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Integration of financial markets and national price levels: the role of exchange rate volatility

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Abstract:

How does international financial integration affect national price levels? To analyze this question, this paper formulates a two-country open economy sticky-price model under either segmented or complete asset markets. It is shown that the effect of financial integration, i.e. moving from segmented to complete asset markets, is regime-dependent. Under managed exchange rates, financial integration raises the national price level. Under floating exchange rates, however, financial integration lowers national price levels. Thus, the paper proposes a novel argument to rationalize systematic deviations from PPP. Panel evidence for 54 countries supports the main findings. A 10% larger ratio of foreign assets and liabilities to GDP, our measure of international financial integration, increases the national price level by 0.27 percentage points under fixed and intermediate exchange rate regimes and lowers the price level by 0.3 percentage points under floating exchange rates.

Keywords:

International financial integration, exchange rate regime, national price level, PPP, foreign asset position

JEL-Classification:

F21, F36, F41

Non-technical summary

Over the last two decades, financial market globalisation has become an important aspect of the world economy. Since the early 1970s, international capital market transactions have grown more sharply than world GDP. This paper analyses the consequences of this development for the internationally comparable equilibrium price level in industrialised and emerging market economies. A first look at the data gives the impression that closer financial integration is associated with an increase in the price level of the countries concerned. This paper sets out to explain this positive relationship in the framework of a standard general equilibrium model of an open economy. However, in this framework, it also becomes clear that this positive relationship is not universally valid. In fact, it will be demonstrated that the exchange rate regime – and therefore the ability of monetary policy to influence prices – plays a decisive role. The positive relationship between financial market integration and the national price level should, according to the theoretical model, only be true in countries with managed exchange rates, whereas a negative relationship should be observable in countries where the nominal exchange rate can float freely and the country's monetary policy is able to act independently of the nominal exchange rate.

In the theoretical model, the potentially existing risk premium, which is demanded by sticky-price good producers, and its interaction with the exchange rate expectation play a crucial role in explaining the different effects financial market integration has on national price levels. The following arguments and combinations of arguments – depending on the integration of financial markets and the exchange rate regime choice – explain the results: a risk premium of domestic sticky-price goods has a positive effect on the domestic price level and can only be controlled in a flexible exchange rate environment. This risk premium increases the expected exchange rate (depreciation) while the exchange rate volatility lowers it. In each case, this effect only occurs in segmented financial markets, not in fully integrated financial markets. In a flexible exchange rate regime, relative price changes are allowed for and the risk premium – and therefore the domestic price level – is reduced. The reduced price level affects exchange rate expectations in segmented financial markets and causes a higher national price level. The opposite effect occurs in the case of an exchange rate peg. In the end, the following situations should be distinguished: in the process of international financial integration, the national price level rises only in the case of managed exchange rates. In the case of floating exchange rates, by contrast, the process of financial integration lowers the national price level.

This result is corroborated by panel data for 54 countries. It is shown that moving from segmented to complete international asset markets, i.e. moving to international financial integration, lowers national price levels for those countries that let their exchange rate float. In pegged or

intermediate exchange rate regimes, however, closer financial integration raises national price levels. For example, a 10% higher ratio of foreign assets and liabilities to GDP increases the national price level by 0.27 percentage points in fixed and intermediate exchange rate regimes and lowers the price level by 0.3 percentage points in the case of floating exchange rates. These effects are most clearly seen for OECD countries and are less clear-cut for developing countries.

Nicht-technische Zusammenfassung

In den letzten zwanzig Jahren wurde die Weltwirtschaft zunehmend von der Globalisierung an den Finanzmärkten geprägt. Das Transaktionsvolumen an den internationalen Kapitalmärkten hat seit Anfang der Siebzigerjahre stärker zugenommen als das weltweit erwirtschaftete Bruttoinlandsprodukt. Die vorliegende Arbeit untersucht, welche Folgen diese Entwicklung für das international vergleichbare gleichgewichtige Preisniveau in Industrie- und Schwellenländern hat. Auf den ersten Blick vermitteln die Daten den Eindruck, dass die zunehmende Integration der Finanzmärkte in diesen Ländern mit einem Preisniveauanstieg einhergeht. In dieser Arbeit wird versucht, diese positive Beziehung anhand eines standardisierten allgemeinen Gleichgewichtsmodells einer offenen Volkswirtschaft zu erklären. Dabei wird gleichwohl auch deutlich, dass diese positive Beziehung nicht immer besteht. Vielmehr wird gezeigt, dass das Wechselkursregime und damit die Fähigkeit der Geldpolitik, die Preisentwicklung zu steuern, eine entscheidende Rolle spielen. Dem theoretischen Modell zufolge sollte der positive Zusammenhang zwischen der Finanzmarktintegration und dem Preisniveau eines Landes nur in Ländern mit kontrollierten Wechselkursen bestehen; in Ländern mit frei schwankenden nominalen Wechselkursen, wo die Geldpolitik unabhängig vom nominalen Wechselkurs agieren kann, sollte dagegen ein negativer Zusammenhang zu beobachten sein.

Im theoretischen Modell spielt die Risikoprämie, die eventuell von den Produzenten von Gütern mit unflexiblen Preisen verlangt wird, sowie deren Zusammenwirken mit den Wechselkurserwartungen und der Wechselkursvariabilität eine wesentliche Rolle bei der Erklärung der unterschiedlichen Auswirkungen, die die Finanzmarktintegration auf das Preisniveau in den einzelnen Ländern hat. Die folgenden Argumentationen erklären – je nach Integrationsgrad der Finanzmärkte und Wechselkursregime – die Ergebnisse: Eine Risikoprämie für inländische Güter mit unflexiblen Preisen wirkt sich positiv auf das inländische Preisniveau aus und lässt sich nur in einem System flexibler Wechselkurse steuern. Diese Risikoprämie führt zu der Erwartung eines höheren Wechselkurses (Abwertung), während Wechselkursschwankungen zur Folge haben, dass niedrigere Wechselkurse erwartet werden. In jedem Fall tritt dieser Effekt nur in segmentierten, nicht aber an vollständig integrierten Finanzmärkten auf. In einem System flexibler Wechselkurse gibt es Raum für relative Preisänderungen, so dass die Risikoprämie und damit das inländische Preisniveau niedriger ausfallen. Bei segmentierten Finanzmärkten beeinflussen diese niedrigen Preise die Wechselkurserwartungen und führen zu einem Anstieg des inländischen Preisniveaus. Ist der Wechselkurs an eine andere Währung gebunden, verläuft diese Entwicklung in die entgegengesetzte Richtung. Letzten Endes ist zwischen den folgenden Situationen zu unterscheiden: Während des Prozesses der Integration der internationalen Finanzmärkte steigt das Preisniveau eines Landes nur im Falle kontrollierter Wechselkurse. Bei frei schwankenden Wechselkursen hingegen führt die Finanzmarktintegration zu einer Verringerung des inländischen Preisniveaus.

Dieses Ergebnis wird durch ein Datenpanel zu 54 Ländern bestätigt. Es wird gezeigt, dass durch einen Übergang von segmentierten zu vollständigen internationalen Märkten für Vermögenswerte, d.h. durch eine Integration der internationalen Finanzmärkte, das inländische Preisniveau in den Ländern sinkt, die ihre Wechselkurse frei schwanken lassen. Bei Wechselkursanbindungen oder Zwischenformen führt die stärkere Finanzmarktintegration jedoch zu einem Anstieg des Preisniveaus eines Landes. Beispielsweise lässt eine Zunahme des Verhältnisses der ausländischen Vermögenswerte und Verbindlichkeiten zum BIP um 10% das inländische Preisniveau in einem System fester Wechselkurse oder einer Zwischenform um 0,27 Prozentpunkte steigen, während es bei frei schwankenden Wechselkursen um 0,3 Prozentpunkte sinkt. Diese Effekte treten bei den OECD-Ländern am deutlichsten zutage, sind bei Entwicklungsländern aber weniger eindeutig zu erkennen.

Contents

List of Tables

List of Figures

Integration of Financial Markets and National Price Levels: The Role of Exchange Rate Volatility[1]

1 Introduction

Over the last two decades, international financial market integration has dramatically increased, leading to financial interconnectedness not only of regions but also of geographically distant countries. How does this ongoing financial market integration affect domestic inflation and price levels? And which role does monetary policy play in this process? Most of the debate on the consequences of globalisation on inflation, however, focuses on the effect of trade integration on inflation dynamics and national price levels. It is argued that increased goods market integration leads to a decline in the price level due to fiercer competition, a more efficient allocation of production and a disciplining effect on national policy makers. For recent contributions, see Bernanke (2007), Borio and Filardo (2007) or IMF (2006).[2] So far, the literature has not discussed the effect of monetary policy on national price levels in industrialised and emerging market economies in the case of international financial integration.[3] This paper aims to close this gap. A first look at the data gives the impression that closer financial integration is associated with an increase in the price level of the countries concerned. Figure (1) shows the relationship between the (log of the) internationally comparable national price level and the degree of international financial integration measured by the stock of foreign assets and liabilities for 54 industrialised and emerging countries between 1970 and 2004. There is a clear positive relationship between these two variables. Countries that are more financially integrated into the world economy exhibit a higher national price level. While trade integration arguably lowers prices, financial integration seems to raise the price level.

This paper can explain this positive relationship in a framework of a standard two-country open economy sticky-price model (see, for example, Devereux and Engel (2003), Obstfeld and Rogoff (2000a) and Sutherland (2005)) in different asset market structures. However, it also becomes clear in this framework that this positive relationship is not universally valid. In fact, it

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[2] Ball (2006), by contrast, argues that globalisation has no impact on domestic inflation.

[3] A large amount of literature investigates the effect of financial integration on growth and macroeconomic volatility. See Kose et al. (2006) for a recent survey on financial globalisation.

will be demonstrated that the exchange rate regime – and therefore the ability of monetary policy to influence prices – plays a decisive role. The positive relationship between financial market integration and the national price level should, according to the theoretical model, only be true in countries with managed exchange rates, whereas a negative relationship should be observable in countries where the nominal exchange rate can float freely and the country's monetary policy is able to act independently of the nominal exchange rate. Given that the majority of observations in figure (1) reflect de facto managed exchange rates, the figure disguises this important regime-dependent relationship. In order to assess the effect monetary policy has on the national price level in the process of international financial market integration, the theoretical model focuses on a fixed and floating exchange rate rule. In this way, attention is restricted to a monetary policy of targeting a subset of CPI consisting of domestically produced goods prices. The latter rule parallels the optimal rule of price stability that results from many recent closed economy sticky-price models (see, for example, King and Wolman (1999) and Woodford (2003)) and corresponds to a float. It is assumed that the monetary policy rules are equally credible. The paper therefore abstracts from credibility issues of monetary policy and assesses the properties of the alternative exchange rate arrangements on the national price level in the process of financial market integration.[4]

The regime-dependent influence of international financial market integration on the national price level is the result of the potentially existing risk premium, which is demanded by sticky-price good producers, and its interaction with the exchange rate expectation and exchange rate volatility. The following arguments and combinations of arguments – depending on the integration of financial markets and the exchange rate regime choice – explain the results: a risk premium of domestic sticky-price goods has a positive effect on the domestic price level and can only be controlled in a flexible exchange rate environment. This risk premium increases the expected exchange rate while the exchange rate volatility lowers it. In each case, this effect only occurs in segmented financial markets, not in fully integrated financial markets. In a flexible exchange rate regime, relative price changes are allowed for and the risk premium – and therefore the domestic price level – is reduced. The reduced price level affects exchange rate expectations in segmented financial markets and causes a higher national price level. The opposite effect occurs in the case of an exchange rate peg. In the end, the following situations should be distinguished: in the process of international financial integration, the national price level rises only in the case of managed exchange rates. In the case of floating exchange rates, by contrast, the process of

[4] To classify exchange rate regimes, we rely on the de facto classifications recently provided by literature. Hence, we do not rely on the exchange rate regime that is officially announced to the International Monetary Fund.

financial integration lowers the national price level.

This result it corroborated by panel data for 54 countries. In accordance with the theoretical notion of asset trade, we measure the degree of international financial integration by the country's gross foreign asset position. It is shown that moving from segmented to complete international asset markets, i.e. moving to international financial integration, lowers national price levels for those countries that let their exchange rate float. In pegged or intermediate exchange rate regimes, however, closer financial integration raises national price levels. For example, a 10% higher ratio of foreign assets and liabilities to GDP increases the national price level by 0.27 percentage points in fixed and intermediate exchange rate regimes and lowers the price level by 0.3 percentage points in the case of floating exchange rates. These effects are most clearly seen for OECD countries and are less clear-cut for developing countries.

The paper also contributes to the analysis of the puzzling behaviour of the real exchange rate. A vast amount of literature documents systematic departures from purchasing power parity (PPP). In a related paper, Broda (2006) sheds light on the role of the exchange rate regime choice for these departures. He finds that the national price level is systematically higher in the case of fixed exchange rates than in floating regimes. However, he is not able to trace these observable differences back to underlying economic forces. We will extend this analysis and offer a rationale for Broda's observation in terms of the role of financial integration. According to our findings, the process of international financial integration affects the price level differently in the case of floats than in the case of pegs.

The remainder of this paper provides the relevant underlying theory in section 2. Section 3 discusses the data used, provides an explanation of the econometric methodology and reports the empirical evidence. Finally, section 4 summarises the main results.

2 The model

The starting point of the analysis is a stochastic two economy world, which consists of a home, H, and foreign, F, country. It is assumed that the agents in the home and foreign country produce tradeable goods. Home agents are indexed by numbers in the interval $[0, 1]$ and foreign agents reside on $[0, \mathcal{P}^*]$. The population size of the foreign country corresponds simply to $\mathcal{P}^*$ while the share of the home population in the world population equals $\mathcal{P} = 1/(1 + \mathcal{P}^*)$. The agents in the domestic economy consume a basket consisting of a continuum of sticky price home and foreign produced goods. Each household i provides labour supply to producers of fixed price goods. The prices of the goods are set in advance of the realization of shocks. It follows that producers meet the demand at the pre-set price. Thus, when the fixed goods price is chosen, exogenous changes realized at the current period are not known.[5] The foreign country conditions, labeled by an asterisk * are defined in an analogous manner and are only presented when necessary.

There is only one period and at the beginning of the period households trade if markets are not segmented in a world market in state contingent assets before the exchange rate regime is chosen, knowing that the state dependent security payoffs occur at the realized exchange rate. Producers set their prices at home and abroad before shocks, i.e. supply shocks, production and consumption are realized. Households decide about money balances and consumption while firms supply the goods that consumers demand once uncertainty is revealed. In the foreign country a similar pattern of events occurs.

2.1 Preferences and prices

Preferences of the representative Home agent i in state s are given by the following utility

$$U = \sum_s \pi_s \left(\ln C(i) + \chi \ln \left(\frac{M(i)_s}{P_s} \right) - KL(i)_s \right), \tag{1}$$

The parameter K can be seen as a random shift in the marginal disutility of work effort with a mean value of $E_{-1}(\ln K) = 0$ and a variance σ_k^2, where E_{-1} is the expectation operator across states of natures s and $\ln K \, \epsilon[-\varepsilon, \varepsilon]$. A negative supply shock, a rise in K, allows the household to produce less in a given amount of time. The shift parameter in money demand is reflected by χ. Real balances are equal to $\frac{M_s}{P_s}$, whereby the home consumer price index equals

$$P_s = \left(nP_{H,s}^{1-\eta} + (1-n)\, P_{F,s}^{1-\eta} \right)^{\frac{1}{1-\eta}}, \tag{2}$$

and η reflects the parameter of the elasticity of substitution between home and foreign goods. It captures the sensitivity of allocation between home and foreign goods with respect to relative price changes of home and foreign goods. The parameter $n = 1 - (1 - \mathcal{P})\,\gamma$, measures the overall share of home goods in the home consumption basket. Trade openness is measured by the parameter $0 < \gamma \leq 1$. This formulation accounts for the empirical consumption bias towards tradeable goods produced locally. When $\gamma < 1$ households potentially give a higher weight to local than to foreign goods and purchasing power parity (PPP) does not hold. The consumption index equals

$$C(i)_s = \left(n^{\frac{1}{\eta}} C(i)_{H,s}^{\frac{\eta-1}{\eta}} + (1-n)^{\frac{1}{\eta}} C(i)_{F,s}^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}}. \tag{3}$$

The price and consumption indices for the composite goods are defined as

[5] Note that whether price stickiness results because the price in the current period has to be announced at an earlier time, or simply because price-setters make their decision on the basis of old information, does not matter.

$$P_{H_s}=\left(\int_0^1 P_{H_s}(z)^{1-\theta}dz\right)^{\frac{1}{1-\theta}}, \qquad C(i)_{H_s}=\left(\int_0^1 C_{Hs}(i,z)^{\frac{\theta-1}{\theta}}dz\right)^{\frac{\theta}{\theta-1}},$$
$$P_{F_s}=\left(\frac{1}{\mathcal{P}^*}\int_0^{\mathcal{P}^*} P_{F_s}(z)^{1-\theta}dz\right)^{\frac{1}{1-\theta}}, \quad C(i)_{F_s}=\left(\left(\frac{1}{\mathcal{P}^*}\right)^{\frac{1}{\theta}}\int_0^{\mathcal{P}^*} C_{F_s}(i,z)^{\frac{\theta-1}{\theta}}dz\right)^{\frac{\theta}{\theta-1}},$$

whereby the elasticity of substitution between any two heterogeneous goods is reflected by $\theta > 1$. Total labour effort is given by

$$L(i)=\int_0^1 L_H(z)\,dz, \text{ with } Y_H(z)=L_H(z),\; Y_H(z)=\int_0^1 C_{H_s}(i,z)di+\int_0^{\mathcal{P}^*} C^*_{H_s}(i,z)di.$$

The resource constraint in the foreign country takes on a similar form. Foreign agents (denoted by $*$) have identical preferences, except that K^* and L^* may differ from K and L. For simplicity it is assumed that K and K^* are uncorrelated. Additionally it is assumed that foreign agents hold their own money, M^*, deflated by their general price level, $P^*_s=\left(n^*P^{*1-\eta}_{F_s}+(1-n^*)\,P^{*1-\eta}_{H,s}\right)^{\frac{1}{1-\eta}}$, with $n^*=1-\mathcal{P}\gamma$. The foreign consumption and price indices are similar to the ones for the home country. The conditional commodity demand functions are derived by minimizing the expenditure for the composite goods z and are given by

$$\frac{C_{H_s}(i,z)}{C_s}=n\left(\frac{P_{H_s}(z)}{P_{H_s}}\right)^{-\theta}\frac{P^\eta_s}{P^\eta_{Hs}} \text{ and } \frac{C_{F_s}(i,z)}{C_s}=\frac{(1-n)}{\mathcal{P}^*}\left(\frac{P_{F_s}(z)}{P_{F_s}}\right)^{-\theta}\frac{P^\eta_s}{P^\eta_{Fs}}. \tag{4}$$

2.2 The budget constraint

The home and foreign agent i have a state s specific budget constraint,

$$\Pi_s+W_sL_s+\Sigma\Gamma_s=P_sC_s+M_s-M_0+T_s. \tag{5}$$

$\Sigma\Gamma_s$ denotes the state dependent part of the budget constraint, W_s, the nominal wage rate, and Π_s, total profits of the firms, which are owned by the households

$$\Pi_s=\int_0^1 P_{H_s}(z)C_{H_s}(i,z)dz+S_s\int_0^{\mathcal{P}^*} P^*_{H_s}(z)C^*_{H_s}(i,z)dz-W_sL_s(i).$$

The equilibrium taxes by the government are given by $T_s=-(M_s-M_0)$. S_s is the nominal exchange rate, defined as the number of domestic currency units per unit of foreign currency. The equilibrium revenue from producing goods equals

$$\begin{aligned} REV_s &= \Pi_s+W_sL_s=n\left(\frac{P_{H_s}}{P_s}\right)^{1-\eta}P_sC_s+(1-n)\,S_s\left(\frac{P^*_{H_s}}{P^*_s}\right)^{1-\eta}P^*_sC^*_s \text{ and} \\ REV^*_s &= \Pi^*_s+W^*_sL^*_s=n^*\left(\frac{P^*_{F_s}}{P^*_s}\right)^{1-\eta}P^*_sC^*_s+(1-n^*)\frac{1}{S_s}\left(\frac{P_{F_s}}{P_s}\right)^{1-\eta}P_sC_s. \end{aligned}$$

2.3 Households' optimality conditions and money supply

The following optimality conditions for consumption, real balances and labour effort for agent i are derived from the objective function (1) and the budget constraint

$$\lambda_s=\frac{C_s^{-1}}{P_s},\;\lambda_s=\chi\,(M_s)^{-1},\;\lambda_s=\frac{K}{W_s}, \text{ with } \frac{M_s}{P_s}=\chi C_s \text{ and } \frac{W_s}{P_s}=KC_s. \tag{6}$$

The foreign country has similar first order conditions. Combining the domestic and foreign money demand equations one arrives at

$$\frac{C_s}{C_s^*} = \frac{M_s}{P_s}\frac{P_s^*}{M_s^*}. \tag{7}$$

The implication is that the relative marginal utilities of consumption at home and abroad need to equate to the relative marginal utilities of holding money. The money supply in each country is determined by the national monetary authorities and is conditional on the supply disturbances K and K^*. It is assumed that each country decides on an exchange rate rule for setting the money supply. The precise monetary policy rules are specified below.

2.4 Firms' optimal price setting

For illustrative purposes, we introduce the shadow price P_{H,V_s} which would be charged if all prices were flexible. It follows that under flexible prices producers would require prices that equal

$$P_{H,V_s} = \frac{\theta}{(\theta-1)} K P_s C_s \text{ and } P_{F,V_s}^* = \frac{\theta}{(\theta-1)} K^* P_s^* C_s^*. \tag{8}$$

Thus, flexible goods producers set prices such that the marginal costs, $\frac{K}{P_{H,Vs}}$, from a price reduction equate to the marginal utility from income, $\frac{C^{-1}}{P}$.

For the remaining part, it is assumed that prices are fixed. Firms at home [abroad] do not enter separate price contracts for domestic and international sales and set one domestic price, $P_{H_s}(z)$ $[P_{F_s}^*(z)]$. The households at home and abroad then pay for their requested foreign good the following ex post price: $P_{F_s}(z) = P_F^*(z)S_s$ and $P_{H_s}^*(z) = \frac{P_H(z)}{S_s}$. As firms set their price before the realization of the shock they like to maximize the real discounted value of their profits. The price by the fixed price producer at home equates to

$$P_H = \frac{E_{-1}(P_{H,V}\frac{L}{PC})}{E_{-1}(\frac{L}{PC})}. \tag{9}$$

Thus, the expected marginal gains from sales, $P_{H,2}E_{-1}\left(C^{-1}\cdot L/P\right)$, equal the marginal costs, i.e. the expected value of the price set by flexible price producers adjusted by the marginal gains from sales $E_{-1}\left(P_{H,V}C^{-1}\cdot L/P\right)$. The foreign fixed-prices are given by

$$P_F^* = \frac{E_{-1}(P_{F,V}^*\frac{L^*}{P^*C^*})}{E_{-1}(\frac{L^*}{P^*C^*})}. \tag{10}$$

Expectational prices contain a form of risk premium, which depends on variances and covariances of the variables displayed in the equations above. The risk premium reflects the fact that prices need to be set before shocks are realized and plays a role in the link between shocks and monetary policy. Monetary policy can be used to affect the variances and covariances of the shocks and therefore it is able to influence the risk premium.

The model outlined above is not linear in logs and it becomes necessary to solve the model by a second order approximation around a non-stochastic steady state. Let's define for any variable X that $\mathsf{x} = \ln\left(\frac{X}{\bar{X}}\right)$ where $\bar{X}$ is the value in the deterministic equilibrium. Taking a second order approximation of the price equations around the deterministic symmetric equilibrium for $\bar{K} = \bar{K}^* = 1$ and accounting for the fact that $\frac{X-\bar{X}}{\bar{X}} = \mathsf{x} + \frac{\mathsf{x}^2}{2} + O(\varepsilon)^3$ it follows that for expectational prices the following risk premiums are derived

$$
\begin{aligned}
E_{-1}(\mathsf{p}_H) &= \mathcal{R}_{p_H}, \qquad E_{-1}(\mathsf{p}_F) = \mathcal{R}_{p_F^*} + E_{-1}(\mathsf{s}), \\
E_{-1}(\mathsf{p}_F^*) &= \mathcal{R}_{p_F^*}, \qquad E_{-1}(\mathsf{p}_H^*) = \mathcal{R}_{p_H} - E_{-1}(\mathsf{s}),
\end{aligned}
$$

The risk premiums for domestic prices, $\mathcal{R}_{p_H}$ and $\mathcal{R}_{p_F^*}$, equate to

$$
\mathcal{R}_{p_H} = \frac{\sigma^2_{p_{H,V}}}{2} - (1-\eta)\,\sigma_{\frac{L}{PC},p_{H,V}}), \; \mathcal{R}_{p_F^*} = \frac{\sigma^2_{p^*_{F,V}}}{2} - \sigma_{\frac{L^*}{P^*C^*},p^*_{F,V}}), \tag{11}
$$

where we utilized the fact that $E\left(\mathsf{x}^2\right) + O(\varepsilon)^3 = E\left(\ln X - E(\ln X)\right)^2 = \sigma_x^2$ and terms of order $O(\varepsilon)^3$ are ignored. They increase with the volatility of the shadow price, P_{H,V_s}. This follows from the fact that fix price producers would like to adjust their prices in response to a supply disturbance but are not allowed to do so. To be compensated for this they require a risk premium. In contrast, the expected fixed prices charged abroad depend on the expected nominal exchange rate, $E_{-1}(\mathsf{s})$, which in turn depends on whether the economies allow for trade in state contingent asset.

2.5 International asset markets

Two different financial market structures are defined, namely financial autarky and complete asset markets. Under financial autarky an international financial market does not exist and ex-ante trade in state-contingent assets is not possible. When financial markets are integrated, it is assumed that sufficient contingent financial market instruments are available, which allow households to diversify idiosyncratic risk, so that sharing of consumption risk is possible. Financial market integration corresponds to a movement from financial autarky towards complete financial markets.

2.5.1 Segmented financial markets

If there is no ex ante trade in state contingent assets then financial markets are segmented, denoted with *seg*, and households cannot trade in any security with each other. Thus, they can neither borrow or lend. It follows that $\Sigma\Gamma_s = 0$ in any state of nature. Thus, the current account needs to be in balance and the nominal value of the domestic goods consumed abroad $\mathcal{P}^* S_s P^*_{Hs} C^*_{Hs}$ needs to equal the amount of foreign goods consumed at home in nominal terms, $P_{Fs} C_{Fs}$. Therefore the ratio of consumption between the two countries equals

$$\frac{C_s}{C_s^*} = \left(\frac{S_s P_s^*}{P_s}\right)^{\eta} \left(\frac{S_s P^*_{Hs}}{P_{Fs}}\right)^{1-\eta}. \tag{12}$$

Under segmented financial markets the relative consumption of the home and foreign country needs to equal the relative prices, i.e. the real exchange rate, $\frac{S_s P_s^*}{P_s}$, and the terms of trade, $\frac{S_s P^*_{Hs}}{P_{Fs}}$. The responsiveness of the real exchange rate (terms of trade) to movements in relative consumption under segmented markets is affected by η. The higher η the less (more) accentuated need to be shifts in the real exchange rate (terms of trade) for a given change in the relative consumption pattern.

2.5.2 Complete financial markets

Under complete financial markets, defined as *comp*, there exists a full set of state contingent assets. Hence, an asset is traded for each state s of the world, reflected by the term $\Sigma\Gamma_s = (B_{H,s} + S_s B_{F,s}) - \sum_{\mathcal{S}} (q_{H,\mathcal{S}} B_{H,\mathcal{S}} + q^*_{F,\mathcal{S}} S_s B_{F,\mathcal{S}})$ for the home country. A similar expression applies for the foreign country. The quantity of securities paying one unit of country H currency in state $\mathcal{S}$ purchased by the household in country H equals $B_{H,\mathcal{S}}$ and $S_s B_{F,\mathcal{S}}$ while the pay-offs equal $B_{H,s}$ and $S_s B_{F,s}$, respectively. The price for one unit of a security paying off in country H currency in state $\mathcal{S}$ equals $q_{H,\mathcal{S}}$, while $q^*_{F,\mathcal{S}}$ is the price of the security in the foreign country paying off in state $\mathcal{S}$. State contingent assets are in zero net supply and the trade in state contingent assets takes place before shocks are realized while payments occur after the realization of the disturbances at the actual exchange rate.[6] From the budget constraint the optimal security holdings in the home and foreign country yield the following no-arbitrage condition at home and abroad

$$\frac{q_{H,s}}{q^*_{F,s}} = \frac{E_{-1}(S\lambda)}{S_s E_{-1}(\lambda)} \text{ and } \frac{q^*_{F,s}}{q_{H,s}} = \frac{S_s E_{-1}\left(\frac{\lambda^*}{S}\right)}{E_{-1}(\lambda^*)}. \tag{13}$$

Households at home and abroad balance their expected marginal utilities of holding domestic and foreign securities across different state of natures, adjusting the relative price of assets by the realized nominal exchange rate in state s. The risk sharing condition equates to

$$\frac{C_s}{C_s^*}(1+\Gamma) = \frac{S_s P_s^*}{P_s}, \quad (1+\Gamma) = \frac{E_{-1}\left(REV^{-1}\right)}{E_{-1}\left((REV^* \cdot S)^{-1}\right)}. \tag{14}$$

[6] The zero net supply restriction implies that $nB_{H,\mathcal{S}} + \mathcal{P}^* n^* B^*_{H,\mathcal{S}} = nB_{F,\mathcal{S}} + \mathcal{P}^* n^* B^*_{F,\mathcal{S}} = 0$. Thus, countries hold assets of each other independent of their size. The asset prices are unaffected by the size of the economy.

Contrary to the segmented market case, it is now the ratio of the marginal utilities at home and abroad, adjusted by the relative expected revenue of sales, which have to equal the real exchange rate. Since asset trade takes place before exchange rate regime decisions are made, households will expect a symmetric equilibrium, such that $\Gamma = 0$.[7] Consequently, an additional unit of revenue in either country will be expected to be equally distributed. The marginal utilities of income across countries are equalized when adjusted by the nominal exchange rate and risk sharing is complete.

2.5.3 The expected exchange rate

From the relative money demand equation (7) and the determination of relative consumption levels under the two financial market structures one can establish the following relationships

$$S_s^{seg} = \frac{M_s}{M_s^*}\left(\frac{P_s^*}{P_s}\frac{P_{Fs}}{P_{Hs}^*}\right)^{1-\eta} \quad \text{and} \quad S^{comp} = \frac{M_s}{M_s^*}.$$

Under segmented financial markets, the expected exchange rate depends on how expected foreign and domestic prices develop

$$E_{-1}\left(\mathsf{s}^{seg}\right) = \frac{(1-\Delta)\left(\mathcal{R}_{p_F^*} - \mathcal{R}_{p_H}\right) + (1-\eta)^2\left(n^*\left(1-n^*\right) - n\left(1-n\right)\right)\frac{\sigma_s^2}{2}}{\Delta}, \qquad (15)$$

where $\Delta = (1-(1-\eta)(n^*+n))$. Under segmented financial markets households do not have access to a complete set of state contingent assets. The expected exchange rate acts as an insurance device. More precisely, the expected exchange rate guarantees the expected relative income transfer needed in the absence of international financial markets by adjusting the purchasing power of households. Therefore, the expected exchange rate depends on the relative size of domestic and foreign risk premiums as well as on the volatility of the nominal exchange rate.

Under complete financial markets the expected nominal exchange rate only depends on the expected money supply, which is conditional on the expected realization of the supply disturbance. As $E_{-1}(\ln K) = 0$ it follows that $E_{-1}\left(\mathsf{s}^{comp}\right) = 0$. No adjustment of the expected exchange rate is needed to provide households with the expected consumption levels across countries. Thus, complete financial markets stabilize the expected nominal exchange rate. As risk sharing is complete, expected marginal utility levels are equalized across countries.

[7] The theoretical results discussed below are independent of the timing of asset trade. They also hold if asset trade takes place after exchange rate regime decisions are made, which implies that $\Gamma \neq 1$. A proof can be provided on request.

2.5.4 International asset markets and monetary policy rules

The objective of this paper is to assess the properties of alternative exchange rate arrangements on the country's national price level when the economy moves towards internationally integrated financial markets. Therefore, it is necessary to specify the behavior of the foreign monetary authority. To simply matters, it is assumed that the foreign economy is large relative to the home country, so that $\mathcal{P} \to \infty$ and $n^* \to 1$. It then follows that a monetary policy rule that stabilizes foreign prices is a natural benchmark for the foreign economy because stabilizing foreign producer prices replicates a situation of completely flexible prices in the large foreign country. To ensure such a target, the foreign economy sets its money supply so that the foreign risk premium $\mathcal{R}_{p_F^*}$ equates to zero. Then the foreign money supply adjusts in the following way: $\mathsf{m}_s^* = -\mathsf{k}^*$.

For the domestic economy, an exchange rate peg is compared to a monetary policy of targeting domestic goods prices. The latter rule utilizes the monetary instrument to stabilize domestic goods prices. This eliminates the need for fixed price goods producers to require a risk premium since their inability to adjust their prices becomes irrelevant. Such a rule leaves the nominal exchange rate free to float. When the monetary authority of the domestic economy aims at targeting the risk premium on domestic goods prices, $\mathcal{R}_{p_H}$ equals zero, it adjusts the domestic money supply as follows

$$\mathsf{m}_s = -\mathsf{k}, \tag{16}$$

regardless of the financial market structure. The monetary policy rule induces a procyclical reaction of domestic money supply to movements in domestic supply disturbances.

In the case of a peg the home monetary authority varies the home money supply to maintain the exchange rate at a target rate $\bar{S}$, so that $\mathsf{s}_s - E_{-1}(\mathsf{s}) = 0$ holds. This implies that $\sigma_{\mathsf{s}}^2 = 0$. The domestic monetary authority needs to account for the differing nominal exchange rate movements under segmented and complete financial market structures to ensure its exchange rate target. The financial market conditions (12) and (14) imply that the nominal exchange rate under segmented and complete financial markets becomes

$$\mathsf{s}_s^{seg} = \frac{(\mathsf{m}_s - \mathsf{m}_s^*)}{\Delta} \text{ and } \mathsf{s}_s^{comp} = \mathsf{m}_s - \mathsf{m}_s^*, \tag{17}$$

respectively. Conditional on the money supplies at home and abroad, the nominal exchange rate will be more sensitive under complete than segmented financial markets when $\Delta > 1$. Given (17), domestic money supply adjusts regardless of the financial market structure by

$$\mathsf{m}_s = -\mathsf{k}^*. \tag{18}$$

Given the monetary policy rules, the main ex post realized values of the model can be summarized in Table (1). On this basis, it is now possible to assess the effects of the different exchange rate arrangements on NPL in the process of financial market integration.

2.6 National price levels and the exchange rate regime

The NPL of a country can be written as

$$NPL = \frac{P}{SP}.$$

The aim is to analyze the effect monetary policy has on NPL in the process of financial market integration. We therefore express the NPL in expected terms, accounting for the fact that the model is not linear in logs

$$E_{-1}(\mathsf{npl}) = E_{-1}(\mathsf{p}) - E_{-1}(\mathsf{p}^* + \mathsf{s}).$$

Given the definition of the price indices one can write

$$E_{-1}(\mathsf{p}) = n\mathcal{R}_{p_H} + (1-n)\left[\mathcal{R}_{p_F^*} + E_{-1}\left(\mathsf{s}^{fms}\right) + n(1-\eta)\frac{\sigma_s^2}{2}\right] \text{ and } E_{-1}(\mathsf{p}^*) = \mathcal{R}_{p_F^*} = 0,$$

as the foreign economy is large, $n^* \to 1$ and it stabilizes the foreign risk premium. The expected NPL can be written under the different financial market structures, fms, as

$$E_{-1}\left(\mathsf{npl}^{fms}\right) = \underbrace{n\,\mathcal{R}_{p_H}}_{\text{"price effect"}} - \underbrace{(1-n)\,n\,(\eta-1)\,\frac{\sigma_s^2}{2}}_{\text{"relative price effect"}} - \underbrace{n\,E_{-1}(\mathsf{s})}_{\text{"purchasing power effect"}}, \tag{19}$$

given the expected nominal exchange rate $E_{-1}\left(\mathsf{s}^{fms}\right)$ under segmented and complete asset markets

$$E_{-1}\left(\mathsf{s}^{seg}\right) = \frac{(\Delta-1)\,\mathcal{R}_{p_H} - (1-\eta)^2\,n\,(1-n)\,\frac{\sigma_s^2}{2}}{\Delta} \text{ and } E_{-1}\left(\mathsf{s}^{comp}\right) = 0. \tag{20}$$

The "price effect" occurs because domestic firms cannot adjust their prices after supply disturbances have occurred. Therefore, they require a risk premium $\mathcal{R}_{p_H}$, which causes the domestic, and hence, NPL (19) to rise.

The expected NPL (19) is also affected by the variability of the nominal exchange rate. Any movement in the nominal exchange rate induces a "relative price effect". The greater η the higher will be the impact of exchange rate movements on overall price movements. Since goods prices are sticky relative price changes, which are due to the nominal exchange rate, are desirable from the view of domestic households when $\eta > 1$ because this allows them to substitute domestic for foreign goods for a given price change. As a result, the price of the consumption basket will be kept at the desired level. Consequently, the NPL declines when the nominal exchange rate is allowed to fluctuate freely.

Equation (20) shows that the expected exchange rate induces a "purchasing power effect" because it adjusts the purchasing power of households. For $\eta > 1$ the expected exchange rate mitigates the positive effect of the risk premium on the NPL while it dampens the negative effect exchange rate variability has on (19). More precisely, a higher risk premium causes a higher expected exchange rate. This takes away purchasing power of the home economy and causes ceteris paribus the NPL to decline. The variability of the nominal exchange rate brings about relative price changes. The relative price change improves the purchasing power of domestic households and is reflected in a lower expected exchange rate. Therefore, the expected exchange rate mitigates the negative effect exchange rate variability has on (19).

The different effects can be illustrated in more detail when considering the impact of the different exchange rate regimes on the NPL. Under a floating exchange rate regime, the NPL equates under segmented and complete financial markets to

$$\begin{aligned} E_{-1}\left(\mathsf{npl}^{seg}_{Float}\right) &= \frac{\eta\left(1-\eta\right)n\left(1-n\right)}{\Delta}\frac{\sigma^2_{s^{seg}}}{2} \\ E_{-1}\left(\mathsf{npl}^{comp}_{Float}\right) &= \left(1-n\right)n\left(1-\eta\right)\frac{\sigma^2_{s^{comp}}}{2}, \end{aligned} \tag{21}$$

respectively. Under a float, the NPL depends only the variability of the nominal exchange rate.

Under a peg, the different financial market structure imply that

$$\begin{aligned} E_{-1}\left(\mathsf{npl}^{seg}_{Peg}\right) &= \frac{n\left(2-\Delta\right)}{\Delta}\mathcal{R}_{p_H} \\ E_{-1}\left(\mathsf{npl}^{comp}_{Peg}\right) &= n\mathcal{R}_{p_H}, \end{aligned} \tag{22}$$

and, hence, a fixed exchange rate regime causes the NPL to rise with the risk premium of domestic goods prices. Table (1) allows to state the variability of the nominal exchange rate and the risk premium as

$$\sigma^2_{s^{seg}} = \frac{\sigma^2_k + \sigma^2_{k^*}}{\Delta^2} \text{ and } \sigma^2_{s^{comp}} = \sigma^2_k + \sigma^2_{k^*} \text{ as well as } \mathcal{R}_{p_H} = \frac{\sigma^2_k + \sigma^2_{k^*}}{2}. \tag{23}$$

On the basis of equations (21)-(22) it is possible to state the following proposition:

Proposition 1 *The expected national price level under*

(i) a fixed exchange rate regime increases in the process of financial market integration.

(ii) a floating exchange rate regime declines in the process of financial market integration.

Proof. To establish the claim made in part one of proposition 1, note from equation (22) that the difference between the national price levels under complete and segmented financial markets equals

$$E_{-1}\left(\mathsf{npl}^{comp}_{Peg} - \mathsf{npl}^{seg}_{Peg}\right) = n\frac{2\left(\Delta-1\right)}{\Delta}\frac{\sigma^2_k + \sigma^2_{k^*}}{2} > 0, \tag{24}$$

for $0 < n \leq 1$ and $\eta > 1$. The claim made in part one of proposition 1 immediately follows from equation (24).

To establish part two consider equation (21), which allows to state the following relationship

$$E_{-1}\left(\mathsf{npl}^{comp}_{Float} - \mathsf{npl}^{seg}_{Float}\right) = (1-n)\, n\, (1-\eta)\left(1 - \frac{\eta}{\Delta^3}\right)\frac{\left(\sigma^2_k + \sigma^2_{k^*}\right)}{2} < 0, \qquad (25)$$

for $0 < n < 1$ and $\eta \neq 1$. Equation (25) establishes the claim made in part two of proposition 1. ■

As the monetary authority maintains a fixed exchange rate, it cannot resolve the risk premium demanded by domestic goods producers. This creates uncertainty in the economy and causes the NPL to rise with the risk premium, as illustrated in equation (22) and (24). However, under segmented financial markets this effect will be compensated via the expected exchange rate. The risk premium also increases the expected exchange rate under segmented financial markets, which mitigates the NPL, due to the induced income transfer from home to abroad. This latter effect does not occur under complete financial markets. Here the expected exchange rate is stabilized due to the presence of a complete set of state contingent assets. Consequently, the positive effect of the risk premium on the NPL will be amplified when financial markets become integrated. To summarise, the NPL will be lower under segmented than complete international financial markets under an exchange rate peg.

The opposite pattern occurs under floats, as shown in equation (21) and (25). The monetary authority accommodates the domestic supply shock and resolves the risk premium. This stabilizes the level of domestic goods prices and leads to a lower NPL via the induced flexibility in the nominal exchange rate. The relative price changes, induced by the nominal exchange rate, affect the expected exchange rate negatively. The lower expected exchange rate under floats raises the purchasing power of the domestic country and increases the NPL under segmented financial markets. This latter effect is not present under complete financial markets. As a consequence, the NPL appears to be higher under segmented than complete financial markets when the country decides to let the nominal exchange rate float freely. This holds as long as the economy is open to trade, $0 < n < 1$, and the elasticity of substitution between home and foreign goods η is not unity while under fixed exchange rate regimes NPL rise in the process of financial market integration as long as $\eta > 1$.

It is noteworthy at this point to consider the available empirical estimates for the elasticity of substitution between home and foreign goods. Obstfeld and Rogoff (2000b) survey some of the literature and quote estimates of between 1.2 and 21.4 for individual goods. For the average elasticity of traded goods η lies in the range of 5 to 6 (Anderson and van Wincoop (2003), Harrigan (1993) as well as Trefler and Lai (1999)). The real business cycle literature uses values of around 1.5 (see Chari, Kehoe and Mc Gratten, 2002). Adolfson et al. (2007) provide estimates of η of around 11. Thus, there is considerable empirical evidence that the elasticity of substitution between home and foreign goods is not unity and larger than one. Hence, the following corollary should hold:

Corollary 1 *The equilibrium national price level increases [decreases] when financial markets become more integrated with the inflexibility [flexibility] of the nominal exchange rate. Consequently,* $E_{-1}\left(\mathsf{npl}_{Peg}^{comp} - \mathsf{npl}_{Peg}^{seg}\right) > 0$ $[E_{-1}\left(\mathsf{npl}_{Float}^{comp} - \mathsf{npl}_{Float}^{seg}\right) < 0]$.

This corollary, that the equilibrium level of national prices increases [decreases] with the rigidity [flexibility] of the exchange rate regime choice in the process of financial market integration, is the central hypothesis of the model. In the next section the paper, we test this conclusion empirically.

3 Empirical Evidence

This section provides evidence on the relationship between international financial integration and national price levels based on a panel of 54 countries.

3.1 Measurement issues

Three crucial points pertain to measurement issues: First, the measurement of the price level deserves particular attention. Second, assessing the degree of international financial integration is not straightforward. Third, the identification of a country's exchange rate regime is complicated by the fact that the official exchange rate regime the country reports to the IMF need not correspond to the country's de facto policy. We discuss each of these issues in turn.

National price level (NPL): We use the same data definition as in Broda (2006). The data is taken from the Penn World Tables (PWT) 6.2 and, alternatively, from the World Development Indicators (WDI) database of the World Bank. The data is computed using the same methodology across countries. This means that, in contrast to real exchange rate data, the NPL in this study is comparable across countries, see Summers and Heston (1991). These data sources collect prices of different goods and services for a selected number of countries. Drawing on this sample of prices, PPP indices for each country relative to the US are constructed, defining a country's NPL as the PPP index of that country divided by it's foreign exchange rate. The NPL for country i is

$$NPL_i = \frac{1}{s_{i,US}} \sum_j \omega_j \frac{p_{i,j}}{p_{us,j}}, \tag{26}$$

where $s_{i,US}$ is the exchange rate between country i's currency and the U.S. dollar. The weight of good j is denoted by ω_j and p_{ij} are national goods prices.

International Financial Integration (FIN): The key explanatory variable measuring the degree of international financial integration using the gross foreign asset position relative to GDP as constructed by Lane and Milesi-Ferretti (2001a, 2003, 2006). For country i at date t the measure FIN_{it} is given by the sum of foreign assets FA_{it} and foreign liabilities FL_{it} over GDP

$$FIN_{it} = \frac{FA_{it} + FL_{it}}{GDP_{it}}. \tag{27}$$

This variable closely corresponds to the theoretical notion of international financial integration in terms of the availability of state-contingent assets. Furthermore, Kose et al. (2006a) argue that this quantity-based measure of international financial market integration, based on actual flows and stocks, provides the best available measure of a country's integration with international financial markets.

Exchange rate regime classification: A recent literature documents that the exchange rate regime a central bank officially announces not necessarily corresponds to actual policy. Even under officially freely floating exchange rates, central banks regularly intervene in foreign exchange markets. For this reason, we do not rely on the de jure classification provided by the IMF's Annual Report on Exchange Arrangements, but draw on the de facto classifications provided by Levy-Yeyati and Sturzenegger (2003, 2005) and Reinhart and Rogoff (2004). For each classification, we distinguish between a peg (Fix), a floating exchange rate (Float) and an intermediate regime (INT). Table (2) documents the number of observations available under each classification for four different samples. For the purpose of this paper, the classification of Reinhart and Rogoff (2004) is more relevant, since its puts more weight on actual exchange rate volatility.[8] Levy-Yeyati and Sturzenegger (2003) also include changes in reserve holdings, which essentially scales down the weight of exchange rate fluctuations.

3.2 The estimation strategy

We estimate the following regression using Panel OLS

$$\begin{aligned} \log NPL_{it} &= \alpha_{it} + \beta_0 \times FIN_{it} + \beta_1 \{(FIX_{it} + INT_{it}) \times FIN_{it}\} + \\ &\quad \beta_2 \{FLO_{it} \times FIN_{it}\} + \Gamma' X_{it} + \varepsilon_{it}. \end{aligned} \tag{28}$$

The vector X_{it} contains a set of control variables with coefficient vector Γ. All regressions allow for fixed (time) effects. We apply the two alternative classifications explained above to distinguish

[8] See Aghion et al. (2006) for this point.

three different exchange rate regimes. The dummy variables FIX_{it}, INT_{it} and FLO_{it} have a value of one if the country exhibits a fixed exchange rate, an intermediate degree of exchange rate management or a freely floating exchange rate, respectively, and zero otherwise. Note that we include both the level of FIN_{it} and its interaction with the exchange rate regime dummy. Our main hypothesis, formulated in corollary 1, suggests that $\beta_0 + \beta_1 > 0$ and $\beta_0 + \beta_2 < 0$. That is, financial integration has a positive effect on the national price level under pegged and intermediate exchange rate regimes and has a negative effect under floating exchange rates. We test this hypothesis using a standard χ^2 distributed Wald test statistic.[9] To check the robustness of the results, we allow the effects of fixed and intermediate regimes to be different. We estimate the following regression

$$\begin{aligned} \log NPL_{it} &= \alpha_{it} + \beta_0 \times FIN_{it} + \beta_1 \{(FIX_{it} \times FIN_{it}\} + \beta_2 \{INT_{it} \times FIN_{it}\} \\ & \quad \beta_3 \{FLO_{it} \times FIN_{it}\} + \Gamma' X_{it} + \varepsilon_{it}. \end{aligned} \tag{29}$$

We also include an extensive set of various control variables which is mirrored in the vector

$$\begin{aligned} X'_{it} &= (\log GDP_{it}, OPEN_{it}, \log SIZE_{it}, OPEN_{it} \times \log GDP_{it}, \\ & \qquad DUR_{it}, CREDIT_{it}, FIX_{it}, INT_{it}, FLO_{it}). \end{aligned} \tag{30}$$

The most important is the log of per-capita GDP (GDP) as taken from the PWT. This variable captures the well-known Balassa-Samuelson connection of productivity differentials between tradable and non-tradable goods and the overall price level. Thus, we expect GDP to enter the equation with a positive sign. The degree of trade openness ($OPEN$), measured by the ratio of exports plus imports to GDP, is also taken from the PWT. As mentioned earlier, it is frequently argued that countries which are more exposed to trade should exhibit lower price levels. Thus we expect $OPEN$ to have a negative sign. The country size ($SIZE$) is measured by the (log) population reported by the PWT. We include a measure of the level of the development of the domestic financial system ($CREDIT$). This measure is given by the log of the ratio of private credit to GDP obtained from Beck, Demirguc-Kunt, and Levine (2000). We control for the fact that in many developing countries the exchange rate regime exhibits a very unstable pattern. Therefore, we construct a measure of the duration (DUR) of a given exchange rate regime (in years). It corresponds to a time trend in the price level that experiences a break whenever the

[9] As Aghion et al. (2006) note in a similar set-up, the endogenous nature of the exchange rate regime is less of an issue with an interaction term than with single variables. The reason is that the endogeneity of the exchange rate regime choice could bias the coefficient on the exchange rate regime in a linear regression. Assume that the exchange rate regime choice coincides with other policies associated with a higher price level. It follows that this can only bias the interaction coefficients to the extent that the correlation between these policies and the exchange rate regime choice varies significantly with the degree of financial integration.

exchange rate regime changes.[10] Finally, the interaction term $OPEN \times \log(GDP)$ is included in analogy to Broda (2006) and can be motivated by the assumption that a high propensity to trade should pull a country's price level upwards.[11] Some of the non-OECD countries, notably China, accumulate large external positions while maintaining a restricted capital account. To account for those cases, we include Chinn and Ito's (2007) measure of capital account openness ($KAOPEN$) in those regressions.[12]

To check the robustness of the results with respect to the time-series properties of the variables, we allow for non-stationarity and possible cointegration and estimate the model using Dynamic OLS following, among others, Mark and Sul (2003). This amounts to estimating an augmented equation which includes one lead and one lag of all explanatory variables. For this purpose, we restrict the sample to include only those exchange rate regimes that lasted for a minimum of three years to guarantee that the contemporaneous observation and both the lead and the lag are taken to the same underlying exchange rate regime.

The set of countries comprises all OECD and major emerging market countries. However, we leave Luxembourg, Hong Kong, and Singapore out as these off-shore financial centers hold exceptionally high net foreign asset positions. To account for the possibility of nonlinearity in the relationship between financial integration and national price levels, we follow Lane and Milesi-Ferretti (2001b and 2004) and split the sample into OECD and non-OECD countries. They argue that the size of the foreign asset positions as well as its composition might depend nonlinearly on the level of economic development.

We use annual data for the period 1990-2004 for 54 countries. Before 1990, the dynamics of the gross foreign asset position, our measure of financial integration, were essentially flat.[13] Figure (2) depicts the average degree of financial integration for all three country groups. Apparently, financial integration increased dramatically in the post-1990 period. Therefore, we base our main specification on data ranging from 1990 to 2004, but also report results for the 1970-2004 period. The graph also confirms that OECD and Non-OECD countries exhibit a different pace of financial integration that justifies to split the sample accordingly.

[10] This indicator roughly corresponds to Broda's (2006) index of exchange rate regime shifts.

[11] See Kravis and Lipsey (1987) for this argument.

[12] The regressions based on price level data from the WDI data base include a step-dummy for membership in the European Monetary Union (EMU) from 1999 onwards. This accounts for the apparent large structural break in the data for EMU member countries.

[13] Kose et al. (2006b) estimate a panel using the same data set on foreign assets and liabilities. They refer to the post-1987 period as the "globalization period".

3.3 A first look at the data

In a first attempt to gauge the relationship between FIN_{it} and $\log NPL_{it}$ for different exchange rate regimes, figures (3) and (4) present the combinations of these two variables in a set of scatter plots. Under managed exchange rate regimes, i.e. under pegs and intermediate regimes, a clear positive relationship emerges. Countries that are more financially integrated have higher price levels. Under floating exchange rates, this relationship flattens substantially under the LYS classification and turns negative for the RR classification. Hence, this rough evidence indeed suggests a nominal exchange rate regime-dependent pattern of interdependence. Note that, as stated above, the RR classification is more relevant in this context as it puts more weight on actual exchange rate volatility in the classification of de-facto regimes than the LYS classification. We use formal econometric testing to identify this regime dependent nature and appropriately control for other explanatory variables.

In a second step, we discover the unconditional relationship between the national price level and the degree of international financial integration, that is, we do not condition on the prevailing exchange rate system. Table (3) reports the results from regressing NPL on FIN and other major explanatory variables. The degree of international financial integration enters with a significant positive coefficient. Thus, countries that have more access to international financial assets exhibit a higher price level. It turns out that all control variables are significant and have the expected sign. Countries with a higher per capita income and a higher level of domestic financial development have higher price levels. On the other hand, more open countries and larger countries tend to have smaller price levels. The interaction term $OPEN \times GDP$ enters with a positive sign indicating that the price-effect of GDP is stronger the more open the economy. With respect to the control variables the findings are completely in line with Broda (2006), among others. Results based on WDI data exhibit similar characteristics.

3.4 The role of the exchange rate regime

We now turn to the effect different exchange rate regimes have on national prices in the process of international financial market integration. The baseline results are reported in table (4). All major control variables remain significant and have the expected sign. Most importantly the level of financial integration enters positively, while the interaction terms with prevailing exchange rate regime indicate important regime-dependent effects. The Wald tests confirm this finding: For both the LYS and the Reinhart-Rogoff classification we find a positive price effect of integration under managed exchange rates and a significant negative effect under floating exchange rates. Technically, $\beta_0+\beta_1 > 0$ for fixed and intermediate exchange rates and $\beta_0+\beta_1 < 0$

for floating exchange rates. Thus, we can corroborate our main hypothesis for both exchange rate classification schemes. Under the Reinhart-Rogoff classification for PWT data, for example, a 10% larger share of gross foreign assets increase the national price level by 0.27 percentage points under fixed and intermediate exchange rate regimes and lowers the price level by 0.3 percentage points under floating exchange rates. The regressions based on the price level data from the WDI data set support these numbers.

In many transition countries, data availability and data quality for the early 1990s is a source of concern. Therefore, we also estimate a regression excluding all transition countries. The results, which are presented in table (5), lend further support to our main hypothesis.

In tables (6) and (7) we separate OECD countries from Non-OECD countries. Interestingly, the data indeed suggests that developed and emerging countries exhibit different response patterns as suggested by Lane and Milesi-Ferretti (2001b and 2004). The price level in OECD countries, for example, reacts less to GDP and to $CREDIT$, our measure of domestic financial development, than in the larger set of countries. OECD countries, on the contrary, respond more to the measure of trade openness and its interaction with income. International financial integration has a larger price impact in the OECD sample than in the large sample. Under the LYS classification, for example, the coefficient on FIN is 0.033 for all countries but 0.059 for OECD countries. Our theoretical hypothesis gains strong empirical support in the OECD sample. Moving from a financially closed economy to a fully open capital account raises the national price level under pegged and intermediate exchange rate regimes and lowers the price level under floating exchange rates. For the Non-OECD countries, we find limited evidence in favor of a negative price effect of financial integration under floating exchange rates and only insignificant or negative price effects under managed exchange rate regimes.

Since our sample comprises various short-lived exchange rate regimes, we report a separate set of results for those regimes, that have a minimum duration of three years.[14] Table (8) confirms our main result indicating that it is not due to exchange rate regime instabilities. Finally, tables (9) and (10) document the results for the long sample period ranging from 1970 to 2004 for the large set of countries and for the OECD sample. The degree of financial integration enters positively in both cases. Under managed exchange rate, we find a significantly positive price impact of financial integration. For floating exchange rates, this effect becomes negative under the LYS and the RR classification. However, the negative effects lacks statistical significance for the large set of countries. These results improve if we restrict the sample to OECD countries. Under both de facto classification schemes, the price effect is statistically significant and negative under flexible exchange rates. Only for the RR classification, however, do we also find a statistically

[14] In his case we drop the DUR_{it} index.

significant positive effect under managed exchange rate regimes. Table (11) reports the results based on the estimation of (29), i.e. with explicitly allowing the intermediate regime to have a separate effect. It turns out that the effect of financial integration on the price level changes its sign for floating exchange rate regimes. In other word, bundling fixed and intermediate exchange rate regimes together is an innocuous simplification.

To control for the possibility that the results reflect a process of price convergence of countries with relatively low national price levels we allow in tables (12) and (13) for initial price levels and levels of financial integration of country i in the sample. More precisely, we estimate two specifications that include either NPL or FIN of a base year, i.e. 1990. The results are presented in tables (12) and (13). All previous findings remain qualitatively and quantitatively unchanged for given values of NPL_{1990} and FIN_{1990}.

Finally, table (14) contains the estimates obtained from using Dynamic Panel OLS to estimate the model. Both $\beta_0+\beta_1$ and $\beta_0+\beta_1$ have the correct sign and are in almost all cases significantly different from zero. Again, financial integration lowers prices under floats and raises prices under managed exchange rates.

In sum, we find strong evidence in support of our main theoretical hypothesis for the post-1990 sample in which financial integration gained momentum. Based on the available de facto exchange rate classification schemes we find that national price levels are higher for those countries that actively manage their exchange rate and lower for those countries that let their currency float freely. This result stems mostly from the advanced economies in our sample.

4 Conclusions

This paper investigated the effects of international financial integration on national price levels. In particular, we shed light on the role of the exchange rate regime for the relationship between price levels and financial integration. A standard two country open economy model with nominal rigidities was employed to derive our main hypothesis: The effect of financial integration on national price levels depends on the exchange rate regime. Under floating exchange rates, deeper financial integration lowers the price level. Under managed exchange rates, on the contrary, financial integration raises the price level. Extensive evidence based on a panel of 54 countries supported this result. For the overall set of countries and, in particular, for the subset of OECD countries, we find strong evidence of a regime-dependent effect of financial integration on the national price level. For floating exchange rates, the price level decreases in the degree of financial integration. For managed exchange rates, the price level increases. As a by-product, the paper proposed a rationale for the well-documented systematic deviations from PPP. To the extend that countries exhibit different degrees of international financial integration, their price levels differ when expressed in a common currency.

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5 Appendix: The list of countries

country	subsamples		country	subsamples	
	OECD	Non-Transition		OECD	Non-Transition
Argentina		+	Japan	+	+
Australia	+	+	Korea (South)	+	+
Austria	+	+	Latvia		
Belgium	+	+	Lithuania		
Bolivia		+	Malaysia		+
Brazil		+	Malta		+
Bulgaria			Mexico	+	+
Canada	+	+	Netherlands	+	+
Chile		+	New Zealand	+	+
China (P.R.)		+	Norway	+	+
Columbia		+	Paraguay		+
Cyprus		+	Peru		+
Czech Republic	+		Philippines		+
Denmark	+	+	Poland	+	
Ecuador		+	Portugal	+	
Estonia			Romania		
Finland	+	+	Russia		
France	+	+	Slovakia	+	
Germany	+	+	Slovenia		
Greece	+	+	South Africa		+
Hungary	+		Spain	+	+
Iceland	+	+	Switzerland	+	+
India		+	Thailand		+
Indonesia		+	Turkey	+	+
Ireland	+	+	United Kingdom	+	+
Israel		+	United States	+	+
Italy	+	+	Venezuela		+

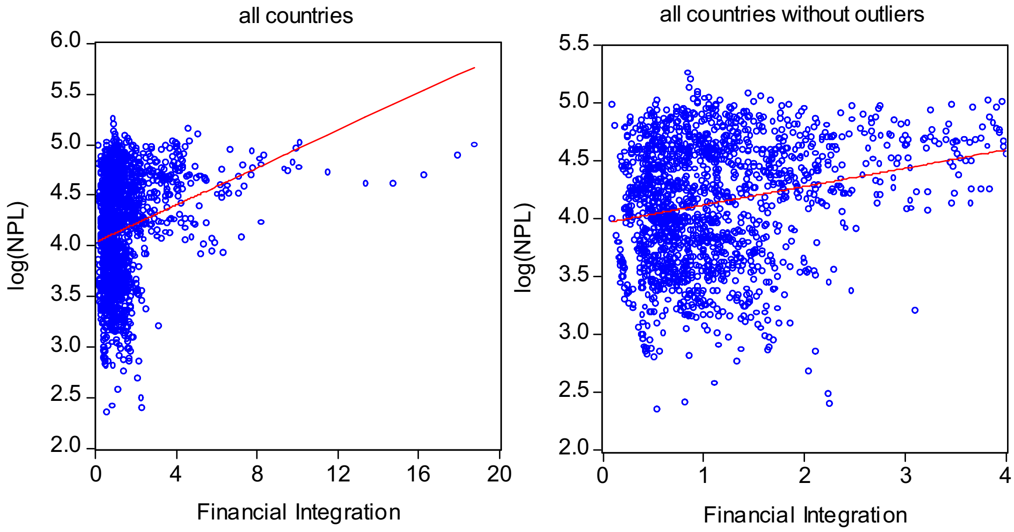

Figure 1: National price levels (NPL) from Penn World Tables against international financial integration measured by the stock for foreign assets and liabilities, 1970-2004

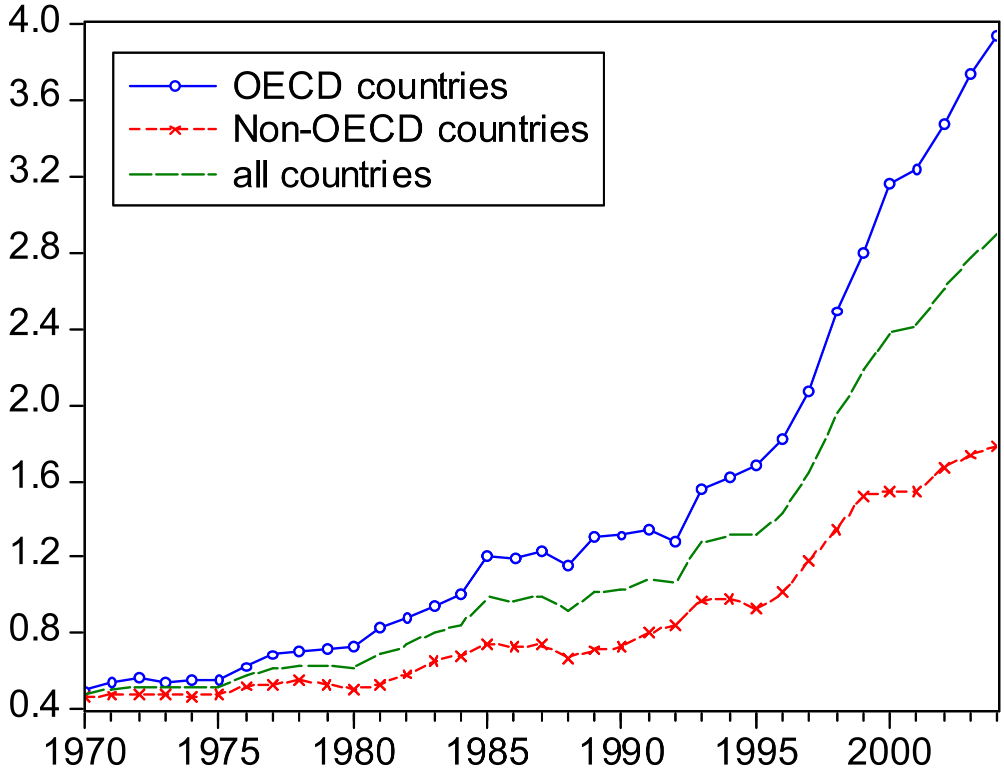

Figure 2: Average degree of international financial integration as measured by the sum of foreign assets and liabilities in % of GDP

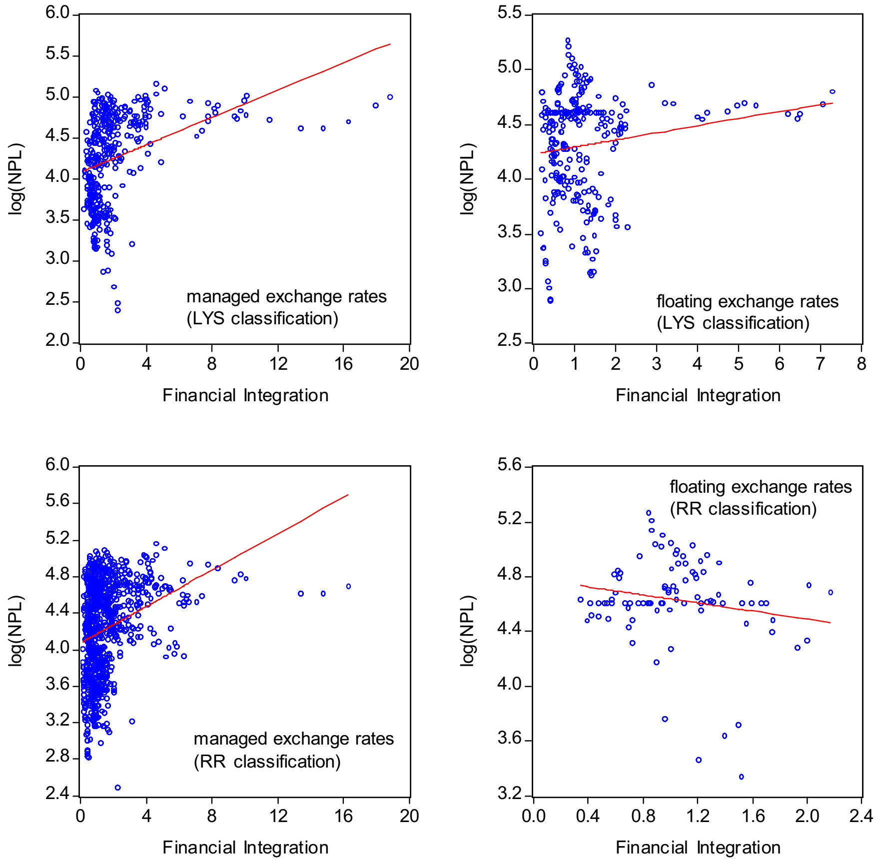

Figure 3: National price levels (PWT data) against international financial integration for different exchange rate regimes, 1970-2004

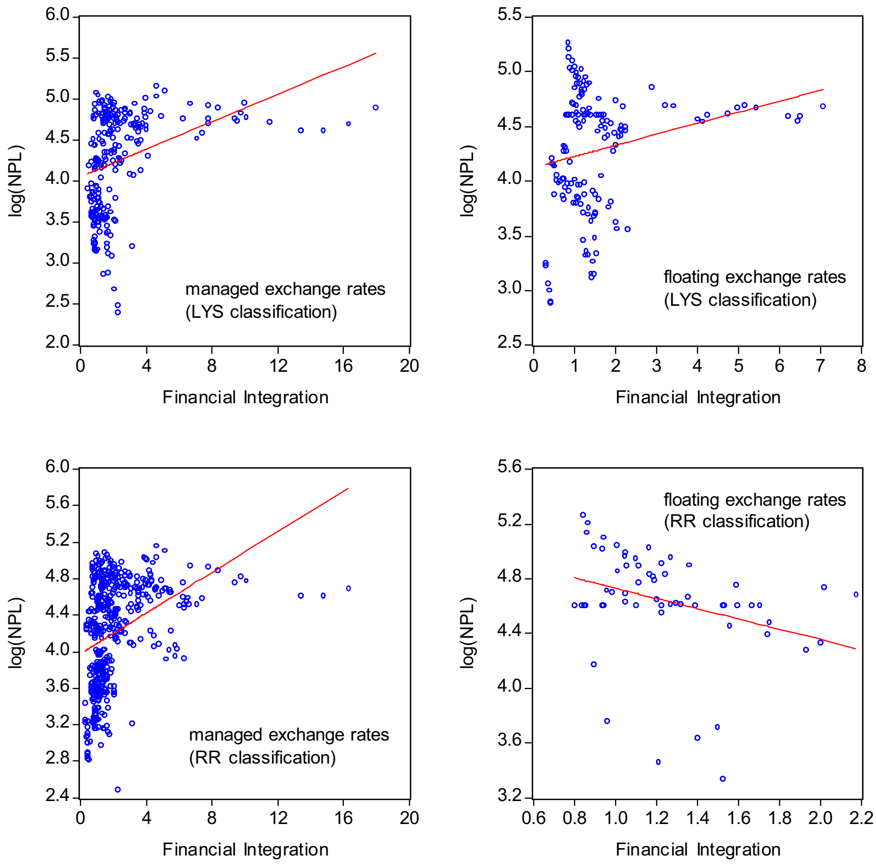

Figure 4: National price levels (PWT data) against international financial integration for different exchange rate regimes, 1990-2004

Table 1: Summary of the realized endogenous variables

Segmented Markets		Complete Markets	
$s_s = \frac{m_s - m_s^*}{\Delta}$		$s_s = m_s - m_s^*$	
Float :	$-\frac{1}{\Delta}(k - k^*)$	*Float* :	$-k + k^*$
Peg :	0	*Peg* :	0
$p_{H,V\,s} = k - m_s$		$p_{H,V\,s} = k - m_s$	
Float :	0	*Float* :	0
Peg :	$k - k^*$	*Peg* :	$k - k^*$
$p_s = (1-n)\,s_s = (1-n)\,\frac{m_s - m_s^*}{\Delta}$		$p_s = (1-n)\,s_s = (1-n)\,(m_s - m_s^*)$	
Float :	$-\frac{(1-n)}{\Delta}(k - k^*)$	*Float* :	$-(1-n)\,(k - k^*)$
Peg :	0	*Peg* :	0
$c_s = m_s - p_s$		$c_s = m_s - p_s$	
Float :	$-\frac{\Delta-(1-n)}{\Delta}k - \frac{(1-n)}{\Delta}k^*$	*Float* :	$-nk - (1-n)\,k^*$
Peg :	$-k^*$	*Peg* :	$-k^*$
$l_s = (1-n)\,s_s + c_s$		$l_s = (1-n)\,\Delta s_s + c_s$	
Float :	$-k$	*Float* :	$-((1-n)\,\Delta + n)\,k - (1-n)\,(1-\Delta)\,k^*$
Peg :	$-k^*$	*Peg* :	$-k^*$

Table 2: Number of exchange rate regime observations, 1990-2004

Sample	FX regime	Classification		
		de jure	LYS	RR
all countries	Fix	174	209	142
	Intermediate	213	59	311
	Float	217	154	55
OECD countries	Fix	75	143	87
	Intermediate	128	20	174
	Float	135	108	50
Non-OECD countries	Fix	99	66	55
	Intermediate	85	39	137
	Float	82	46	5
No transition countries	Fix	124	179	121
	Intermediate	186	55	274
	Float	209	138	55

Table 3: Preliminary results, all countries, 1990-2004

	I	II	III	IV	V	VI
			Penn World Tables (PWT) data			
const	-2.627^{***}	-2.509^{***}	-2.305^{***}	-1.797^{***}	0.390^{*}	0.467^{***}
	(0.097)	(0.101)	(0.113)	(0.138)	(0.227)	(0.137)
GDP	0.723^{***}	0.709^{***}	0.709^{***}	0.689^{***}	0.549^{***}	0.532^{***}
	(0.010)	(0.011)	(0.012)	(0.012)	(0.016)	(0.011)
FIN		0.013^{***}	0.040^{***}	0.041^{***}	0.023^{***}	0.019^{***}
		(0.003)	(0.004)	(0.004)	(0.003)	(0.001)
OPEN			-0.003^{***}	-0.004^{***}	-0.019^{***}	-0.018^{***}
			(0.0003)	(0.0003)	(0.001)	(0.001)
SIZE				-0.028^{***}	-0.121^{***}	-0.117^{***}
				(0.003)	(0.008)	(0.005)
$OPEN \times GDP$					0.001^{***}	0.001^{***}
					(0.0001)	(0.000)
CREDIT						0.063^{**}
						(0.026)
R^2	0.718	0.750	0.797	0.800	0.836	0.842
obs.	823	809	809	809	809	744
			Word Development Indicators (WDI) data			
const	-2.150^{***}	-1.974^{***}	-1.846^{***}	-1.451^{***}	-1.662^{***}	-1.247^{***}
	(0.158)	(0.152)	(0.145)	(0.243)	(0.133)	(0.211)
GDP	0.292^{***}	0.269^{***}	0.265^{***}	0.249^{***}	0.262^{***}	0.226^{***}
	(0.017)	(0.017)	(0.017)	(0.020)	(0.013)	(0.018)
FIN		0.021^{***}	0.033^{***}	0.034^{***}	0.036^{***}	0.020^{***}
		(0.004)	(0.004)	(0.005)	(0.006)	(0.004)
OPEN			-0.001^{***}	-0.002^{***}	-0.0006	-0.0005
			(0.0001)	(0.0001)	(0.001)	(0.0008)
SIZE				-0.021^{***}	-0.012^{***}	-0.027^{***}
				(0.006)	(0.004)	(0.006)
$OPEN \times GDP$					-0.0001	-0.0002^{***}
					(0.000)	(0.000)
CREDIT						0.190^{***}
						(0.027)
R^2	0.349	0.358	0.377	0.382	0.382	0.435
obs.	808	807	794	794	794	729

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 4: Results for all countries, 1990-2004

sample: 1990 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	0.033^{***}	0.019^{***}	-0.033^{***}	0.021^{***}
	(0.007)	(0.004)	(0.012)	(0.006)
$(FIX + INT) \times FIN$ (β_1)	-0.016^{**}	0.008	0.056^{***}	0.011
	(0.007)	(0.005)	(0.018)	(0.009)
$FLO \times FIN$ (β_2)	-0.060^{***}	-0.318^{***}	0.021	-0.374^{***}
	(0.007)	(0.092)	(0.018)	(0.080)
Wald Test				
$\beta_0 + \beta_1$	0.017^{***}	0.027^{***}	0.023^{***}	0.033^{***}
$\beta_0 + \beta_2$	-0.027^{***}	-0.300^{***}	-0.012	-0.352^{***}
control variables				
const	0.880^{***}	0.573^{***}	-1.204^{***}	-1.280^{***}
	(0.187)	(0.171)	(0.316)	(0.195)
GDP	0.492^{***}	0.518^{***}	0.233^{***}	0.231^{***}
	(0.016)	(0.013)	(0.023)	(0.017)
$OPEN$	-0.019^{***}	-0.019^{***}	0.000	-0.001^{*}
	(0.0008)	(0.0007)	(0.001)	(0.0008)
$OPEN \times GDP$	0.001^{***}	0.001^{***}	-0.0002^{**}	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
$CREDIT$	0.054^{**}	0.032	0.172^{***}	0.151^{***}
	(0.025)	(0.020)	(0.027)	(0.021)
$SIZE$	-0.127^{***}	-0.119^{***}	-0.035^{***}	-0.029^{***}
	(0.005)	(0.006)	(0.011)	(0.007)
DUR	0.008^{***}	0.000	0.007^{***}	-0.002
	(0.0007)	(0.001)	(0.001)	(0.001)
R^2	0.848	0.846	0.467	0.512
obs.	744	744	729	729

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 5: Results for all countries excluding transition countries, 1990-2004

sample: 1990 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
$FIN\ (\beta_0)$	0.013^{**}	0.019^{***}	-0.050^{***}	0.010^{*}
	(0.006)	(0.004)	(0.011)	(0.006)
$(FIX + INT) \times FIN\ (\beta_1)$	0.008	0.005	0.065^{***}	0.020^{**}
	(0.005)	(0.005)	(0.018)	(0.010)
$FLO \times FIN\ (\beta_2)$	-0.031^{***}	-0.323^{***}	0.032^{*}	-0.347^{***}
	(0.005)	(0.094)	(0.019)	(0.082)
Wald Test				
$\beta_0 + \beta_1$	0.021***	0.024***	0.015*	0.030***
$\beta_0 + \beta_2$	-0.018***	-0.304***	-0.018*	-0.337***
control variables				
const	-0.101	-0.253^{*}	-1.344^{***}	-1.289^{***}
	(0.147)	(0.147)	(0.345)	(0.211)
GDP	0.573^{***}	0.590^{***}	0.249^{***}	0.232^{***}
	(0.010)	(0.010)	(0.026)	(0.018)
$OPEN$	-0.014^{***}	-0.014^{***}	0.001	-0.002^{***}
	(0.001)	(0.001)	(0.001)	(0.0007)
$OPEN \times GDP$	0.001^{***}	0.001^{***}	-0.0002^{**}	0.000
	(0.000)	(0.000)	(0.0001)	0.000
$CREDIT$	-0.046^{*}	-0.064^{**}	0.138^{***}	0.152^{***}
	(0.027)	(0.028)	(0.033)	(0.025)
$SIZE$	-0.090^{***}	-0.090^{***}	-0.034^{***}	-0.030^{***}
	(0.006)	(0.006)	(0.011)	(0.007)
DUR	0.007^{***}	-0.001	0.007^{***}	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.872	0.870	0.427	0.501
obs.	611	611	596	596

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 6: Results for OECD countries, 1990-2004

sample: 1990 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	0.059^{***}	0.020^{***}	-0.011	0.001
	(0.010)	(0.005)	(0.021)	(0.009)
$(FIX + INT) \times FIN$ (β_1)	-0.044^{***}	0.014^{***}	0.043^{*}	0.047^{***}
	(0.009)	(0.005)	(0.025)	(0.016)
$FLO \times FIN$ (β_2)	-0.071^{***}	-0.346^{***}	-0.029	-0.466^{***}
	(0.008)	(0.098)	(0.023)	(0.101)
Wald Test				
$\beta_0 + \beta_1$	0.015^{***}	0.034^{***}	0.032^{***}	0.049^{***}
$\beta_0 + \beta_2$	-0.012^{**}	-0.326^{***}	-0.040^{***}	-0.465^{***}
control variables				
const	2.508^{***}	1.970^{***}	-2.087^{***}	-1.549^{***}
	(0.257)	(0.239)	(0.467)	(0.229)
GDP	0.329^{***}	0.401^{***}	0.352^{***}	0.313^{***}
	(0.017)	(0.018)	(0.027)	(0.016)
$OPEN$	-0.023^{***}	-0.022^{***}	0.006	-0.005^{**}
	(0.002)	(0.002)	(0.004)	(0.002)
$OPEN \times GDP$	0.002^{***}	0.001^{***}	-0.0008^{**}	0.0002^{*}
	(0.0001)	(0.0002)	(0.0003)	(0.0001)
$CREDIT$	0.019	-0.06	0.245^{***}	0.192^{***}
	(0.039)	(0.036)	(0.039)	(0.047)
$SIZE$	-0.129^{***}	-0.129^{***}	-0.064^{***}	-0.078^{***}
	(0.015)	(0.015)	(0.022)	(0.013)
DUR	0.012^{***}	0.001	0.002	-0.004
	(0.001)	(0.001)	(0.002)	(0.003)
R^2	0.807	0.780	0.361	0.503
obs.	404	404	404	404

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 7: Results for Non-OECD countries, 1990-2004

sample: 1990 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	-0.032^{**}	-0.042^{*}	0.007	0.008
	(0.014)	(0.023)	(0.006)	(0.008)
$(FIX + INT) \times FIN$ (β_1)	-0.027	0.032	0.015	0.008
	(0.022)	(0.022)	(0.018)	(0.009)
$FLO \times FIN$ (β_2)	-0.087	0.019	-0.079^{**}	-0.034^{*}
	(0.053)	(0.081)	(0.034)	(0.020)
Wald Test				
$\beta_0 + \beta_1$	-0.059^{**}	-0.010	0.022	0.0004
$\beta_0 + \beta_2$	-0.120^{**}	-0.060	-0.072^{**}	-0.026
control variables				
$const$	0.890	0.716	-1.823^{***}	-1.894^{***}
	$(0.501)^{*}$	(0.512)	(0.129)	(0.140)
GDP	0.469^{***}	0.477^{***}	0.251^{***}	0.244^{***}
	(0.041)	(0.044)	(0.012)	(0.012)
$OPEN$	-0.008^{***}	-0.008^{***}	-0.0004	0.0005
	(0.002)	(0.002)	(0.0007)	(0.0005)
$OPEN \times GDP$	0.0004^{**}	0.0003^{*}	-0.000	-0.0001^{**}
	(0.0002)	(0.0002)	(0.000)	(0.000)
$CREDIT$	0.183^{***}	0.191^{***}	0.084^{***}	0.129^{***}
	(0.028)	(0.035)	(0.015)	(0.018)
$SIZE$	-0.106^{***}	-0.097^{***}	0.004	0.013^{***}
	(0.016)	(0.017)	(0.004)	(0.004)
DUR	-0.010^{***}	-0.002^{*}	0.007^{***}	-0.003^{***}
	(0.003)	(0.001)	(0.002)	(0.0008)
$KAOPEN$	0.050^{***}	0.052^{***}	0.036^{***}	0.031^{***}
	(0.007)	(0.010)	(0.003)	(0.003)
R^2	0.7321	0.732	0.678	0.705
obs.	309	309	294	294

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 8: Results for all countries excluding unstable regimes, 1990-2004

sample: 1990 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	-0.098^{**}	0.012	-0.004	0.007
	(0.052)	(0.009)	(0.069)	(0.010)
$(FIX+INT)\times FIN$ (β_1)	0.128^{***}	0.016^{*}	0.034	0.028^{**}
	(0.051)	(0.009)	(0.067)	(0.013)
$FLO\times FIN$ (β_2)	0.061	-0.450^{***}	-0.015	-0.701^{***}
	(0.051)	(0.127)	(0.068)	(0.157)
Wald Test				
$\beta_0+\beta_1$	0.029^{***}	0.028^{***}	0.036^{***}	0.035^{***}
$\beta_0+\beta_2$	-0.037^{***}	-0.438^{***}	-0.018^{**}	-0.697^{***}
control variables				
$const$	-0.428	-0.320^{*}	-2.915^{***}	-0.039
	(0.289)	(0.183)	(0.276)	(0.484)
GDP	0.617^{***}	0.587^{***}	0.359^{***}	0.163^{***}
	(0.017)	(0.014)	(0.040)	(0.034)
$OPEN$	-0.016^{***}	-0.012^{***}	0.007^{**}	-0.003^{***}
	(0.002)	(0.0007)	(0.003)	(0.001)
$OPEN\times GDP$	0.001^{***}	0.0008^{***}	-0.0008^{***}	0.0001
	(0.0002)	(0.000)	(0.0003)	(0.0001)
$CREDIT$	-0.022	0.033	0.093^{***}	0.167^{***}
	(0.032)	(0.034)	(0.030)	(0.045)
$SIZE$	-0.079^{***}	-0.079^{***}	0.021^{**}	-0.076^{***}
	(0.014)	(0.007)	(0.009)	(0.018)
R^2	0.863	0.880	0.443	0.479
obs.	354	443	354	443

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 9: Results for all countries, 1970-2004

sample: 1970 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	0.048^{***}	0.034^{***}	-0.002	0.019^{***}
	(0.009)	(0.005)	(0.011)	(0.005)
$(FIX + INT) \times FIN$ (β_1)	-0.018^{**}	0.010	0.033^{**}	0.031^{***}
	(0.008)	(0.008)	(0.014)	(0.012)
$FLO \times FIN$ (β_2)	-0.056^{***}	-0.060	0.009	-0.350^{***}
	(0.009)	(0.066)	(0.015)	(0.035)
Wald Test:				
$\beta_0 + \beta_1$	0.029^{***}	0.043^{***}	0.031^{***}	0.050^{***}
$\beta_0 + \beta_2$	-0.008	-0.027	0.006	-0.331^{***}
control variables				
$const$	1.020^{***}	0.895^{***}	-0.357	-0.057
	(0.150)	(0.157)	(0.238)	(0.261)
GDP	0.454^{***}	0.466^{***}	0.155^{***}	0.134^{***}
	(0.012)	(0.012)	(0.019)	(0.021)
$OPEN$	-0.013^{***}	-0.011^{***}	-0.0002	-0.002^{***}
	(0.002)	(0.002)	(0.0006)	(0.000)
$OPEN \times GDP$	0.0008^{***}	0.0007^{***}	-0.0002^{***}	0.000
	(0.0001)	(0.0001)	(0.000)	(0.000)
$CREDIT$	0.092^{***}	0.083^{***}	0.185^{***}	0.147^{***}
	(0.020)	(0.017)	(0.021)	(0.021)
$SIZE$	-0.088^{***}	-0.084^{***}	-0.050^{***}	-0.058^{***}
	(0.009)	(0.009)	(0.008)	(0.007)
DUR	0.011^{***}	0.002^{***}	0.009^{***}	0.002
	(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.799	0.796	0.312	0.356
obs.	1468	1468	1267	1267

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 10: Results for OECD countries, 1970-2004

sample: 1970 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	0.029***	0.011**	0.059***	0.009
	(0.007)	(0.005)	(0.022)	(0.008)
$(FIX + INT) \times FIN$ (β_1)	−0.024***	0.014***	−0.016	0.070***
	(0.005)	(0.004)	(0.021)	(0.019)
$FLO \times FIN$ (β_2)	−0.051***	−0.137***	0.047**	−0.376***
	(0.007)	(0.056)	(0.019)	(0.047)
Wald Test				
$\beta_0 + \beta_1$	0.004	0.024***	0.043***	0.079***
$\beta_0 + \beta_2$	-0.022***	-0.126**	0.012	-0.367***
control variables				
const	2.358***	2.191***	−0.712*	0.063
	(0.209)	(0.228)	(0.425)	(0.445)
GDP	0.367***	0.396***	0.219***	0.177***
	(0.014)	(0.014)	(0.035)	(0.034)
$OPEN$	−0.022***	−0.021***	0.007**	−0.002
	(0.002)	(0.002)	(0.003)	(0.003)
$OPEN \times GDP$	0.002 ***	0.002 ***	−0.001***	−0.0001
	(0.0002)	(0.0001)	(0.0002)	(0.0002)
$CREDIT$	0.036	0.040	0.205***	0.153***
	(0.026)	(0.026)	(0.035)	(0.042)
$SIZE$	−0.133***	−0.134***	−0.072***	−0.098***
	(0.011)	(0.012)	(0.013)	(0.014)
DUR	0.013***	−0.0002	0.005***	0.0004
	(0.001)	(0.001)	(0.002)	(0.003)
R^2	0.764	0.748	0.250	0.359
obs.	863	863	748	748

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 11: Results for all countries, 1990-2004, three FX regimes

sample: 1990 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	0.034^{***}	0.019^{***}	-0.031^{***}	0.022^{***}
	(0.007)	(0.004)	(0.011)	(0.006)
$FIX \times FIN$ (β_1)	-0.017^{**}	0.003	0.052^{***}	-0.009
	(0.009)	(0.005)	(0.017)	(0.009)
$INT \times FIN$ (β_2)	-0.012^{*}	0.014^{*}	0.060^{***}	0.035^{*}
	(0.007)	(0.007)	(0.019)	(0.020)
$FLO \times FIN$ (β_3)	-0.060^{***}	-0.318^{***}	0.020	-0.366^{***}
	(0.007)	(0.093)	(0.018)	(0.088)
Wald Test				
$\beta_0 + \beta_1$	0.016^{***}	0.022^{***}	0.021^{***}	0.012
$\beta_0 + \beta_2$	0.022^{***}	0.033^{***}	0.029^{***}	0.056^{***}
$\beta_0 + \beta_3$	-0.026^{***}	-0.299^{***}	-0.011	-0.344^{***}
control variables				
const	0.886^{***}	0.598^{***}	-1.231^{***}	-1.203^{***}
	(0.194)	(0.178)	(0.317)	(0.230)
GDP	0.491^{***}	0.516^{***}	0.236^{***}	0.226^{***}
	(0.017)	(0.014)	(0.023)	(0.019)
$OPEN$	-0.019^{***}	-0.019^{***}	-0.0001	-0.002^{***}
	(0.001)	(0.001)	(0.0008)	(0.0007)
$OPEN \times GDP$	0.001^{***}	0.001^{***}	-0.0001^{*}	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
$CREDIT$	0.053^{**}	0.030^{***}	0.164^{***}	0.135^{***}
	(0.025)	(0.019)	(0.028)	(0.017)
$SIZE$	-0.127^{***}	-0.120^{***}	-0.036^{***}	-0.033^{***}
	(0.005)	(0.006)	(0.011)	(0.007)
DUR	0.008^{***}	0.000	0.007^{***}	-0.003
	(0.001)	(0.001)	(0.001)	(0.002)
R^2	0.847	0.846	0.465	0.516
obs.	744	744	729	729

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 12: Results for all countries with initial value of national price level, 1990-2004

sample: 1990 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	0.009	0.009***	−0.042***	0.013**
	(0.006)	(0.003)	(0.012)	(0.006)
$(FIX + INT) \times FIN$ (β_1)	−0.001	0.001	0.061***	0.012
	(0.006)	(0.004)	(0.018)	(0.009)
$FLO \times FIN$ (β_2)	−0.036***	−0.305***	0.036**	−0.362***
	(0.008)	(0.084)	(0.018)	(0.081)
Wald Test				
$\beta_0 + \beta_1$	0.008***	0.010***	0.018***	0.026***
$\beta_0 + \beta_2$	-0.027***	-0.296***	-0.007	-0.348***
control variables				
$const$	1.284***	1.119***	−1.073***	−1.190***
	(0.188)	(0.173)	(0.312)	(0.184)
GDP	0.293***	0.303***	0.162***	0.176***
	(0.002)	(0.025)	(0.027)	(0.015)
$OPEN$	−0.015***	−0.015***	0.001*	0.000
	(0.001)	(0.001)	(0.0008)	(0.000)
$OPEN \times GDP$	0.001***	0.001***	−0.0002***	−0.0001**
	(0.000)	(0.000)	(0.000)	(0.000)
$CREDIT$	0.030	0.008	0.133***	0.125***
	(0.024)	(0.021)	(0.027)	(0.023)
$SIZE$	−0.113***	−0.108***	−0.034***	−0.026***
	(0.007)	(0.007)	(0.010)	(0.006)
DUR	0.006***	−0.0005	0.005***	−0.0022
	(0.001)	(0.0006)	(0.001)	(0.001)
NPL_{1990}	0.317***	0.322***	0.123***	0.095***
	(0.035)	(0.035)	(0.012)	(0.011)
R^2	0.892	0.892	0.499	0.542
obs.	744	744	729	729

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 13: Results for all countries with initial value of financial integration, 1990-2004

sample: 1990 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	-0.033^{**}	0.002	-0.072^{***}	0.005
	(0.015)	(0.005)	(0.018)	(0.007)
$(FIX + INT) \times FIN$ (β_1)	0.026^{**}	-0.006	0.075^{***}	0.005
	(0.011)	(0.006)	(0.021)	(0.008)
$FLO \times FIN$ (β_2)	-0.070^{***}	-0.329^{***}	0.022	-0.353^{***}
	(0.012)	(0.089)	(0.019)	(0.081)
Wald Test				
$\beta_0 + \beta_1$	-0.007	-0.004	0.002	0.010^{***}
$\beta_0 + \beta_2$	-0.104^{***}	-0.327^{***}	-0.050^{***}	-0.348^{***}
control variables				
const	0.133	0.162	-1.501^{***}	-1.447^{***}
	(0.130)	(0.149)	(0.317)	(0.204)
GDP	0.538^{***}	0.541^{***}	0.249^{***}	0.237^{***}
	(0.013)	(0.012)	(0.023)	(0.017)
$OPEN$	-0.014^{***}	-0.016^{***}	0.003^{***}	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
$OPEN \times GDP$	0.001^{***}	0.001^{***}	-0.000^{***}	-0.000^{***}
	(0.000)	(0.000)	(0.000)	(0.000)
$CREDIT$	0.014	-0.006	0.148^{***}	0.134^{***}
	(0.022)	(0.022)	(0.026)	(0.020)
$SIZE$	-0.094^{***}	-0.103^{***}	-0.021^{**}	-0.021^{***}
	(0.005)	(0.006)	(0.011)	(0.007)
DUR	0.008^{***}	-0.001	0.008^{***}	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)
FIN_{1990}	0.133^{***}	0.090^{***}	0.079^{***}	0.050^{***}
	(0.018)	(0.012)	(0.009)	(0.006)
R^2	0.866	0.858	0.495	0.538
obs.	743	743	728	728

Notes: The dependent variable is the national price level. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

Table 14: Results for all countries using Dynamic OLS, 1990-2004

sample: 1990 - 2004	I	II	III	IV
	PWT data		WDI data	
	FX regime classification		FX regime classification	
	LYS	RR	LYS	RR
financial integration				
FIN (β_0)	-0.114^{*}	0.003	0.043	0.012
	(0.067)	(0.012)	(0.094)	(0.013)
$(FIX + INT) \times FIN$ (β_1)	0.138^{**}	0.012	-0.012	0.022
	(0.065)	(0.013)	(0.092)	(0.016)
$FLO \times FIN$ (β_2)	0.077	-0.546^{***}	-0.058	-0.887^{***}
	(0.067)	(0.124)	(0.093)	(0.170)
Wald Test				
$\beta_0 + \beta_1$	0.020^{***}	0.015^{**}	0.031^{**}	0.034^{***}
$\beta_0 + \beta_2$	-0.037^{**}	-0.543^{***}	-0.015	-0.874^{***}
control variables				
$const$	0.002	-0.304	-3.816^{***}	-0.217
	(0.533)	(0.421)	(0.567)	(0.472)
GDP	0.567^{***}	0.583^{***}	0.407^{***}	0.174^{***}
	(0.039)	(0.033)	(0.036)	(0.031)
$OPEN$	-0.013^{***}	-0.011^{***}	0.011^{***}	-0.005^{***}
	(0.002)	(0.002)	(0.003)	(0.002)
$OPEN \times GDP$	0.001^{***}	0.001^{***}	-0.001^{***}	0.0002
	(0.000)	(0.000)	(0.000)	(0.0002)
$CREDIT$	0.033	0.044	0.126^{**}	0.179^{***}
	(0.045)	(0.037)	(0.060)	(0.047)
$SIZE$	-0.065^{***}	-0.074^{***}	0.042^{*}	-0.081^{***}
	(0.018)	(0.013)	(0.023)	(0.018)
R^2	0.897	0.890	0.416	0.506
obs.	311	428	311	428

Notes: The dependent variable is the national price level. The regression also includes one lead and lag of all explanatory variables. Standard errors are given in parenthesis and are clustered at the country level. All regressions include time specific fixed-effects and the exchange rate regime dummies separately. The Wald test evaluates whether the reported sum of the coefficients is significantly different from zero. A significance level of 1%, 5%, and 10% is indicated by ***, **, and *, respectively.

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