Efficiency and stabilization: reducing Harberger triangles and Okun gaps

Jean-Olivier Hairault\textsuperscript{a}, François Langot\textsuperscript{b}, Franck Portier\textsuperscript{c,}\textsuperscript{*}

\textsuperscript{a}EUREQUA—Paris I, Paris, France
\textsuperscript{b}Université du Maine — GAINS and CEPREMAP, Maine, France
\textsuperscript{c}IDEI, Université des Science Sociales, Place Anatole France, F-31042 Toulouse, France

Received 23 July 1999; received in revised form 9 February 2000; accepted 20 April 2000

Abstract

We provide in this paper a simple example of a dynamic stochastic imperfectly competitive economy in which introducing some distortive taxation increases both allocation efficiency and stabilization. © 2001 Published by Elsevier Science B.V.

Keywords: Business cycle; Stabilization; Welfare analysis

JEL classification: E32; E63

1. Introduction

The conventional wisdom is that there is a tradeoff between stabilization and allocation distortions, the latter being always larger than the former. It is clear that from a theoretical point of view, this tradeoff needs not to be a general result, but it is often thought in the profession as robust in plausible models. We want to provide a ‘plausible’ counter-example to the conventional wisdom: public intervention simultaneously reduces Harberger triangles and Okun gaps. We use a model of imperfect (monopolistic) competition, which is now widely accepted in macroeconomics as capturing some features of the real world. In this model, a natural candidate for public intervention is a Pigovian taxation policy, which we show to allow for allocation efficiency and stabilization. In doing so, we fully take into account the transitional dynamics that follows a policy change, and decompose the welfare gain of introducing distortive taxation into a steady-state (efficiency) gain (what is the welfare gain disregarding both ongoing shocks and the transition from an initial steady-state to a final one), a

\textsuperscript{*}Corresponding author. Tel.: +33-5-6112-8840; fax: +33-5-6112-8637.
E-mail address: fportier@cict.fr (F. Portier).
transitional (efficiency) gain and a stabilization gain (that is the measure proposed by Lucas). Cooley and Hansen (1992) and Chari et al. (1995) have shown that a proper welfare evaluation of a tax reform cannot disregard the transition path, even if this is generally done in the macroeconomic literature (as for instance in Cooley and Hansen (1989) or in Greenwood and Huffman (1991)).

2. The model

The economy is populated with a representative infinitely lived household, \( n \) monopolistic competitors producing imperfectly substitutable goods with the same technology and a government that levies taxes and makes lump sum transfers.

The representative household supplies \( h \) units of labor, consumes, invests and gets profits and capital income from firms. It maximizes the expected utility \( W \):

\[
W = E_0 \left\{ \sum_{t=0}^{\infty} \beta^t (\log(c_t) + \eta \log(1 - h_t)) \right\}
\]

with \( k_0 \) given and with respect to the following budget constraint

\[
c_t + i_t = wh_t + zk_t + \Pi_t - T_t
\]

where \( c \) and \( i \) are consumption and investment baskets:

\[
c_t = \left( \sum_{j=1}^{n} c_{jt}^{\frac{1}{\gamma}} \right)^{1+\mu}
\]

\[
i_t = k_{t+1} - (1 - \delta) k_t = \left( \sum_{j=1}^{n} i_{jt}^{\frac{1}{\gamma}} \right)^{1+\mu}
\]

\( w \) is real wage, \( z \) the rental cost of capital, \( k \) the stock of capital, \( \Pi \) the sum of profits and \( T \) lump sum transfers. The government is assumed to tax firms input (labor and capital) at rate \( \tau \) and to transfer tax revenues to the household in a lump sum way, so that its budget constraint is given by:

\[
\tau (wh_t + zk_t) = T_t
\]

Firm \( j \) produces according to the following constant returns to scale technology:

\[
y_{jt} = A_j k_j^{\alpha} h_j^{1-\alpha}
\]

and total factor productivity \( A \) is a stationary stochastic process with mean \( \bar{A} \):

\[
\log A_t = (1 - \rho) \log A_{t-1} + \rho \log A_{t-1} + \varepsilon_t
\]

with \( 0 < \rho < 1 \) and where \( \varepsilon_t \) is normally distributed with mean 0 and variance \( \sigma^2 \).

In such an economy, demand addressed to firm \( j \) is iso-elastic with price elasticity \( -\frac{1}{\mu} \), and each firm sets price as a constant markup \( 1 + \mu \) over marginal cost.

Given an initial level of capital \( k_0 \), a path of public decisions and total factor productivity \( (\tau, \{T_t, A_j\}_{t=0,\infty}) \), a symmetrical monopolistic competitive equilibrium of this economy is then given
by a sequence of allocations \( \{c_t, h_t, y_t, k_t, i_t, \pi_t\}_{t=0}^\infty \) and prices \( \{z_t, w_t, p_t\}_{t=0}^\infty \) such that quantities maximize utility and profit at equilibrium prices and markets clear.

3. Pigovian taxes and stabilization

From firm \( j \) profit maximization conditions, one gets:

\[
F_{k,j}^* = (1 + \mu)(1 + \tau) z_t,
\]

\[
F_{h,j}^* = (1 + \mu)(1 + \tau) w_t,
\]

where \( F_x^* \) is the marginal productivity of input \( x \). In an economy without taxes \( (\tau = T = 0) \), the equilibrium is not Pareto optimal. A structural policy that reduces this negative effect of market power on factors demand is to subsidize factors demand, i.e. to choose a negative value for \( \tau \). For \( \tau^* = -[\mu/(1 + \mu)] \), one gets the first best allocation.

Working with a dynamic model\(^1\) allows us to study the effect of such a policy at the steady-state, during the transition from a distorted economy to an non-distorted one and at the business cycle frequency. We can therefore measure the gains or losses in allocation efficiency and stabilization related to different values of \( \tau \) from 0 (the unregulated monopolistic competition case) to \( \tau^* = -[\mu/(1 + \mu)] \) (the competitive-equivalent case) and \( 2\tau^* \) (over subsidizing case).

The model is calibrated on postwar quarterly US data (see Table 1). Technology parameters are taken from Kydland and Prescott (1982), \( \beta \) is chosen such that annual real interest rate is 6.5%, \( \mu \) such that the markup level is 10%, \( \eta \) is such that \( h = 0.3 \) for the competitive-equivalent economy.

With this calibration, we compute the total welfare loss associated to a move from a non distorted steady state economy \( (\tau = \tau^*) \) to a distorted one \( (\tau \neq \tau^*) \). Given that we solve the model by log linearization, this loss can be approximately decomposed\(^2\) into three terms: (i) the welfare cost (or gain) of the deterministic transition from the initial deterministic steady-state to the final one, (ii) the welfare cost (or gain) of being at the terminal deterministic steady-state rather than at the initial one, once the transition is done, (iii) the extra cost of fluctuations around the deterministic transition path and the terminal steady-state.

This decomposition, and the business cycle effects of changing the value of \( \tau \) from \( \tau^* \) to some point of the interval \([2\tau^*, 0]\) are presented in Fig. 1.

---

**Table 1**

<table>
<thead>
<tr>
<th>Parameters value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \delta )</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>0.025</td>
</tr>
</tbody>
</table>

---

\(^1\)The model’s symmetric equilibrium conditions are log-linearized around the unique symmetrical steady state.

\(^2\)The algebra for such a decomposition is detailed in a technical appendix available from the authors.
Fig. 1. Numerical results.
We consider the middle of the $\tau$ interval (the competitive-equivalent case) as the benchmark one, so that the linear approximation stays valid for the all interval. Panel (iii) shows that subsidizing input is good from an output stabilization perspective: the standard deviation of the relative deviation of output is decreasing. This stabilization effect is the consequence of the decrease in the variability in worked hours (panel (iv)). This is explained by the increase in the steady state level of worked hours (panel (ii)). Given the preferences chosen ($\log(1 - h)$), the intertemporal elasticity of labor supply is decreasing in the level of $h$: as households supply more labor on average, they become more averse to worked hours fluctuations, and decrease their labor supply variability (see Gali (1994) for a similar result). The relative standard deviation of consumption is also slightly decreasing (panel (iv)), and we observe that the welfare cost of fluctuations is reduced when $\tau$ decreases (panel (vi)). Okun gaps are therefore reduced in that economy when one subsidizes inputs. This result needs not to be a general one, and is dependent on the utility function chosen. We already notice households were more averse to worked hours fluctuations when $h$ increased on average. This effect might well dominate the welfare gain associated to the decrease in the variability of worked hours. It does not with the standard log preferences we have chosen. Finally, let us notice that from a pure stabilization perspective, cyclical welfare losses and output fluctuations are still decreasing when one moves from $\tau^*$ to smaller value. We will see later that too much stabilization ($\tau < \tau^*$) will have an efficiency cost that off sets the stabilization gain.

Let us now turn to Harberger triangles. We can obviously see from panel (v) that starting from a steady state with $\tau = \tau^*$, total welfare, expressed as a percentage of permanent consumption when $\tau = \tau^*$, is decreasing whether $\tau$ is increased or decreased. Total welfare decomposition is presented on panel (vi), (vii) and (viii). Shifting from $\tau > \tau^*$ to $\tau^*$ is costly along the transition, since a higher capital steady state level has to be reached, implying a decrease in consumption and an increase in worked hours. But this cost is offset by the gain of reaching an undistorted steady state. Similarly, if it was possible to jump directly to a distorted steady state with $\tau < \tau^*$ (by an instantaneous (non-feasible) increase in capital), an economy with over-subsidized input will be preferred by agents, in terms of steady-state welfare (panel (viii)). This result shows the importance of taking into account the transition to evaluate the effect of an economic reform. When one takes into account the cost of the transition (panel (vii)), it is the equilibrium with $\tau = \tau^*$ that is preferred (panel (v)).

Our results suggest that most of the models of the literature are metaphorically somewhere on the left side of $\tau^*$: stabilizing output (panel (iii)) and reducing the welfare cost of fluctuations (panel (vi)) is achieved by a move towards the left, that strictly decreases total welfare (panel (v)): the tradeoff is observed. But in an economy that is on the right side of $\tau^*$, both stabilization and welfare improvement are achieved by a move to the left.

**Acknowledgements**

We thank J.P. Benassy, F. Collard, R. Cooper, P. Fève, PY. Hénin and an anonymous referee for comments.

---

1We measure here the standard deviation of output relative to the steady state level associated to the corresponding value of $\tau$. Nevertheless, the absolute level of output standard deviation is increasing, the decrease in the relative level (panel (iii)) being offset by an increase in the steady state level of output (panel (i)).

2Let us recall that with $\tau = \tau^*$, one replicates the first best allocation.
References