A note on the effect of market power in Ricardian economies

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Abstract

We argue that it is the number of agents using market power, rather than the use of market power itself, that may drive Ricardian economies into autarchy. As a consequence, the monopoly equilibrium outcome Pareto-dominates the oligopoly one. Thus, counter-intuitively, a non monotonic relationship between number of agents endowed with market power and economic efficiency may emerge.

Keywords: Comparative advantage, market power, efficiency.

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1 Introduction

The Ricardian principle of comparative advantage is a cornerstone of classical trade theory. Absent any impediment to trade, countries specialize in the production of the good for which they enjoy a comparative advantage. Consequently, competitive economies achieve productive efficiency and potential gains from trade are exploited.

Cordella and Gabszewicz (1997) -CG henceforth- pose the question about "whether, and the extent to which, the use of market power by economic agents on the world market would alter the prediction of the Ricardian theory" (p. 334). The answer they provide is positive: market power may drastically affect the Ricardian outcomes. Indeed, CG demonstrate that in a wide class of Ricardian economies where all of the agents are endowed with market power, autarchy is *the only* outcome to be expected. Their result is striking since their model is built to generate the largest incentives to trade.

This note complements the answer provided by CG, by analyzing the case in which all the market power is concentrated in a monopolist. We use Baldwin (1948) monopoly equilibrium concepts to argue that in the class of Ricardian economies identified by CG, monopoly equilibria always feature trade, whereas autarchy is never an outcome. Consequently, the monopoly equilibrium outcome Pareto-dominates the oligopoly one. Thus, we maintain that it is the

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number of agents using market power that may force Ricardian economies into autarchy, rather than the use of market power itself. Stated differently, *the distribution of market power influences the development of trade*. In our example, when market power is concentrated in one agent, the equilibrium outcome is more efficient than when it is evenly distributed among (few) agents. This observation suggests that there may exist a non-monotonic relationship between the number of agents holding market power and economic efficiency.[1]

In the following, Section 2 presents the basic example, Section 3 discusses some generalizations and concludes.

2 Model and Equilibrium

2.1 The Model

Consider two countries, with one agent in each. Each agent is endowed with one unit of labor, label agents M and C. There are two consumption goods, 1 and 2, produced out of labor. Technologies are linear, the production frontier for agent i is defined as $\left\{\frac{y^i}{a_1^i}, \frac{(1-y^i)}{a_2^i} | y^i \in [0,1]\right\} \in \mathbb{R}_+^2$, where a_l^i is the labor input used by agent $i \in \{M, C\}$ to produce one unit of good $l \in \{1, 2\}$, and y_l^i is the quantity of labor agent i assigns to the production that good. Like CG, we assume:

(1) Agent M has a comparative advantage in the production of good 1: $\frac{a_1^M}{a_2^M} < \frac{a_1^C}{a_2^C}$.

(2) Agent M has an absolute advantage in the production of good 1 and agent C in the production of good 2: $0 < a_1^M < a_1^C$ and $0 < a_2^C < a_2^M$.

(3) Each agent is only interested in the good for which he has a comparative *disadvantage*: $U^M(x_1, x_2) = x_2$, $U^C(x_1, x_2) = x_1$, where $U^i(\cdot)$ is the utility function of agent i, and x_l is the quantity of good l consumed.

Assumptions (1)-(3) guarantee the greatest incentives to trade. Indeed, at the unique competitive equilibrium of this model, each agent completely specializes according to comparative advantage, and the amounts produced are fully exchanged at the relative prices $\frac{p_1^*}{p_2^*} = \frac{a_1^M}{a_2^C}$. This results in the competitive utility levels $U^M(\cdot) = \frac{1}{a_2^C}$ and $U^C(\cdot) = \frac{1}{a_1^M}$, see Figure 1(a).

The only *oligopoly equilibrium* (CG, p. 338) of this example is autarchic.[2] Each agent produces for self-consumption the good in which it has a comparative *disadvantage* only, and the potential gains from trade are unexploited (Figure 1(b)). The intuition is as follows. For any quantity of good 1 offered by the M-agent, the C-agent has a strategic incentive to increase its utility by reducing the supply of good 2 and therefore increase the consumption of good 1. Symmetrically, the same holds for the M-agent.[3]

[1] Section 3 briefly discusses this result with respect to the "quasi-anticompetitiveness" property (the rise in the equilibrium price and thus the decrease in economic efficiency following the increase in the number of competitors) of Cournot markets.

[2] If both agents are endowed with market power, then the allocation of labor between the production of two commodities ($y^i, i = M, C$) is a *strategic* variable for them. For any pair $(y^M, y^C) \in [0,1]^2$ the *indirect utility* of agent i, $V^i(y^M, y^C)$, may be defined. An *oligopoly equilibrium* is, thus, a Nash equilibrium of the game that has $V^i(y^M, y^C)$ as payoff function for agent i. See CG (p.335-338) for more details.

[3] This result is a special case of CG's Proposition 2, p. 343.

2.2 Monopoly equilibrium

Baldwin (1948) analyzes the trade equilibrium conditions of a two-agent economy in the cases of (i) "monopoly", (ii) "discriminating monopoly" and (iii) "pure competition". [4] We apply concepts $(i)-(ii)$ to our model to find its monopoly equilibria.[5] To avoid confusion with the general concept of monopoly equilibrium we refer to Baldwin (1948) "monopoly" as "pure monopoly". In the rest of the paper let agent M be the monopolist.

2.2.1 (i) Pure Monopoly

The "pure monopolist" (p-monopolist, henceforth) sets a price vector, $[\bar{p}_1, \bar{p}_2] \in \mathbb{R}^2_+$, or, equivalently, relative prices $\frac{\bar{p}_1}{\bar{p}_2} \equiv \bar{p}$, and agent C reacts to them according to utility maximization. Three cases may occur.

(a) For all $\bar{p} > \frac{a_1^C}{a_2^C}$, the competitive agent fully specializes in the production of good 1, and demands the same quantity of good 1 for consumption.

(b) For $\bar{p} = \frac{a_1^C}{a_2^C}$, the competitive agent is indifferent among producing any plan on its frontier, and demands a quantity $\frac{1}{a_1^C}$ of good 1.

(c) For all $\bar{p} < \frac{a_1^C}{a_2^C}$, the competitive agent fully specializes in the production of good 2 and demands a quantity $\frac{\bar{p}}{a_2^C} > \frac{1}{a_1^C}$ of good 1.

The p-monopolist sets $\bar{p}$ to obtain the highest possible quantity of good 2 in exchange for the least quantity of good 1. Thus all relative prices of case (c) are not an optimal choice, because for all these prices agent C offers the same quantity of good 2, in exchange for a quantity of good 1 which is the larger the lower $\bar{p}$ is. Similarly, all relative prices of case (b) are excluded, since at all these prices agent C does not produce good 2. The p-monopolist is left with the option to set $\bar{p} = \frac{a_1^C}{a_2^C} \equiv \bar{p}^*$ only. This is its optimal choice, indeed, at $\bar{p}^*$, agent C is indifferent among all production plans on its production frontier, and demands $\frac{1}{a_1^C}$ units of good 1 for consumption. Thus, the p-monopolist maximizes its utility by allocating a quantity of labor $\bar{y}^M = \frac{a_1^M}{a_1^C}$ to the production of good 1, so as to meet the demand of agent C at $\bar{p}^*$ and obtain in exchange from this agent its full production of good 2. The p-monopolist, is left with $1 - \frac{a_1^M}{a_1^C}$ units of labor to produce good 2 for self-consumption, yielding to a quantity $\frac{a_1^M}{a_1^c a_2^M}$. Any other labor allocation for the p-monopolist is not optimal, since either it reduces the quantity of good 2 for self consumption, without increasing the quantity of good 2 obtained from agent C (if $y^M > \bar{y}^M$), or it cannot buy all of the good 2 produced by agent C at $\bar{p}^*$. The utility reached by the p-monopolist is $U^{M*} = \frac{1}{a_2^C} + \frac{a_1^M}{a_1^C a_2^M}$, which is larger than the autarchic one, while agent C enjoys its autarchic utility. This excludes the possibility that the p-monopolist chooses not to trade. Thus, the only pure monopoly equilibrium of this model features trade.

2.2.2 (ii) Discriminating Monopoly

A discriminating monopolist (d-monopolist henceforth) "[makes] an all-or-none offer, and the other country, [...], reacts in the best way to the given amounts and prices" (Baldwin, 1948,

[4]Other analyses of monopolized Ricardian economies include Sweeney (1974) and Rieber (1982).

[5]In our case, these concepts lead to the same equilibrium outcome, but this needs not to hold in general, see Baldwin (1948).

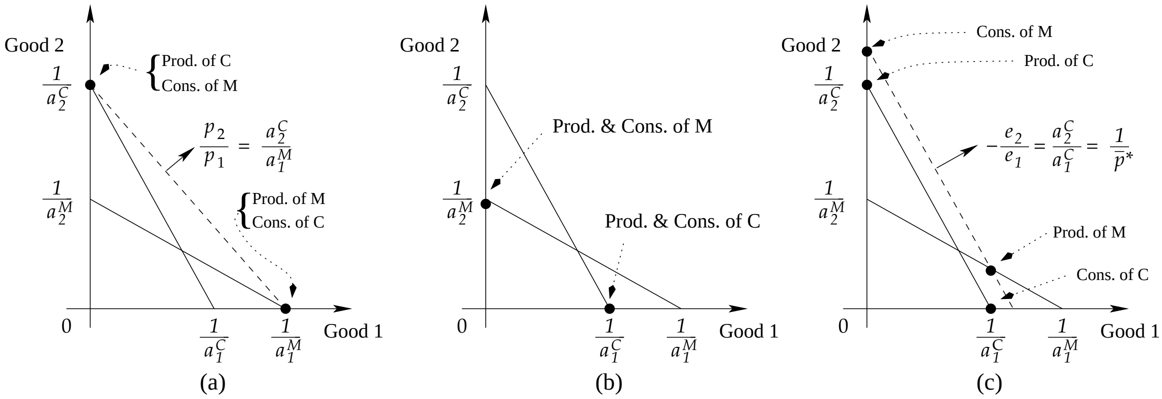

Figure 1: Competitive (a), Autarchic/Oligopoly (b), Monopoly (c) equilibria.

p. 756). Let $E = [e_1, e_2] \in \mathbb{R}^2$ be the *exchange vector* proposed by the d-monopolist to the C-agent. Its elements are the quantities the d-monopolist demands to agent C, negative values represent a quantity offered. The d-monopolist seeks to obtain the largest amount of good 2 in exchange for the least quantity of good 1 that makes agent C accept the deal. This quantity is $\frac{1}{a_1^C}$, the autarchic consumption by the C-agent. Any lower quantity of good 1 in exchange for good 2 would not make agent C willing to trade, whereas any larger quantity could be reduced and still allow to exchange. In return for this quantity, the d-monopolist can demand any combination of goods on the C-agent's production frontier. Thus, it will demand the quantity $\frac{1}{a_2^C}$ of good 2. Accordingly, the exchange vector proposed is $E^{DM} = [-\frac{1}{a_1^C}, \frac{1}{a_2^C}] \equiv E^{DM*}$, which is accepted by the C-agent. Like in the pure monopoly case, the d-monopolist is left with $1 - \frac{a_1^M}{a_1^C}$ units of labor for the production of good 2 for self consumption. The C-agent enjoys its autarchic utility level, while the d-monopolist reaches a utility level $U^{DM*} = \frac{1}{a_2^C} + \frac{a_1^M}{a_1^C a_2^M}$. No other exchange vector provides the d-monopolist with a utility level equal or larger, therefore at the only discriminating monopoly equilibrium of this model agents trade. Notice that E^{DM*} implicitly defines the terms of trade $(\frac{a_1^C}{a_2^C})$, which coincide with $\bar{p}^*$. Figure 1(c) depicts monopoly equilibria.

The autarchic outcome of strategic interaction follows from the failure of agents holding market power to coordinate their actions. Under monopoly, this coordination role is taken up by the monopolist, that acts as a self-interested Walrasian auctioneer.

3 Discussion and Conclusion

Both monopoly equilibrium concepts applied to our example point to the same result. When market power is concentrated in one agent only, trade always characterizes equilibrium, while autarchy never does. This result can be generalized. First, imagine that the distribution of comparative advantages is the same as in this paper, but agent C (agent M) enjoys absolute advantages in the production of both goods. Agent M still proposes an exchange with relative (explicit or implicit) prices equal to the slope of the C-agent's production frontier. Agent M (agent C) then fully specializes according to comparative advantage, whereas agent C (agent

M) specializes only partially. Second, assume that the monopolist faces a competitive fringe of identical agents. In this case, it still exploits its market power to govern the allocation of resources. The volume of trade depends on the production possibilities of the monopolist relative to that of the fringe. If the monopolist enjoys an absolute production advantage *with respect to the whole fringe* it manipulates the terms of trade to induce the competitive fringe to specialize according to comparative advantage, and buy all of its production of good 2. By contrast, if the monopolist's production possibilities do not allow for absorbing all the production of the competitive fringe, the monopolist may decide to trade with a fraction of it only, or to trade with all C-agents, but in such a way to induce an individual partial specialization. In any case, specialization according comparative advantage, either partial or total, occurs at equilibrium.

Further, notice that the monopoly equilibrium outcome is Pareto-efficient, since the M-agent's utility level is larger than the competitive one. Thus, to concentrate all the market power in one agent restores Pareto efficiency with respect to the situation where market power is uniformly distributed among (few) agents. This proves that Ricardian economies may not display a monotonic relation between the number of agents endowed with market power and economic efficiency.

Finally, this note connects the partial-equilibrium literature on entry in Cournot markets (see Amir and Lambson 2000 and the references therein contained) and that on general-equilibrium Ricardian trade. In particular, the outcome that the equilibrium price in Cournot markets may increase with the number of competing firms, leading to a decrease in the industry's efficiency, is known as "quasi-anticompetitiveness", and depends on the relative shapes of the market demand and of the individual cost functions. Our example shows that Ricardian economies may be "quasi-anticompetitive", but this phenomenon originates from the potential loss of coordination among agents when moving from a situation where market power is concentrated to one where it is evenly distributed.

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