y)$	$\mathbf{Tr}(Y)$		
Government	$\mathbf{T}(x,t)$	$\mathbf{R}(VA)$	$\mathbf{T}(Y,t)$	$\mathbf{T}(Y,t)$		
Saving			$\mathbf{S}(Y_{d,r})$	$\mathbf{S}_G(Y_{d,r})$		
Rest of the World	$\mathbf{M}(x,p_M)$	$\mathbf{R}(VA)$	$\mathbf{Tr}(Y)$	$\mathbf{Tr}(Y)$		(+/-)a

Table 2

Macroeconomic Impacts of Milan Expo 2015 in Italy

Scenario	Millions euro
<i>1. pre- Expo</i>	
Infrastructural Investment increase with relation to the main infrastructures connected with the event	3.400
TOTAL <i>pre-Expo</i>	3.400
<i>2. post- Expo</i>	
National consumption of touristic goods	1.422
Exports for tourist consumption	3.421
Research	750
Change in investment for ordinary and extraordinary maintenance of infrastructures after the event	1.200
TOTAL <i>post-Expo</i>	6.793

Note. Scenarios are elaborated on the basis of the analysis carried out by CERTeT – Bocconi University and “Camera di Commercio di Milano”.

Table 3

*Macroeconomic impact of Expo with constraint on Government Consumption expenditure
(percentage change from benchmark)*

	Scenario 1 <i>pre- Expo</i>	Scenario 2 <i>post- Expo</i>	Overall Impact
Real GDP	0.19	0.72	0.93
Private consumption	0.08	0.93	1.00
Investments	1.49	1.29	2.80
Exports	0.07	2.36	2.44
Imports	0.21	0.70	0.91

Table 4

*Macroeconomic impact of Expo with no constraint on Government Consumption expenditure
(percentage change from benchmark)*

	Scenario 1 <i>pre-Expo</i>	Scenario 2 <i>post- Expo</i>	Overall Impact
Real GDP	0.31	1.26	1.58
Private consumption	0.01	1.94	1.95
Investments	1.40	1.01	2.44
Exports	0.11	0.98	1.09
Imports	0.01	1.78	1.78