

# **Optimal Risk-Sharing in a Monetary Union\***

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**DISCUSSION PAPER No. 182**  
**December 2006**

The Discussion Papers in this series circulate mainly for early presentation and discussion, as well as for the information of the Academic Community and all interested in our current research activity.

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(\*) This paper supersedes Discussion Paper No. 135.

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# Optimal Risk-Sharing in a Monetary Union

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## Abstract

It is argued that a monetary union is a more efficient way to organize an insurance system to cope with asymmetric shocks than a monetary arrangement based on the existence of national currencies. This is due to the fact that in a monetary union the exchange rate risk and uncertainty are removed, and this favours the diversification of assets, improving thus the allocation of risk among economic agents. By exploiting the results from the theory of general economic equilibrium, we argue in this paper that the formation of a monetary union is a necessary condition for the organization of such an insurance system, but it is not sufficient. Sufficiency requires markets to be complete. In fact, the ability of the markets to smooth consumption, and thus to offer a (complete) insurance to consumers against asymmetric shocks, is possible only in the case in which these markets are complete. With incomplete markets this is no longer true. In this last case either consumers have to save more in order to self-insure themselves against the randomness of their consumption patterns, and/or monetary unions have to be vested with a fiscal system providing automatic transfers from regions in prosperity to regions in distress in order to soften the negative effects of asymmetric shocks on regional consumption.

**JEL Classification:** E42, E33, F42

**Keywords:** Monetary unions, Asymmetric shocks, Risk-sharing, Complete and incomplete markets

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## **1. Introduction**

It is argued (De Grauwe, 2005) that a monetary union is a more efficient way to organize an insurance system to cope with asymmetric shocks than a monetary system based on the existence of national currencies. This is due to the fact that in a monetary union the exchange rate risk and uncertainty are removed, and this favours the diversification of assets, improving thus the allocation of risk among economic agents. This is the essence of the so called Mundell II argument (Mundell, 1973). By exploiting the results from the theory of general economic equilibrium, we argue in this paper that the formation of a monetary union is a necessary condition for the organization of such an insurance system, but it is not sufficient. Sufficiency requires markets to be complete. Only in this case the allocation of risk is Pareto efficient (although not necessarily socially efficient), and markets offer complete insurance to economic agents, against the negative effects of asymmetric shocks. With incomplete markets this is no longer true. In this last case, either consumers have to save more in order to self-insure themselves against the randomness of their consumption patterns, and/or monetary unions have to be vested with a fiscal mechanism providing automatic transfers from regions in prosperity to regions in distress.

The paper is organized as follows: In the next section, we present a short review of the literature on the theory of monetary unions, asymmetric shocks and risk sharing. In Section 3, we discuss the importance of complete and incomplete markets for monetary unions, the conditions under which consumption patterns are smoothed in these markets and their corresponding implications for consumers' relative insurance against asymmetric shocks. Section 4 summarizes the findings.

## **2. Monetary Unions, Asymmetric Shocks and Risk Sharing**

The traditional theory of monetary unions argues that the cost of sacrificing the tool of monetary policy by a member country depends, in part, on (i) the extent to which member countries are likely to suffer from asymmetric shocks, and (ii) the availability of alternative (other than national monetary policies) asymmetric shock absorbers. The first condition is fulfilled if the members of a monetary union are countries that are similar in their economic structure (similar in tastes, factor endowments and technology), and therefore they do not specialize by trade. Non-specialization reduces the likelihood of appearance of asymmetric shocks. In the case, however, in which asymmetric shocks are present (because the member

countries are different in their economic structure and therefore specialize by trade), alternative asymmetric shock absorbers (price and wage flexibility, factor mobility, fiscal policy) are needed.

More recent contributions to the debate emphasize that asymmetric shocks (stemming from the specialization of economic activity) do not constitute a problem for monetary unions, provided that mechanisms, for achieving an intra-union income insurance are present (Kalemli-Ozcan, Sorensen and Yosha, 2004).<sup>1</sup> These mechanisms (channels for risk sharing) are two: fiscal policy, and market institutions. Fiscal policy may be conducted either at the union level (fiscal federalism) or at the national level (decentralized fiscal policy). In the first case, the union has a centralized budget and a federal income tax. In the case of an asymmetric shock the region in distress has to pay less income tax, while federal employment benefits increase. The opposite is true for the regions in prosperity. Thus, there is an automatic transfer of wealth from regions in prosperity to regions in distress that soften the negative effects of asymmetric shocks; risk-sharing takes place between regions. In the second case (decentralized fiscal policy), the region in distress has to borrow from the region in prosperity. Since debts have to be serviced in the future, the risk is shared between generations of the same region and not between regions (De Grauwe, 2005). Market institutions insure economic agents through trade in assets. The gains from this trade is the risk-sharing among the agents involved, which is achieved by the diversification of assets. Recent contributions (Krugman, 1991) have shown that more capital market integration may lead to more trade specialization (Krugman's view) in a different context, but the negative effects of asymmetric shocks are softened by the increased risk-sharing (Acemoglu and Zilibotti, 1997; Kalemli-Ozcan, Sorensen and Yosha, 2003; Melitz, 2004).

A factor that reduces the ability of capital markets to insure consumers is the "home bias puzzle" (French and Poterba, 1991; Tesar and Werner, 1995). In a world with no trade costs, perfect information, and the same risk aversion across countries, agents prefer to hold assets of their own geographical region. The "home bias puzzle" is attributed to the exchange rate risk and uncertainty and to the costs involved in converting one currency into another. Some researchers (Coval and Moskowitz, 1999) have found "home bias at home". For example, US institutional investors, while holding assets from all over the United States, still hold a more than proportional amount of assets issued in their own geographical area. But this "home bias at home" is less severe than the "home bias" observed in international markets. It

is argued (De Grauwe, 2005; Mundell, 1973; McKinnon, 2004) that in a monetary union the “home bias” phenomenon is removed (at least to the extent that this phenomenon is attributed to exchange risk and uncertainty, and to transaction costs involved in converting one national currency into another), and from this point of view it offers a more effective mechanism for insurance against asymmetric shocks than a monetary system based on national currencies.

### 3. Risk-sharing in a Monetary Union with Complete and Incomplete Markets

The fact that a monetary union offers a more effective mechanism for insurance in comparison to monetary systems based on national currencies does not necessarily imply (i) that markets can smooth consumption patterns, and (ii) that risk allocations obtained by the market are Pareto efficient. To see this, consider a monetary union as an Arrow-Debreu economy described by<sup>2</sup>:

(i) A set  $S$  of states of nature, corresponding to future events (asymmetric shocks), that may affect consumption. The meaning of uncertainty is that agents do not know the state of nature which finally will materialize, although they may assign a (subjective) probability on it. The information structure of the model is presented by a decision tree.

(ii) A single consumption good. Since we are interested in consumption smoothing, we assume that there is one consumption good called “consumption”, contingent on the states of nature. Therefore, there are  $S$  contingent commodities, that is, the possible levels of consumption are equal to the number of the states of nature.

(iii) A set of consumers. They are the representative citizens of the member countries of the monetary union. Consumers are risk averse. They are endowed with Arrow-Debreu securities that enable them to consume a contingent commodity if and only if a particular state of nature is revealed. It is assumed that they are identical in every respect except in asset endowments. Therefore, there is a motive for trading assets leading to portfolio diversification (Obstfeld, 1995; Svensson, 1988).

Production is omitted for simplicity.

Assume now that markets are complete. This means that there is a market for every contingent level of consumption, that is, for every state of nature. Completeness also implies that information is symmetric, that is, all agents recognize the occurrence of  $s \in S$ . These

markets open before the resolution of uncertainty (for trading the assets available), and then close down again.

It can be proved that the allocation of risk attained in these markets is Pareto efficient (by the First Theorem of Welfare Economics). Consumption depends of course on the state of nature, but since agents are active in all states of nature (by the assumption of completeness) they manage to insure completely. This implies a smooth consumption pattern. Therefore, countries can exploit the benefits derived from specialization (greater efficiency and higher economic growth), without the welfare loss stemming from uninsured asymmetric shocks.

However the Pareto efficiency allocation chosen by the market may not maximize social welfare. In fact, the Pareto efficient allocation selected by the market is one of the Pareto efficient allocations belonging to the  $n-1$  dimensional manifold, where  $n$  is the number of agents. In the Edgeworth box case of two agents, this manifold is the Edgeworth contract curve, every point of which is Pareto efficient. And since by the Second Theorem of Welfare Economics, every Pareto efficient point can be supported by the market, given the appropriate distribution of wealth, a socially acceptable allocation of risk presupposes a redistribution of wealth.

The above discussion may be summarized in the following propositions:

*PROPOSITION 1:* In complete markets: (i) Allocations of risk are Pareto efficient, although not necessarily socially acceptable; (ii) consumption patterns are smoothed by the markets (insurance is complete); (iii) asymmetric shocks do not constitute a problem for a monetary union since their negative effects are completely insured by the markets.

Completeness is an idealization of reality. Transaction and informational costs limit the number of the markets that can function in an economy. Thus the number of the markets that function in the economy is less than the number of the states of nature. More specifically, the model of incomplete markets assumes a system of sequential markets, that is, a system of reopening markets which implies that the assumption that markets open only once (as in the case of complete markets) is removed. These markets are linked by a system of financial markets, the role of which is to transfer wealth across spot markets, and hence to provide insurance opportunities. The model further assumes that there are not enough financial markets to transfer wealth across all spot markets; in other words, markets are incomplete. The question now is how incompleteness modifies Proposition 1.

Pareto optimality is considered first. Since some markets are missing, marginal rates of substitution cannot be equalized across all states of nature, and therefore Pareto efficiency (as it is usually defined) is bound to fail. A more interesting question is whether *existing* markets can work efficiently. This leads to the concept of constrained Pareto efficiency. A feasible allocation is constrained Pareto efficient, if there is no other feasible allocation which is superior to it. It can be proved that incomplete markets with a single good (which is the case usually considered in finance) is constrained Pareto efficient. However in the more general case of more than one consumption goods, even constrained Pareto efficiency fails (Geanakoplos and Polemarchakis, 1986). This is due to the fact that reallocations of portfolio (that take place during the first period) may lead to changes in relative prices. The consensus emerging in the literature seems to be that in incomplete markets, failures of Pareto efficiency are not only possible but even typical (Mas Colell et al. 1995, p.712).

We now turn to the question of whether incomplete markets can smooth consumption patterns, and thus offer complete insurance to economic agents. We have already seen that in complete markets, the variability of consumption across the states of nature is reduced, and thus agents manage to insure completely. This does not hold true in incomplete markets, which are characterized by stochastic consumption patterns (Heaton and Lucas, 1996). Therefore, agents cannot be insured completely against the negative effects of asymmetric shocks. This is due to the fact that in incomplete markets agents cannot transfer wealth across all states of nature. To see this, consider the extreme case in which only spot markets exist. Then, if agents respect their budget constraints, irregular consumption patterns necessarily follow.

The above discussion is summarized in the following proposition:

*Proposition 2:* In incomplete markets: (i) Risk allocations are constrained Pareto efficient, in the particular case of one consumption good. (ii) Markets cannot smooth consumption patterns implying that consumers cannot be insured completely against asymmetric shocks.

This means that either consumers have to save more in order to self-insure themselves against the randomness of their consumption patterns, or / and monetary unions have to be vested with fiscal systems providing automatic transfers from regions in prosperity to regions in distress in order to soften the negative effects of asymmetric shocks on regional consumption (von Hagen 1998, von Hagen and Hepp, 2000).

#### **4. Concluding Remarks**

We found that markets can allocate risk efficiently and smooth consumption patterns only in the case in which they are complete. In reality markets are incomplete. In this case, Pareto optima, if they exist, are constrained Pareto optima, and the markets cannot smooth consumption patterns. Thus, a policy aiming at the integration of financial markets, for example by allowing the cross-border mergers of financial institutions, and by removing the barriers affecting the ability of mutual funds and pension funds to diversify within the union, may improve matters, but the problems with inefficiency, and stochastic consumption patterns still remain.

#### **Aknowledgements**

We have benefited from comments by members of a Faculty Seminar held at the Department of Economics, University of Giessen, Germany and of a Conference at University of Waterloo, on “Globalization and Innovation in Governance in the 21<sup>st</sup> Country”. Professor Demopoulos acknowledges financial support from the Jean Monnet Project 97/0243 of the European Commission.

#### **Notes**

- <sup>1</sup>. This argument is similar to that expressed (within the context of the theory of international trade) by Helpman and Razin (1978) who argued that the benefits from specialization will emerge only if production risk can be insured through trade in assets.
- <sup>2</sup>. For a similar approach, see Obstfeld, 1995.



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