

Dual track liberalization: With and without losers*

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Abstract

Dual track liberalization, relying upon the continued enforcement of existing contracts and the simultaneous creation of a free market sector, represents a powerful mechanism in economic reform. If not anticipated, the reform implements an outcome that is both Pareto improving and efficiency enhancing as compared to the status quo. We show that when the reform is anticipated, *intertemporal arbitrage* arises potentially undermining these properties. Only when the original policy involves both price setting and quantity restrictions can anticipated dual track liberalization maintain its attractiveness. These conditions correspond well to the circumstances faced by transition economies. JEL classification: P2, F1

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1 Introduction

The widespread failure to adopt socially beneficial economic reforms can often be explained by the distributional effects of the new policy. More specifically, the existence of a powerful group of *ex-ante* identifiable losers represents a formidable obstacle to economic liberalization.¹ Explicitly compensating the victims of the reform might well be then the only way to guarantee widespread support. Unfortunately, it is difficult to identify, both in practice and in theory, a mechanism that can achieve these results without requiring the government to have a detailed knowledge of the fundamentals of the economy. In two recent papers Lau, Qian, and Roland (1997), (2000) have shown how the simple dual-track mechanism implemented in the Chinese economic reform served both the purpose of achieving a Pareto improvement, as well as that of attaining an efficient resource allocation.

The dual-track approach allows two regimes to coexist after a reform has been introduced. First, it requires the government to enforce the contractual agreements in place prior to the reform, so that transactions can continue to be executed at the original prices. Second, it allows a new, liberalized sector to emerge, in which exchanges take place in a deregulated market. The enforceability of preexisting contractual agreements ensures that none will be worse off, while the possibility to engage in arbitrage activities, as Lau, Qian, and Roland (2000) intriguingly demonstrate, can help the economy to attain the first best allocation of resources.

Limiting the government role to guarantee the enforcement of already existing contracts, dual-track liberalization represents a very promising approach to successfully implement an efficiency-enhancing reform, that does not involve the creation of victims. Indeed, this approach has been widely regarded as a major catalyst for China's remarkable economic performance in recent decades (Li (1999)). Given its theoretical appeal and its proven

¹Fernandez and Rodrik (1991) and Alesina and Drazen (1991) suggest possible explanations of the delay in implementing reforms, while Dewatripont and Roland (1992a 1992b, 1995) discuss mechanisms that can be used to overcome the resistance to the introduction of a reform.

record of success, it is natural to ask whether this mechanism can be successfully applied to other economies involved in the liberalization process. Under what circumstances is dual track liberalization more likely to achieve the consensus needed for the implementation of a reform? Are there situations in which the use of such a mechanism should not be recommended to a policy maker? These are the questions that motivate this paper.

To address these issues, we extend the analysis of Lau, Qian, and Roland (2000) in several directions. First, while they considered only the liberalization of transactions that were originally carried out between the private sector and the government, in this paper we generalize the pre-reform environment, to include exchanges carried out between private parties, with the possibility of a government intervention. In particular, since the transition process involves the opening up to the market system both domestically and internationally, we extend the analysis of Lau, Qian, and Roland (1997) and (2000) by considering also the effects of removing distortions to international trade. In doing so, we are able to study the effectiveness of the dual track approach to liberalize a regulated market economy, and not just a centrally planned one. Secondly, we recognize that political support for a reform needs to be built even before its implementation. In other words, the design of a reform has to take into account that policies aimed at achieving a Pareto improvement and at building popular support for the liberalization process are in most circumstances rationally anticipated by the private sector. The central issue then becomes whether *anticipated* dual track liberalization can retain the appealing features of being both efficiency-enhancing and Pareto-improving from a dynamic perspective. As it turns out, this is not always going to be the case, and we will identify the institutional settings in which the mechanism is likely to maintain its appealing characteristics. In doing so, we hope to provide useful suggestions concerning the applicability of this mechanism.

Hence, our paper provides a theoretical framework for the welfare analysis of reform mechanisms in a dynamic setting, in which private agents rationally anticipate a future reform. By considering the removal of a broad set of government interventions, the scope for

application of our framework is vast. We show that the introduction of expectations crucially affects the welfare properties of the dual track mechanism we analyze, and furthermore, we highlight how in a dynamic setting only reform packages that are aimed at simultaneously removing multiple distortions (i.e. both price and quantity controls) are likely to be both Pareto improving and efficiency enhancing.

The very nature of dual track reform implies the existence of two different transaction environments after the reform is implemented, one constrained by pre-existing contractual agreements, i.e. by the original distortionary government policies, and another completely free of state intervention. A key insight emerging from our analysis is that, when dual track liberalization is anticipated, the differences in the transaction environments create incentives for private agents to engage in *inter-temporal* arbitrage. Using a two-period model in which private agents anticipate in the first period a dual track liberalization in the second, we show that private agents will distort their first period behavior to exploit better transaction conditions after the reform. In some contexts, this distortion can exacerbate the efficiency loss generated by the existing government policy, making dual track liberalization less efficient than no liberalization at all. Furthermore, such distortion may also impact the transaction conditions prior to the reform, thus generating potential distributional consequences, that in turn may also create losers under the anticipated liberalization.

Only when the original government intervention is “highly pervasive”, i.e. it involves both price setting and quantity restrictions, and the reform simultaneously removes both distortions, can dual track liberalization retain the efficiency-enhancing and Pareto-improving properties. Price setting is necessary for a Pareto improvement to be achieved. Quantity intervention allows us to define conditions under which intertemporal arbitrage actually alleviates the first period distortion, thus making the reform efficiency enhancing. We therefore provide conditions under which the analysis of dual track reform by Lau, Qian, and Roland (1997), (2000) remains robust in a dynamic context.

Our research complements the work of Lau, Qian, and Roland (1997) and (2000). By

allowing the reform to be anticipated in a dynamic context, we take into account that a dual track reform is likely to be implemented as a gradual and evolving process, as in it was the case of China, where the issue has been the subject of heated discussions both in the academic and in the policy circles (Zhang (1985), Wu and Zhao (1987), Byrd (1991)). Our paper also helps further the understanding of the more general question of the design of economic reforms in transition economies. For instance, while Murphy, Shleifer, and Vishny (1992) have shown that for dual track reform to be efficiency enhancing, contractual enforcement is critical, our analysis demonstrates that enforcement is only a necessary condition for anticipated dual track liberalization to bring about both a Pareto-improving and efficiency enhancing outcome. What is also needed is that either the reform comes as a surprise or that it involves the simultaneous removal of multiple distortions.

The rest of the paper is organized as follows. Section 2 introduces the simple two-period supply and demand model used to carry out the analysis. We proceed by using backward induction. In section 3, we study the second period resource allocation after the dual track liberalization is implemented. We show that regardless of the nature of the original government policy, the resource allocation attains the first-best outcome in the second period. In section 4, we then examine the resource allocation in the first period under a set of different government policies, and compare the two-period outcomes under the anticipated reform with the status quo. We first consider (section 4.1) the case in which the original intervention involves only one dimension (either price or quantity), followed by the analysis of the simultaneous removal of multiple distortions (section 4.2). Section 5 concludes the analysis.

2 The Model

To introduce our analysis in the simplest possible framework, we follow Lau, Qian, and Roland (2000), and use a partial equilibrium setup, in which a continuum of buyers and producers each demand and supply one and only one unit of a commodity. All buyers

and producers are price-takers. In order to analyze the effects of anticipated dual track liberalization, we consider a two-period model. In the first period, the market is distorted by a government policy, that might involve direct price setting, quotas, taxes or subsidies. In the second period the government implements a reform aimed at removing this distortion. Buyers' preferences are time separable and invariant, and producers' costs remain constant over time. Both sets of agents have a discount factor δ , and the commodity is assumed to be perishable.

To minimize potential opposition, the government introduces a reform that implements a dual track liberalization in the second period. Two tracks, the regulated track and the market track, emerge as a result of such a reform. In the regulated track, private agents are assigned rights and obligations derived from the first period transactions, which were carried out under the original government policy. That is, if private agents made an exchange of a given quantity at a certain price in the first period, the very same transaction will be enforced in the second period. One way to think of this mechanism is that contracts are written between private parties involved in the transactions. These contracts record the identities of the parties, the quantity transacted, and the price. Dual track liberalization then requires these contracts to be enforceable in court in the second period. In addition, if the original government policy involved a transfer (i.e. a tax or a subsidy) to an agent in the first period, the same payment will be made in the second. Simultaneously, the reform calls for the establishment of a market track, where parties can exchange at the prevailing free market price, even to fulfill the obligations deriving from contracts written in the first period.

An appealing feature of the dual track liberalization mechanism is that it requires very little information on the part of the government. This characteristic differentiates it from the standard lump sum redistributions schemes, often invoked to implement a Pareto improving reform. Such schemes, while theoretically appealing, have proved impractical, requiring information on preferences and initial endowments of the agents that are difficult, if not

impossible for the government to obtain.² If dual track is used instead, only if the original government intervention involved a tax or a subsidy does the policy maker need to have any information at all on the private agents to carry out the liberalization. In this case, it needs to know the identities of the parties that were taxed or subsidized, and the amount it transferred in the first period, to reproduce the very same transfers after the liberalization. Otherwise, the content of the contract between the private parties has to be revealed only in court and in case of a dispute.

Key to our analysis is that private agents anticipate in the first period the implementation of the dual track reform in the second. As a result, the equilibrium resource allocation in the first period is determined not only by the original distortionary policy, but also by the second period reform. Therefore, when evaluating dual track liberalization, we need to consider its welfare implications over both periods. Specifically, we will compare the equilibrium allocation under dual track liberalization to the *status quo* (i.e., no liberalization outcome). We say that the reform is efficiency-enhancing or dominates from the point of view of social welfare the status quo if the total (discounted) surplus over the two periods is greater under the reform than under the status quo. Furthermore, dual track liberalization achieves a *Pareto improvement* over the status quo if the total (discounted) surplus of *each* private agent over the two periods is greater under dual track than under the status quo.

3 The Second Period Resource Allocation

We begin our analysis by solving for the equilibrium in the second period. In the second period, it is useful to distinguish between two sets of agents: those who have transacted in the first period and those who have not. Previously active agents must carry out their original transactions, as required by the dual track liberalization mechanism. However, they can do so through *intratemporal arbitrage*, i.e. by taking advantage of the existence of the market

²Hammond (1979) has actually shown that lump sum redistribution is incentive incompatible.

track *without actually producing or using the commodity*. Consider for instance buyers who were active before the reform was implemented. These agents will be better off reselling in the market track the commodities they acquired from the regulated track, rather than actually using them, if and only if their marginal willingness to pay is below the prevailing free-market price P^e . This implies that the overall quantity consumed in the two tracks will be derived from those buyers with a marginal willingness to pay larger than P^e . A similar argument can be made with respect to producers. That is, for a given P^e , the total quantity produced in the two tracks will be generated only by those producers with a marginal cost lower than P^e . This further implies that, in equilibrium, the free-market price must be at the level where the marginal cost equals the marginal willingness to pay, *independently of the original government policy*. We therefore conclude:

Lemma 1 *Regardless of the first period government policy, dual track liberalization attains the first best allocation in the second period. Moreover, the equilibrium price in the market track is the same as the competitive equilibrium price.*

Agents engaged in transaction before liberalization took place are entitled to continue to carry them out in the second period, and can do so by taking advantage of the newly established market track. Previously inactive agents can now voluntarily engage in new transactions. In addition, dual track liberalization requires the same transfer payments to be made between the government and the private agents in the second period. This implies that in the second period the scheme is Pareto improving as compared to the *status quo*.

4 The First Period Allocation, *Expectations* and Welfare

In our dynamic context, the first period allocation crucially depends on the assumptions made concerning private agents' expectations. Translating the static discussion of Lau, Qian, and

Roland (2000) to our dynamic framework, what sets our analysis apart is that while we allow for the reform to be anticipated, they consider the case in which the liberalization comes as a “surprise”. In that context, the first period outcome is not affected by the ensuing liberalization. Intratemporal arbitrage, as defined in the previous section, will then ensure that even from a dynamic perspective the reform is both efficiency enhancing and Pareto improving as compared to the status quo.

If the reform is anticipated, private agents may be induced to strategically modify their behavior in the first period in order to take advantage of new arbitrage opportunities. These opportunities arise because dual track liberalization creates two tracks in the second period, and agents who have engaged in transactions in the first period are entitled to exchange in the regulated track in the second. Since the prices prevailing in the two tracks may very well differ, agents are likely to be interested in taking advantage of such differences by modifying their first period behavior. To differentiate these arbitrage activities from those arising in the second period, we refer to them as *inter-temporal* arbitrage. Notice that intra-temporal arbitrage is not arbitrage between different prices, whereas inter-temporal arbitrage is. While intra-temporal arbitrage helps to create winners and restore efficiency, inter-temporal arbitrage may not, as we will show next.

In this section, we analyze the equilibrium resource allocation in the first period. By combining this with the equilibrium resource allocation in the second, we evaluate the question as to whether, from a dynamic perspective, *anticipated* dual track liberalization is efficiency enhancing and Pareto improving as compared to the status quo. As it turns out, the answer to this question depends crucially on whether the original government policy involves an intervention in a single dimension (i.e., price intervention or quantity intervention) or in dual dimensions (i.e., price-cum-quantity intervention).

4.1 Single Intervention

When the original policy involves either price or quantitative restrictions alone, we can show that the *anticipated* dual track liberalization can never be both efficiency enhancing and Pareto improving.

4.1.1 Price Intervention

We begin with price intervention. We consider a closed economy, in which the government intervention takes either the form of direct price setting or that of a subsidy.³

Consider first the case of price setting. Let P be price fixed by the government in the first period. Assume that this policy results in excessive demand or, in other words, that supply is binding. As it is illustrated in Figure 1, the second period free-market price P^e is then higher than P . In the first period, the quantity exchanged will be Q if agents do not anticipate future policy changes. This quantity falls short of the market-clearing quantity Q^e .

The difference between P and P^e implies that, if a supplier and a buyer enter an exchange in the first period, under dual track liberalization they will be locked into a lower price in the second. In contrast, they will be able to carry out transactions at a higher price in the second period if they do not exchange in the first. *Intertemporal arbitrage* will induce the first period supply to shrink, while demand will expand, as shown by S' and D' in Figure 1.⁴ By refusing to enter an exchange in the first period, a producer who would be supplying the Q^{th} unit of the commodity loses a net profit equal to $P - S^{-1}(Q)$ in the first period, but gains an amount $P^e - P$ in the second. On the other hand, a user who would be buying

³We do not analyze dual track liberalization when the original intervention is a tax. The removal of a tax will in fact necessarily decrease the price paid by the users, and increase the price received by suppliers in the second period, eliminating in this way the need for implementing a measure that is designed to compensate those agents that are negatively affected by the reform.

⁴Notice that, differently from S and D , the supply S' and the demand D' incorporate intertemporal arbitrage motives and therefore do not have the usual correspondence to the marginal utility and marginal cost.

in the first period under dual track liberalization, Q_1^d , is then given by:

$$Q_1^d = \min\{Q_{1S}^d, Q_{1D}^d\}$$

and naturally, $Q_1^d = Q_{1S}^d$ in this case as we have assumed the supply to be binding.

Since inter-temporal arbitrage causes supply to shrink in the first period, $Q_1^d < Q$. At the same time demand expands, and the reduction in the quantity exchanged must imply that additional users are rationed out. Without liberalization, these users would purchase the commodity at the price P in both periods. With liberalization, they are rationed out in the first period and will purchase the commodity at the price $P^e > P$ in the second. Thus even inter-temporally, these users must be worse-off as compared to the status quo. Dual track liberalization can therefore not be Pareto improving in the dynamic sense.

Notice also that, compared to the status quo, inter-temporal arbitrage induces an additional efficiency loss in the first period, as it exacerbates the shortage. However, this loss must be weighted against the efficiency gain achieved by dual track liberalization in the second period. We can then derive the following conclusion, which holds also for the case of binding demand:

Proposition 1 *Suppose that the government status quo policy is price setting. Then anticipated dual track liberalization is never Pareto improving. From the point of view of social welfare, it is dominated by the status quo if*

$$\delta(Q^e - Q) \leq Q - Q_1^d. \tag{3}$$

Proof. We only need to prove the efficiency result since we have already shown that anticipated dual track liberalization does not lead to a Pareto improvement. We focus on the case of binding supply, with the assistance of Figure 1. Notice that the efficiency loss in the first period is bounded below by $(D^{-1}(Q) - S^{-1}(Q))(Q - Q_1^d)$, whereas the efficiency gain in the second is bounded above by $(D^{-1}(Q) - S^{-1}(Q))(Q^e - Q)$. Therefore, the dual track is not

efficiency enhancing if $\delta(Q^e - Q) \leq Q - Q_1^d$.

QED.

Corollary 1 *Suppose that the government intervenes ex ante through price setting. Then anticipated dual track liberalization is always dominated by the status quo if demand and supply are linear.*

Proof. See Appendix.

When the government intervention takes the form of direct price setting, rationing emerges either because demand or supply are binding. As we have shown, the inter-temporal arbitrage resulting from the anticipation of dual track liberalization will exacerbate the problem, making a Pareto improvement impossible. It becomes then natural to question whether the scheme will be Pareto improving, if the government policy allows market clearing, as in the case of a subsidy.

Under this policy, the second period price prevailing in the market track is higher than the first-period price faced by users, and lower than that received by producers, as illustrated in Figure 2. As a result, the anticipation of the reform induces agents to strategically increase both supply and demand in the first period. This increase in transactions exacerbates the efficiency loss in the first period, shown in Figure 2 as $Q_1^d > Q$. Weighing this loss against the second period gain, we find a condition similar to the one described for the price setting case, under which the anticipated dual track liberalization is dominated by the status quo.

Proposition 2 *Suppose that the government's status quo intervention takes the form of a subsidy. Then*

a.) *Anticipated dual track liberalization is dominated by the status quo if condition (3) holds*

b.) *It is not Pareto improving unless for a given Q and P^e , there exists a corresponding Q_1^d that simultaneously solves the following two equations:*

$$\delta S^{-1}(Q^e) + S^{-1}(Q_1^d) = (1 + \delta)S^{-1}(Q), \quad (4)$$

$$\delta D^{-1}(Q^e) + D^{-1}(Q_1^d) = (1 + \delta)D^{-1}(Q). \quad (5)$$

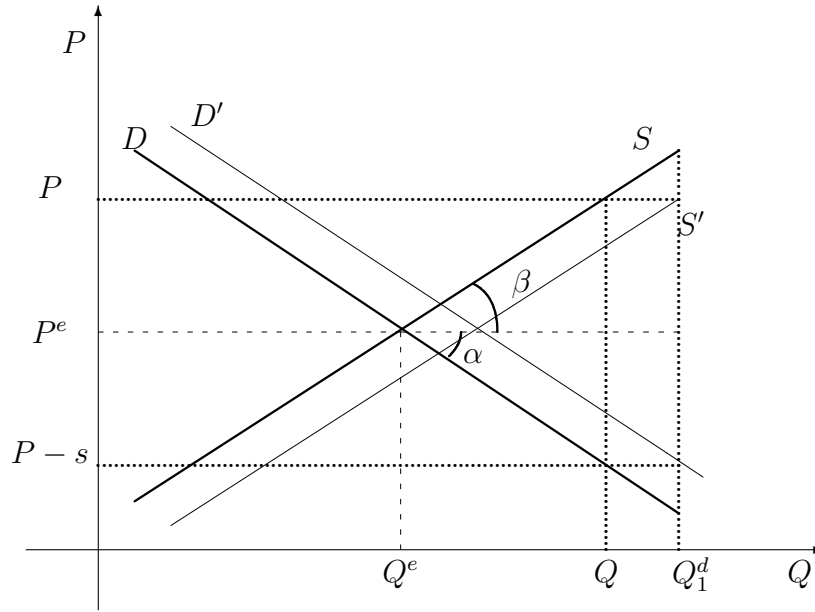


Figure 2: Subsidy

Proof. See Appendix.

According to our result, all agents (excluding of course the government) will be at least as well off under anticipated dual track liberalization as under the status quo if and only if Q_1^d satisfies both equation (4) and (5). Since a system of two equations in one unknown does not admit in general a solution, this proposition suggests that only in rare occasions will the first period price remain unchanged under anticipated dual track liberalization. Mathematically, these situations arise when one of the two equations (4) and (5) is redundant. Economically, this translates in either the demand and supply being linear, or the supply being perfectly elastic at least on the segment between Q_1^d and Q^e .

Corollary 2 *Suppose that the government's ex ante intervention takes the form of a subsidy. Anticipated dual track liberalization makes all agents at least as well off as without liberalization when one of the following two conditions holds:*

a.) *demand and supply are both linear*

b.) either demand or supply is infinitely elastic at least for the segment between Q_1^d and Q^e .

Proof. See Appendix.

The intuition behind Proposition 2 and Corollary 2 can be applied to the case of a small open economy, where either the supply or demand will be infinitely elastic, and similar results can be obtained. Indeed, in the context of our analysis, the only difference between a closed economy and a small open economy is that in the former the government intervention applies to all producers (buyers), while in the latter the intervention is only concerned with foreign producers (buyers).

4.1.2 Quantity Intervention

Let us now turn to quantity interventions. Without loss of generality, consider the introduction of a binding quota. In this case, the first period status-quo price, P , is higher than the second period free-market price P^e , as illustrated in Figure 3. Strategic responses from both buyers and sellers cause the first period supply to increase from S to S' and the first period demand to decrease from D to D' . Consequently, the first period equilibrium price P_1^d is bound to be less than P , and therefore some producers will be worse off.

Notice that as it is illustrated in Figure 3 the increase in supply is symmetric to the decrease in demand, and the quantity exchanged in the first period remains constant despite the inter-temporal arbitrage efforts.⁵ In other words, the distortion-enhancing effect of *in-*

⁵To show that indeed the quantity transacted in the first period does not change as a result of dual track liberalization, we argue that Q_1^d cannot fall short of Q . Suppose this is not the case, i.e. suppose that $Q_1^d < Q$. P_1^d must then clear the market in the first period when the dual track liberalization is anticipated, implying that

$$S'^{-1}(Q_1^d) = D'^{-1}(Q_1^d) \tag{6}$$

Intertemporal arbitrage implies that

$$\begin{aligned} S^{-1}(Q_1^d) - S'^{-1}(Q_1^d) &= \delta(S'^{-1}(Q_1^d) - P^e); \\ D^{-1}(Q_1^d) - D'^{-1}(Q_1^d) &= \delta(D'^{-1}(Q_1^d) - P^e). \end{aligned}$$

and using equation 6 we have $S^{-1}(Q_1^d) = D^{-1}(Q_1^d)$. In other words, Q_1^d is the market clearing quantity under the status quo as well. Given the assumption that $Q_1^d < Q_1$, the first period quota cannot be binding and we have a contradiction.

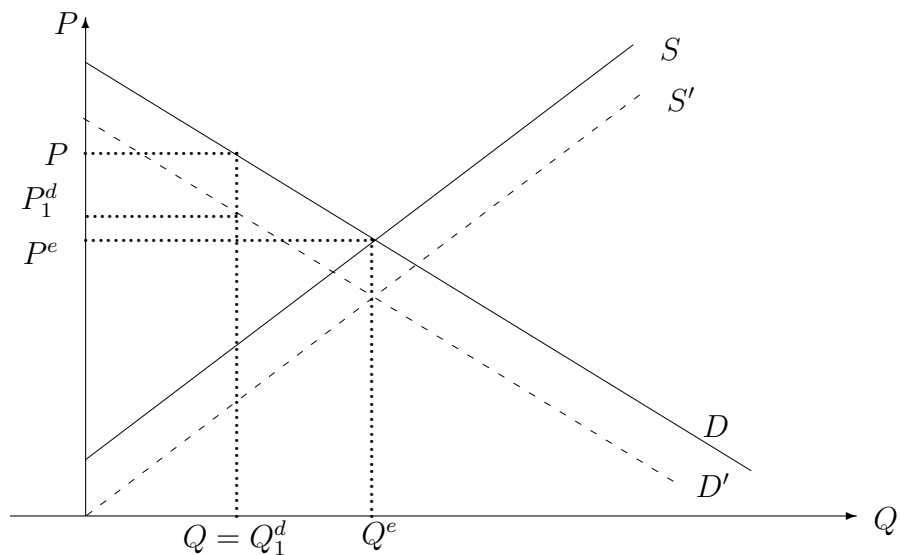


Figure 3: Quota

tertemporal arbitrage we have highlighted in the case of a price intervention, does not exist in this case, and anticipated dual track liberalization is efficiency enhancing as compared to the status quo.

The next proposition summarizes our discussion.

Proposition 3 *Suppose that the status quo government intervention takes the form of a binding quota. Then the anticipated dual track liberalization is efficiency-enhancing. However, some agents will be worse-off under the anticipated liberalization than under the status quo.*

This result highlights that also when the initial government's policy involves a quantitative restriction, the dual-track mechanism is not successful in ensuring the necessary consensus for the reform. As in the case of a tax/subsidy, our discussion of the removal of a quota by means of a dual track mechanism can be directly extended to a small open economy in which foreign imports are constrained, by assuming a portion of the supply to be perfectly elastic.

4.2 Dual Intervention

The analysis we have outlined up to this point has identified a set of circumstances in which dual-track liberalization does not represent an effective tool in the hands of a policy maker interested in market oriented reforms. In these circumstances the mechanism fails either to retain its efficiency enhancing nature, or its Pareto improving characteristic when liberalization is anticipated.

However, in all the cases we have considered so far, the *status quo* government policy involves a single intervention, taking either the format of a quantity restriction, or that of a price distortion. A natural question is then whether dual track liberalization can be both Pareto-improving and efficiency-enhancing when the original government policy involves both quantity and price interventions. This is a particularly relevant issue since heavy government interventions in both dimensions have characterized many transition and developing economies prior to market liberalization. This has been true both in product and factor markets. For instance, in centrally planned economies like China or the Soviet Union the labor market saw the planning authority allocating workers to specific production units, as well as fixing their wage rates. At the same time, many poor countries followed import substitution development strategies, involving the exclusion of foreign competitors on the one hand and the introduction of price-distortionary measures like taxes, subsidies, price ceilings etc. on the other.

To address this question, we consider next a case where the government of a small economy forecloses its market to foreign competition, while at the same time introducing taxes/subsidies or direct price interventions. Later we will present in a more general setting the conditions under which anticipated dual track liberalization is an effective reform mechanism, i.e. it achieves an efficiency-enhancing as well as Pareto-improving outcome.

4.2.1 Domestic *cum* trade liberalization

In the first case we consider, dual track liberalization removes a government's distortionary tax (subsidy) while at the same time opening a small closed economy to international trade. As before, let P and $P - t$ respectively be the price paid by a user and received by a supplier in the status quo, i.e. in the presence of a tax under autarky. Naturally, the second period free-market price P^e equals the price prevailing in the international market. Notice that if $P^e \in [P - t, P]$ dual track liberalization is not needed to achieve a Pareto improvement. For this reason, we restrict our attention to scenarios in which either $P^e > P$ or $P^e < P - t$. Two main lessons can be learned from the analysis.

First, *intertemporal arbitrage* exacerbates the first period distortion introduced by the tax (subsidy). To see this point consider the arbitrage conditions

$$P_{1D}^d - D^{-1}(Q_1^d) = \delta(P^e - P_{1D}^d) \quad (7)$$

$$P_{1S}^d - S^{-1}(Q_1^d) = \delta(P^e - P_{1S}^d) \quad (8)$$

where P_{1D}^d and P_{1S}^d are respectively the first period equilibrium price faced by the user and received by the producer when dual track liberalization is anticipated. Rearranging, we have

$$S^{-1}(Q_1^d) - D^{-1}(Q_1^d) = (1 + \delta)(P_{1S}^d - P_{1D}^d) = (1 + \delta)t. \quad (9)$$

In other words, the wedge between the marginal benefit and the marginal cost increases when the policy is anticipated. This in turn implies that $Q_1^d < Q$, or in other words, *intertemporal arbitrage* induces an additional distortion in the first period.

Second, the policy will not be Pareto improving, even if we consider only the perspective of the private agents. For private agents not to be worse off, buyers which continue to take part in the exchange when dual track liberalization is anticipated should not face a higher price in the first period than they would under the status quo. Similarly, continuously active sellers should not face a lower price. This requires both demand and supply to shift to the

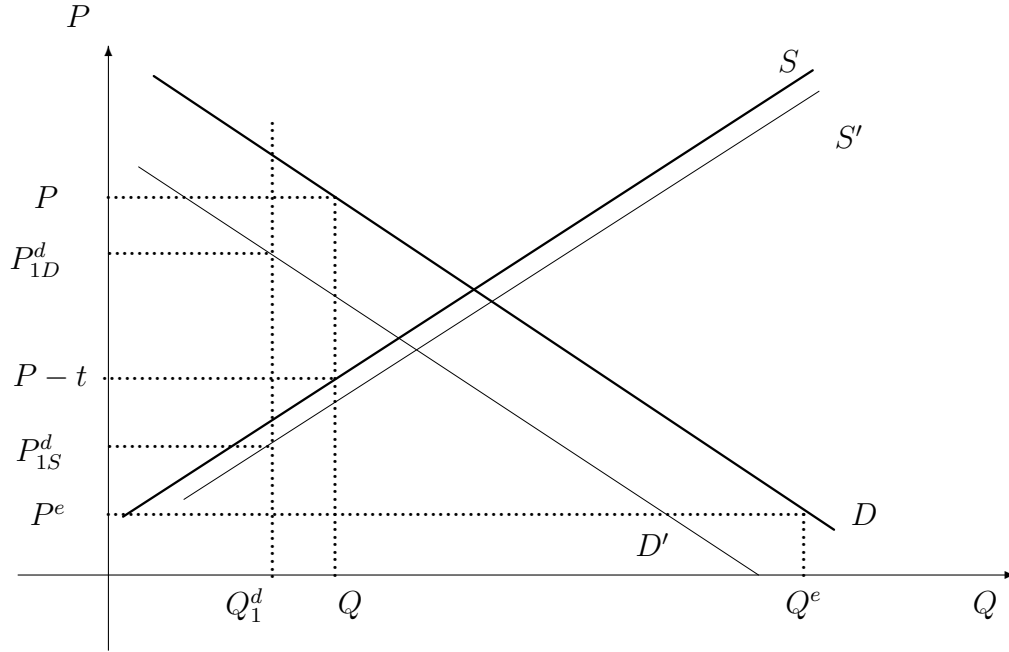


Figure 4: Domestic tax and trade liberalization under dual track

left, because the wedge between marginal cost and marginal benefit increases as a result of *intertemporal arbitrage*. However, this is not possible when either $P^e > P$ or $P^e < P - t$. We can then reach the following conclusion:

Proposition 4 *Suppose that the status-quo policy chosen by the government is a tax (subsidy) in autarky. Then the anticipated dual track liberalization is not Pareto improving, but is possibly efficiency enhancing.*

Notice that autarky amounts to the government setting an import quota equal to zero. It is easy to show that the results obtained in Proposition 4 continue to hold even if the binding quota is strictly positive. The main message is that when dual intervention involves a tax or subsidy which allows market clearing, anticipated dual track liberalization cannot be both efficiency enhancing and Pareto-improving.

Next, we will consider the case in which the status quo policy involves price fixing, and hence rationing of either excessive demand or supply, with foreign suppliers involuntarily

excluded by an import quota.⁶ As it turns out, in this case, dual track liberalization can be simultaneously Pareto-improving and efficiency-enhancing even when it is anticipated. In particular, *intertemporal arbitrage* can actually alleviate the first period distortion induced by the original government policy. In other words, we can identify conditions under which *intertemporal arbitrage* will relax in the first period the rationing implied by the government's price fixing, making dual track liberalization Pareto-improving. This result is summarized in the following

Proposition 5 *Suppose that the status quo policy chosen by the government is domestic price fixing, combined with an import quota. Let P be the domestic target price fixed by the government. Then, domestic cum trade liberalization is Pareto improving and efficiency enhancing if and only if one of the following two conditions holds:*

a.) $P^e > P$ and $S'(P) + q \geq D(P)$

b.) $P^e < P$ and $D'(P) \geq S(P) + q$

Proof. We first establish the sufficiency for part a.) using Figure 5 as an illustration. Since $P^e > P$, demand increases and supply decreases because of arbitrage, and in particular $S'(P) + q < S(P) + q$. Furthermore, given that the supply does not fall short of the demand, i.e. $S'(P) + q \geq D(P)$, the demand must be binding without liberalization, i.e. $S(P) + q > D(P)$. Therefore

$$Q_1^d = \min\{S'(P) + q, D'(P)\} \geq \min\{S(P) + q, D(P)\} = Q$$

⁶This regime for instance broadly describes the pre-1978 Chinese Foreign Trade Corporations (FTC) system. The trading enterprises were tightly controlled by the government through foreign trade planning, which issued mandatory targets. Very often those targets were worked out in great detail, both with respect to the type of good to be traded, as well as to the quantity to be transacted. At the same time domestic prices were completely divorced from world market prices through an arbitrary internal pricing system, aimed at insulating domestic companies from international price fluctuations. The relevant FTC would procure the export good at the internal price set by the government, and resell it in the international market at the prevailing price. Any discrepancy between the foreign price (converted at the official exchange rate) and the domestic target price would represent a profit or a loss for the FTC, which would then be absorbed by the State as either a profit delivery or a subsidy. For more on this, see Chai (1997).

Since the price does not change and the expansion of output is voluntary for both buyers and sellers at the margin, all agents must be weakly better off. The same argument applies for part *b*. We now turn to the necessary condition. Suppose that $P^e > P$, but $S'(P)+q < D(P)$. Then $Q_1^d < Q$ and hence some buyers will be rationed out as a result of such arbitrage. The same logic applies to part *b*.) QED.

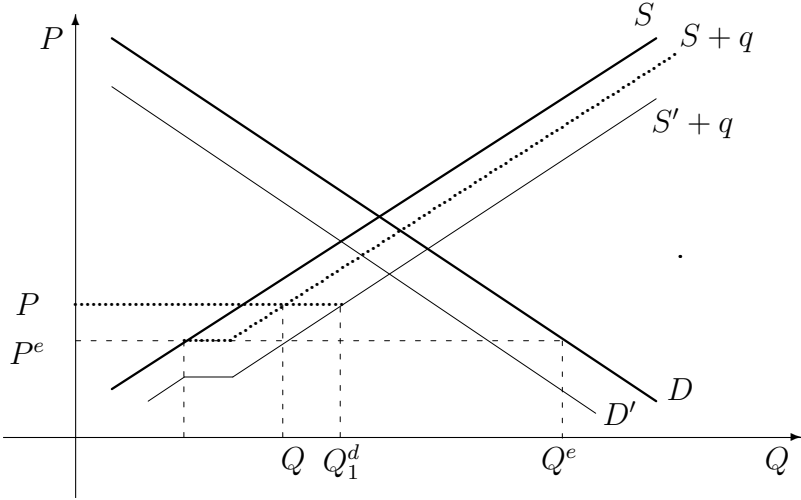


Figure 5: Domestic price and trade liberalization under dual track

An interesting comparison can be drawn between the last result and Proposition 1. In the latter, we considered the effect of removing only a price control, and we showed that *intertemporal arbitrage* exacerbated the first period distortion, by further reducing the quantity exchanged. To the contrary, when liberalization involves the removal of both the price control and the import quota, it may reduce the distortions in the first period, allowing the quantity exchanged to increase. The key to such a difference lies in the fact that when the government's *status quo* policy involves only a price control, there is a close relation between whether demand or supply is binding at the government-fixed price, and the direction in which the price will change after the introduction of the reform. For instance, if the status quo policy involves only price setting and supply is binding in the first period, the price must increase after liberalization, inducing the first period supply to shrink even further. This

linkage breaks down, however, when the status quo policy involves both a price control and an import quota. Consider again the case of binding supply. The prevailing price after liberalization is determined in the international market, and can be anywhere below the autarky price. In particular, if the international market price is below the government fixed domestic price, the anticipated removal of both price and import restrictions induces the supply to increase, rather than shrink in the first period. Naturally, the results of Proposition 5 apply also to the case of an export quota.

4.2.2 Price controls and involuntary participation/exclusion

The positive result we have obtained for the simultaneous removal of price and quantity restrictions can be generalized. We show next that anticipated dual track liberalization is likely to be both Pareto-improving and efficiency-enhancing only when the original government intervention is *highly pervasive*, i.e. it involves both price setting and involuntary participation/exclusion. By involuntary exclusion we intend those situations in which an agent would be willing to undertake an exchange at the prevailing price, but it is not allowed to do so *ex imperio*, i.e. as a result of a prohibition by the authorities. Common examples are import quotas – as we have just discussed – or voluntary export restraints, entry barriers, politically or ideologically motivated restrictions etc. Similarly, by involuntary participation, we refer to those situations where agents would not be willing to engage in a transaction given the prevailing price, but are forced to do so by government *fiat*, as was often observed in centrally planned economies.

Let \tilde{S} and \tilde{D} respectively be the total supply and demand by agents who involuntarily and voluntarily engage in transactions under the status quo. We illustrate these functions in Figure 6 where we assume for simplicity that all users choose voluntarily whether to transact. In Figure 6, some producers with very high marginal cost are forced to supply in the status quo. These producers are represented by the leftmost portion of \tilde{S} . The rest of the producers, represented by the monotonic portion of \tilde{S} , make supply decisions voluntarily.

This is a typical phenomenon in a centrally planned economy, where the government may order high cost producers (such as state-owned enterprises) to deliver the commodity simply because it has no knowledge of their true marginal cost (Lau, Qian, and Roland (2000)). Lacking information on the fundamentals of the economy, the planner sets the price at an arbitrary level P which in our example happens to generate an excess supply, in the sense that $\tilde{S}(P) > \tilde{D}(P)$. Notice that the free-market price P^e that prevails in the market track in the second period bears no relationship with the price at which $\tilde{S} = \tilde{D}$. This is because an arbitrary number of producers are involuntarily forced to participate in transactions due to the original government intervention.

Since P^e and the price at which $\tilde{D} = \tilde{S}$ are not related, it becomes possible for $P^e > P$ while $\tilde{S}(P) > \tilde{D}(P)$. When $P^e > P$, *intertemporal arbitrage* implies that the supply will decrease and the demand will increase in the first period. However, because $\tilde{S}(P) > \tilde{D}(P)$, it is possible for the first period *voluntary* transaction to expand as a result of this arbitrage, and hence $\tilde{Q}_1^d > \tilde{Q}$. Since the increment in transaction is voluntary and the first period price is fixed, there must be a Pareto improvement. *A fortiori*, the anticipated dual track liberalization is also efficiency-enhancing. A similar argument can be made with respect to the case when $P^e < P$ and $\tilde{D}(P) > \tilde{S}(P)$. We conclude:

Proposition 6 *Suppose that the government sets the price with infra-marginal agents participating in the exchange involuntarily. Then anticipated dual track liberalization is Pareto improving if and only if one of the following holds:*

- a. $P^e > P$ and $\tilde{S}'(P) \geq \tilde{D}'(P)$
- b. $P^e < P$ and $\tilde{D}'(P) \geq \tilde{S}'(P)$

Proof. The argument is identical to the proof of Proposition 5 once we redefine D as \tilde{D} , and S as \tilde{S} . *QED.*

Considering Figure 6, if $\tilde{S}'(P) < \tilde{D}'(P)$, the transaction in the first period will decrease when the liberalization is anticipated. Consequently, some additional users will be rationed

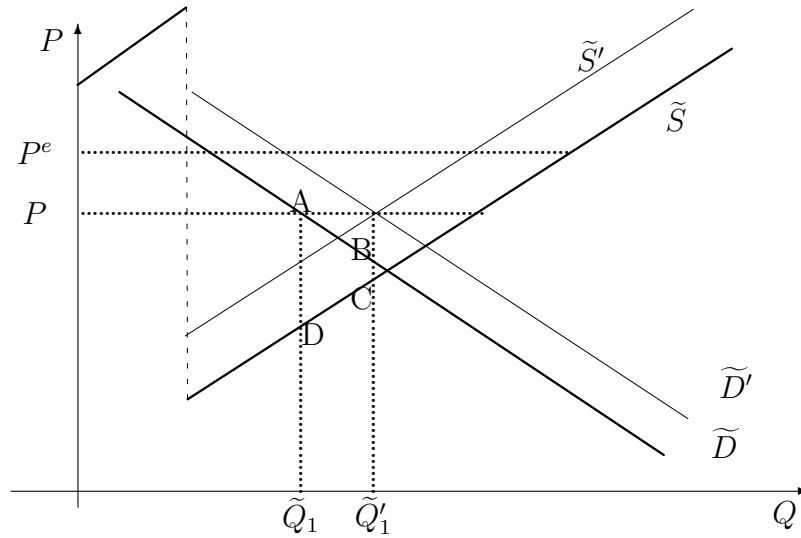


Figure 6: Price control and involuntary participation/exclusion

out in the first period and hence made worse off. They will be made worse off in the second period as compared to the status quo because they have to pay the free-market price $P^e > P$ if they choose to transact. This means that a Pareto improvement cannot be achieved. However, the liberalization could remain efficiency enhancing, since the efficiency gains from removing involuntary participation can be arbitrarily large.

5 Conclusions

We began our discussion pointing out that when dual track liberalization is not anticipated, it achieves a Pareto improving outcome, requiring very little information by the government. These characteristics make such a reform mechanism particularly appealing, and potentially applicable well beyond the scope of the Chinese economic transition, during which it has been developed. This lead us to ask a question, relevant both from the point of view of the theory of reform design, as well as for everyday policy making: Are there limits to dual track liberalization? If so, what are these limits, and in which institutional context is dual track most likely to be successful?

To address this question, we have examined the working of dual track liberalization in a wide range of institutional environments that span from a command to a regulated market economy. In doing so, we have kept in mind that the key purpose of this mechanism is to implement a reform without losers, and hence to obtain widespread political support for a liberalization process. We have noted that reforms seeking popular support are often the subject of public scrutiny prior to their actual implementation, and accordingly, they are more likely to be rationally anticipated than to come as a surprise. We have therefore extended the work of Lau, Qian, and Roland (2000) by considering a two-period model, where dual track liberalization is rationally anticipated in the first period but implemented in the second.

Using a simple partial equilibrium framework, we have studied the dynamic implications of such a reform mechanism in a variety of economic environments. We have learned that when the original government policy involves only price or quantity controls, dual track liberalization is unlikely to continue to be simultaneously efficiency – enhancing and Pareto improving.

However, when the status quo policy involves both price-setting and quantity restrictions, a situation which we refer to as dual interventions, there exists a clear set of conditions under which anticipated dual track liberalization will continue to be both efficiency–enhancing and Pareto–improving. Such pervasive government interventions fit the pre-reform institutional characteristics of many transition economies. For dual track liberalization to be successful in a more general context, our analysis shows that either the reform should be implemented as a surprise or, when it is anticipated, it must involve the simultaneous removal of both price and quantity controls.

While the general purpose of this paper is to understand the applicability of the dual track scheme, we have discussed the issue by considering its applicability to a regulated market economy and at the implications of allowing agents to anticipate such a reform. It might be worthwhile to explore the limits of dual track liberalization from other perspectives, for

instance taking into account the enforceability and credibility issues.⁷ Although enforcement and credibility are important in assessing the implementability of the dual track mechanism, we will leave these issues to future research.

⁷Indeed, when the pre-existing contractual agreements are only imperfectly enforceable, the difference between the first period price, and the free-market price would induce agents not to honor the pre-existing contracts. Thus, under imperfect enforcement, the dual track scheme must ensure that the resulting difference between these two prices are not too large, in order to avoid an inefficient diversion of resources (Murphy, Shleifer, and Vishny (1992)). This may force the government to either continue to exert some control over the price in the market track or adjust the price in the regulated track to accommodate the price increase in the market track. Indeed, at the initial stage of China's dual track reform, some of the prices in the market sector are adjustable only within a band around the price in the plan sector. The band was lifted only at later stages.

Appendix

Proof of Corollary 1

Also in this case, we prove the result if supply is binding using Figure 1. Focusing on the area below P^e (the argument for the area above is symmetric and therefore is omitted), we notice that the triangle BEC represents the gain of the dual track liberalization in the second period, while the trapezoid $ABEF$ represents the loss in the first period. We denote by Δ_{BEC} the area of BEC etc. We want to show that $\delta\Delta_{BEC} < \Delta_{ABEF}$. From the arbitrage condition (1), $\delta\overline{AD} = \overline{DF}$. Since $\delta\overline{BC} = \overline{DE} = \overline{AB}$, $\Delta_{ABED} = 2\delta\Delta_{BEC}$. Therefore, $\Delta_{ABED} > \delta\Delta_{BEC}$, and $\Delta_{ABEF} > \delta\Delta_{BEC}$. The same argument applies to the case of binding demand. *QED.*

Proof of Proposition 2

The proof for the efficiency part of the results is similar to that of Proposition 1 and is therefore omitted. We focus on conditions under which all private agents can be at least as well off as under the status quo, an outcome which will occur if and only if the first period price remains constant despite the anticipated introduction of dual track liberalization.

Let P_{1S}^d be the equilibrium price received by the suppliers in the first period, when dual track liberalization is anticipated, and let P_{1D}^d be the price paid by buyers. As usual, let P be the price received in the status quo by the producer, $P - s$ be the price paid by the consumer and Q be the quantity transacted. Naturally, $P = S^{-1}(Q)$ and $P - s = D^{-1}(Q)$. The prices faced by buyers and suppliers will not change under anticipated dual track liberalization if and only if

$$P_{1S}^d = S^{-1}(Q) \quad \text{and} \quad P_{1D}^d = D^{-1}(Q). \quad (10)$$

Inter-temporal arbitrage implies that in equilibrium:

$$P_{1S}^d - S^{-1}(Q_1^d) = \delta(P^e - P_{1S}^d) \quad (11)$$

$$P_{1D}^d - D^{-1}(Q_1^d) = \delta(P^e - P_{1D}^d). \quad (12)$$

Substituting (10) into the equations above, we have:

$$\delta S^{-1}(Q^e) + S^{-1}(Q_1^d) = (1 + \delta)S^{-1}(Q), \quad (13)$$

$$\delta D^{-1}(Q^e) + D^{-1}(Q_1^d) = (1 + \delta)D^{-1}(Q). \quad (14)$$

QED.

Proof of Corollary 2

We will start showing proving part a) first. Assume that $D = c - dQ$ and $S = a + bQ$, where a, b, c, d are positive constants. We can then rewrite equations 14 and 13 as

$$b(Q_1^d - Q) = \delta b[Q - Q^e] \quad (15)$$

$$-d(Q_1^d - Q) = -\delta d[Q - Q^e] \quad (16)$$

and obviously $Q_1^d = (1 + \delta)Q - \delta Q^e$ satisfies both equations simultaneously. To prove part b), assume the demand is infinitely elastic between Q_1^d and Q^e . Equation (14) is then satisfied for all Q_1^d in the relevant range, and Q_1^d is determined from equation (13). The argument is identical for the case of supply.

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