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Abstract

Contrary to conventional wisdom, higher minimum wages may lead to greater levels of employment under perfect competition. We demonstrate this possibility in a simple general-equilibrium model with two goods produced by two factors and consumed by two representative households. Within our model, hiking a minimum wage redistributes income between heterogeneous consumers. This redistribution may create an excess demand for the labor-intensive good, and hence increase employment to restore equilibrium, despite the fact that every firm becomes less labor intensive.

JEL Classification Codes: J38, J64, F16, F11

Key Words: Minimum Wage; Employment; Unemployment; Marshall-Lerner Condition

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1. Introduction

As we show within a simple general-equilibrium model of perfect competition, higher minimum wages may paradoxically lead to greater levels of employment. Such a paradox has previously been associated with departures from perfectly competitive behavior. For example, the pioneering article by Stigler (1946) includes a monopsonist in the labor market, Manning (1995) has firms setting wages to affect effort, and Flinn (2006) considers wage bargaining with search-and-matching frictions. In contrast to these studies, the present paper assumes that firms take wages as given, in the way usually associated with perfect competition.

Intuitively, a hike in the minimum wage has two effects. First, each firm reduces its labor intensity. Second, income is redistributed between heterogeneous individuals, possibly increasing the relative demand for the labor-intensive good. If this second (demand-side) effect outweighs the first (supply-side) effect, the resulting excess demand for the labor-intensive good requires an increase in employment to restore equilibrium. While the standard partial-equilibrium treatment of minimum-wage hikes focuses only on the supply-side effect, our general-equilibrium approach demonstrates the importance of including also the demand-side effect.

A similar intuition is suggested by Brecher and Gross (2014) in a representative-consumer framework with optimal saving and endogenous growth. However, the present analysis uses a much simpler static model, while adding a second household with different preferences.

Our proofs are straightforward, because they liberally invoke a number of well-known theorems in the theory of international trade. For this reason, we start by adopting a standard open-economy framework in section 2. However, as section 3 explains, this framework and its

implications can be easily reinterpreted as applying to a closed economy, under some innocuous restrictions. The concluding Section 4 summarizes our main contribution.

2. Open Economy

Consider a large open economy that uses capital and labor to produce goods 1 and 2 under constant returns to scale, with production functions that are strictly quasi-concave and satisfy the Inada conditions. Each input is perfectly mobile domestically, but completely immobile internationally. The first good uses a higher capital/labor ratio than the second at any common set of wage and rental rates (for labor and capital, respectively). Firms maximize profits, and production remains diversified. Consumers maximize utility, and their preferences can be represented by a well-behaved set of community indifference curves. Perfect competition prevails.

For any given amounts of capital and labor used in the country as a whole, we can follow Kemp (1969, pp. 61-62) to derive functions $Z_1(p)$ and $Z_2(1/p)$ that denote the economy's excess demands for goods 1 and 2, whose relative prices are p and $1/p$, respectively. As he shows, there exists a $\tilde{p}$ such that $Z_1(p) \begin{matrix} > \\ = \\ < \end{matrix} 0 \begin{matrix} > \\ = \\ < \end{matrix} Z_2(1/p)$ as $p \begin{matrix} < \\ = \\ > \end{matrix} \tilde{p}$. Thus, $\tilde{p}$ is the equilibrium value of p when the country is in a state of autarky.

This home country trades goods (but not factors) freely with a foreign country, which has excess demands $Z_1^*(p^*)$ and $Z_2^*(1/p^*)$ as well as autarkic price ratio $\tilde{p}^*$, where asterisks indicate foreign counterparts of home symbols. For the sake of concreteness, suppose that $\tilde{p}^* < \tilde{p}$, indicating that the foreign (home) country has a comparative advantage in the first (second) good. In free trade, $\tilde{p}^* < p^* = p < \tilde{p}$, and world markets are in equilibrium when $Z_1(p) + Z_1^*(p) = 0$ (implying that $Z_2 + Z_2^* = 0$ by Walras' Law).

Such an equilibrium is stable in the Walrasian sense if and only if $d(Z_1 + Z_1^*)/dp < 0$, so that a rise in the relative price of good 1 causes this good to have an excess world supply, which pushes the price back down to its initial level. Since the home country imports good 1 and exports good 2 (in accordance with comparative advantage), the necessary and sufficient condition for stability is the well-known Marshall-Lerner condition that $e_1 + e_2^* > 1$; where $e_1 \equiv -(\partial Z_1 / \partial p)\, p / Z_1$ and $e_2^* \equiv -[\partial Z_2^* / \partial (1/p)](1/p)/Z_2^*$, which denote the price elasticities of import demand at home and abroad, respectively.

For given factor-use totals in each country, the ZZ curve in Figure 1 shows the relationship between p and $Z_1 + Z_1^*$, which represents the world excess demand for good 1. (Where this sum is negative, the world has a positive excess supply of the first good.) The lower (upper) tail of this curve lies entirely to the right (left) of the vertical axis, because Z_1 and Z_1^* are both greater (less) than zero for all values of $p < \tilde{p}^* < \tilde{p}$ ($p > \tilde{p} > \tilde{p}^*$). In the case illustrated, there are three possible equilibria, given by points A, B and C. Clearly, points A and C are stable equilibria, whereas point B is unstable.

Although simplicity of exposition is commonly assured by assuming that equilibrium is unique and hence stable, Bahmani, Harvey and Hegerty (2013) argue that there is no compelling empirical evidence in support of the Marshall-Lerner condition for stability. Moreover, this condition may fail to hold if the marginal propensity to consume each good is higher for the exporting country than for the importing one, in accordance with the analysis of Johnson (1956).

Corresponding to each of the three equilibria in Figure 1, there is not only a unique value of p but also a corresponding value of w, which denotes the home country's real wage in terms of good 2. This fact follows immediately from Samuelson's (1949) one-to-one correspondence

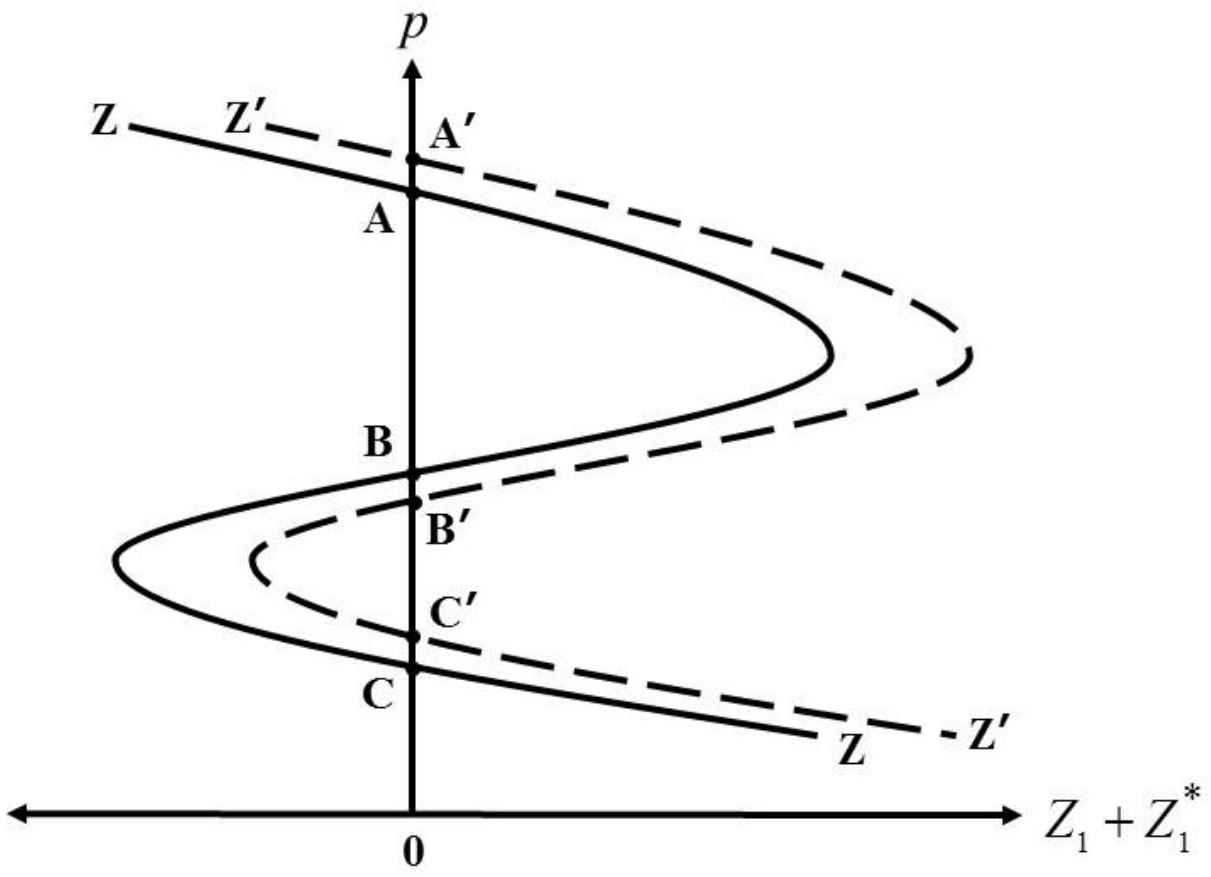

Figure 1

between product prices and factor returns. Furthermore, since good 2 is relatively intensive in labor, w successively rises with $1/p$ as we go from point A to B to C, according to the Stolper-Samuelson (1941) Theorem.

Now consider an arbitrary increase in total employment of labor in the home country. This increase raises the value of Z_1 at each p, as Kemp (1969, pp. 104-111) shows using the Rybczynski (1955) Theorem, under the assumption that good 1 is normal. Consequently, the ZZ curve in Figure 1 shifts rightward to become Z′Z′—thereby shifting equilibrium points A, B and C to A′, B′ and C′, respectively. Corresponding to these six equilibria are the same-lettered points in Figure 2, where L denotes home employment. By continuously increasing and decreasing L, we trace out the rest of the DD schedule in Figure 2. This schedule, with its

reverse-S shape, can be described as a “backward-bending” labor-demand curve of the general-equilibrium (versus Marshallian) type.

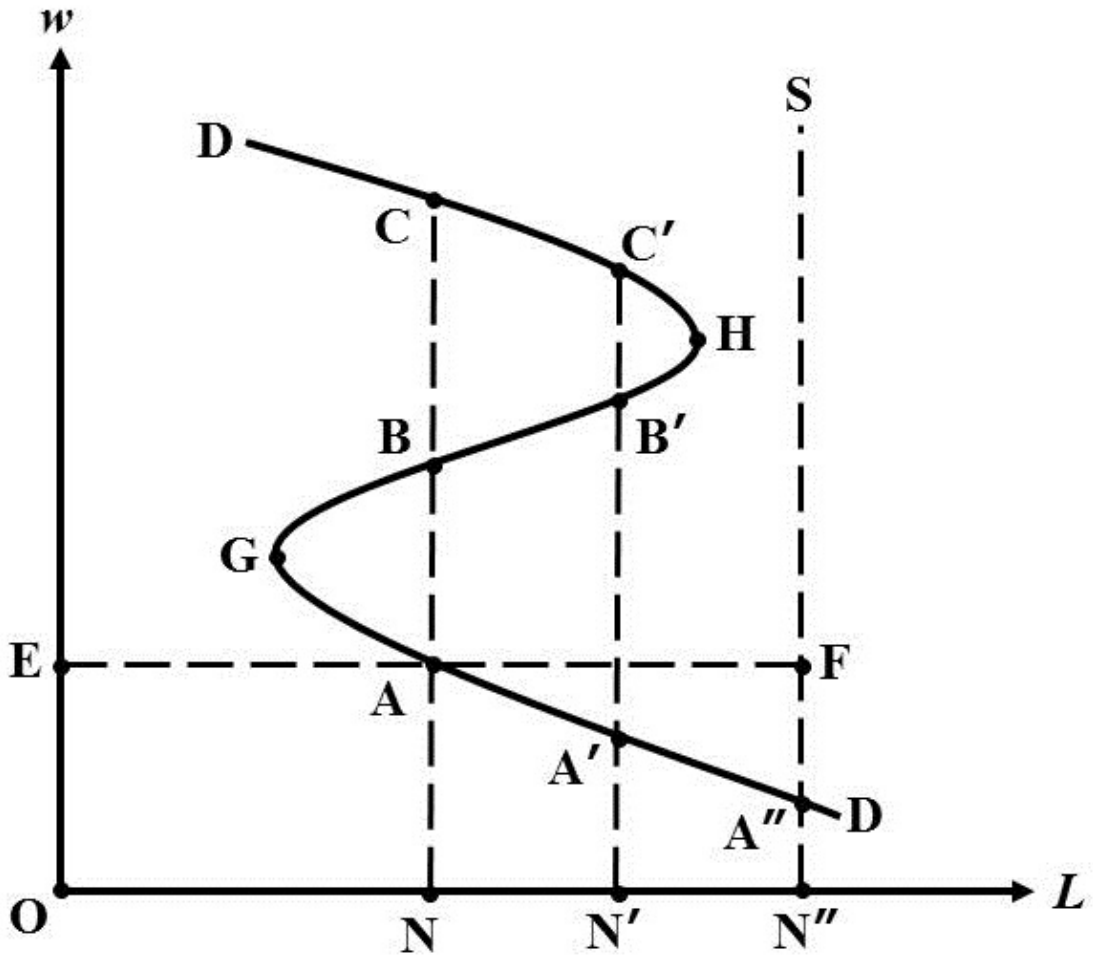

Figure 2

First suppose that the real wage is perfectly flexible. In this case, home labor remains fully employed at its fixed endowment level, represented by point N″ in Figure 2 . Thus, there is a unique equilibrium at point A″, where the demand curve DD intersects the vertical supply curve SN″.

Next, impose a minimum wage, represented by point E in Figure 2. The supply curve for labor then becomes OEFS, which intersects the demand curve at point A, the new equilibrium. Thus, total employment falls from point N″ to N. Further increases in the real wage lead first to

additional declines in employment along the demand curve (until point G), but then to increases (until point H), and eventually to more decreases. Note that even on the backward-bending portion of the demand curve for labor, the minimum-wage equilibrium is unique and stable, in accordance with Brecher's (1974) offer-curve analysis. Thus, although imposing a (binding) minimum-wage constraint creates unemployment, tightening this constraint may paradoxically restore some of the lost jobs. Notably, this paradox does not rely on any type of departure from perfect competition.

3. Closed Economy

The above analysis can be easily reinterpreted as applying to a single country in the absence of international trade. For this reinterpretation, assume no international differences in technology. Also assume that the foreign country is endowed with capital and skilled labor, of which each unit is a perfect substitute for α units of home (unskilled) labor, where $\alpha > 1$. Thus, by Samuelson's (1949) factor-price equalization theorem, the equilibrium wage of skilled (foreign) labor is αw, and both countries have the same rental rate of capital.

Now let the two countries merge into a single closed economy. This merger has no impact on the equilibrium value of any variable, by Mundell's (1957) reasoning. (Skilled labor remains fully employed, because it is not subject to the minimum wage.) Thus, our above analysis in Figures 1 and 2 is unchanged. Specifically, hiking the minimum wage may increase the employment of (unskilled) labor.

There are other ways to obtain this result in a closed economy, without introducing skilled labor. For example, we could assume that one representative household supplies only labor, while the other (with different tastes) owns all of the capital, as discussed by Johnson (1959) and Kenen (1959) for the flexible-wage full-employment case. Alternatively, each household could

be assumed to supply both labor and capital, and have an unemployment rate equal to the economy's average. Under either of these two alternative sets of assumptions, our analysis in Figures 1 and 2 would remain qualitatively unchanged.

4. Conclusion

As this paper shows, hiking the minimum wage can paradoxically lead to gains in employment under perfect competition, if the demand-side (income-redistribution) effect outweighs the supply-side (labor-substitution) effect. Within our general-equilibrium model, this outcome is possible because of a factor-intensity difference between industries and a taste difference between consumers. Based on these plausible differences, the present paradox is a theoretically interesting possibility. It is also in consonance with controversial empirical findings of Card and Krueger (1995), who challenge the conventional partial-equilibrium presumption that minimum-wage hikes depress employment.

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